ENVIRONMENTAL SCREENING OF THE PROPOSED INVESTIGATION AND REMEDIATION OF PIN-B CLIFTON POINT DEW LINE SITE UNDER THE NUNAVUT IMPACT REVIEW PROCESS

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LIST OF ACRONYMS

AIA	Archaeological Impact Assessment
AMSRP	Abandoned Military Site Remediation Protocol
ACM	Asbestos Containing Materials
BMPs	Best Management Practices
CAC	Criteria Air Contaminants
CCME	Canadian Council of Ministers of Environment
CEAA	Canadian Environmental Assessment Act
CEPA	Canadian Environmental Protection Act
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSP	Contaminated Sites Program
CWF	Canadian Wildlife Federation
CWS	Canadian Wildlife Service
DCC	Defense Construction Canada
DDT	dichlorodiphenyltrichloroethane
DEW	Distant Early Warning
DLCU	DEW Line Clean-Up
DFO	Department of Fisheries and Oceans
DND	Department of National Defense
EA	Environmental Assessment
EC	Environment Canada
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ESA	Environmental Site Assessment
EPP	Environmental Protection Plan
ERP	Environmental Response Plan

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FCR	Federal Coordination Regulation
FCSAAP	Federal Contaminated Sites Accelerated Action Plan
GN	Government of Nunavut
GN CLEY	GN Department of Culture Language Elders and Youth
HASP	Health and Safety Plan
HTO	Hunters and Trappers Organization
INAC	Indian and Northern Affairs Canada
IUCN	International Union for Conservation of Nature and Natural Resources
MBCA	Migratory Bird Convention Act
NIRB	Nunavut Impact Review Board
NHWL	Non-Hazardous Waste Landfill
NLCA	Nunavut Land Claims Agreement
NOx	nitrogen oxides
NPC	Nunavut Planning Commission
NPRI	National Pollution Release Inventory
NRCAN	Natural Resources Canada
NSA	Nunavut Settlement Area
NTI	Nunavut Tunngavik Incorporated
NWPA	Navigable Waters Protection Act
NWB	Nunavut Water Board
NWMB	Nunavut Wildlife Management Board
NWNSRTA	Nunavut Waters and Nunavut Surface Rights Tribunal Act
PCBs	polychlorinated biphenyls
PHCs	petroleum hydrocarbons
PM	particulate matter
POL	petroleum, oil and lubricant fluids
POPs	persistent organic pollutants
PWGSC	Public Works and Government Services Canada
RA	Responsible Authority
RAP	Remedial Action Plan
SARA	Species at Risk Act
SO_2	sulphur dioxide
TC	Transport Canada
WHF	Waste Handling Facility
VEC	Valued Ecosystem Components

1.0 INTRODUCTION

Indian and Northern Affairs Canada (INAC), as the caretaker of federal lands in Canada's north, is responsible for the care and management of contaminated sites that are no longer maintained by the original owner/operator (PWGSC, 2008). These sites are often a result of mining, oil and gas activities, as well as government military activities. Through the Contaminated Sites Program (CSP), INAC has made it a priority to assess, prioritize and mitigate/remediate the environmental impacts of contaminated sites in Canada's north. Included in the list of contaminated sites is the PIN-B Clifton Point Distant Early Warning (DEW) Line Site (the Site).

The purpose of this document is to conduct an environmental screening assessment for the proposed investigation and remediation of the former PIN-B Clifton Point DEW Line Site, located, Nunavut consistent with the assessment requirements of both the *Canadian Environmental Assessment Act* (CEAA) and the *Nunavut Land Claims Agreement* (NLCA).

1.1 PROJECT PURPOSE

The purpose of the PIN-B Clifton Point DEW Line Site Remediation Project is to decommission facilities used by the former DEW Line, which have been declared surplus to the requirements of the North Warning System. Decommissioning will meet objectives identified by INAC (INAC 2008) for contaminated sites remediation namely:

- To restore the sites to an environmentally safe condition;
- To prevent environmental migration of contamination into the Arctic ecosystem/food chain;
- To remove physical hazards for the protection of human health and safety; and
- To implement a cost effective remediation solution.

To accomplish this, remediation activities at the Site will include:

- The delineation, excavation and removal of soils in cases where the identified contaminants are above the DEW Line Clean Up criteria (INAC, 2008) set for the project.
- The remediation and/or stabilization of landfills, which may serve as a source of contamination.
- Demolition and segregation of wastes for disposal of all Site structures and tanks which may contain environmental contaminants such as asbestos, lead paint and fuels.
- Collection and disposal of old barrels and their contents.
- Collection and appropriate disposal of hazardous and non-hazardous surface debris.

In addition, as described by UMA (2006), the prevention of biomagnification is paramount to the clean up. The process of biomagnification is particularly important in Arctic organisms, where, as a result of their dependency on a high fat content in their diets, are extremely sensitive to contamination inputs, especially chlorinated contaminants such as PCBs. Given the nature of the Arctic ecosystem, 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 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.

1.2 SCOPE OF ENVIRONMENTAL ASSESSMENT

1.2.1 Scope of Project

The trigger for environmental assessment (EA) under Article 12 of the Nunavut Land Claims Agreement (NLCA) is a project proposal, as defined under Article 1 of the NLCA, requiring one or more authorizations from the Territorial Government, Federal Government or a Designated Inuit Organization. In scoping the project, clean up activities requiring such authorizations were identified. Furthermore, according to Canadian Environmental Assessment Act (CEAA) guidance (CEAA, 2007) the scope of project will also include:

- any component of the development proposal directly related to a regulatory trigger(s) (trigger components); and
- any other components of the development proposal that should be included in the scope of the project in consideration of their potential to cause adverse environmental effects related to matters within federal jurisdiction (non-trigger components).

A trigger component can generally be described as the physical work or activity for which one or more regulatory approvals is/are required. It should usually be defined to include elements physically linked together.

In addition to principle project elements, non-trigger components and accessory components of the project can also be included in the project scope. The decision to include them is based on potential for adverse environmental effects, public concerns and the extent of federal jurisdiction.

As such the scope of the project is defined in Table 1.

Table 1: Project Scope and Assessment

Project	Description
CEAA and NIRB EA Triggers	Funding from INAC; Federal permits required for land use. Water License required from Nunavut Water Board.
Scope of the project – principal project	Physical clean up of the PIN-B site, including: • Delineation of all impacted environmental media • Demolition and disposal of Site structures • Removal of waste materials (including hazardous wastes) • Excavation and landfilling or landfarming of contaminated soil • Collection and disposal of miscellaneous debris • Collection, cleaning (if necessary) and crushing and landfilling of empty barrels • Construction of landfills and hydrocarbon contaminated soil treatment facilities
Accessory physical works	Mobilization and demobilization of contractor's equipment and personnel, temporary construction camp set up, upgrading of roadways where required.
Other undertakings in relation to the physical work	None.

1.2.2 Scope of Assessment

In accordance with Article 12.5.2 of the NLCA, this EA includes a consideration of the following factors:

- Project description, including the purpose and need for the project;
- Anticipated ecosystemic and socio-economic impacts of the project;
- Anticipated effects of the environment on the project;
- Steps which the proponent proposes to take, including any contingency plans, to avoid and mitigate adverse impacts;
- Steps which the proponent proposes to take to optimize benefits of the project, with specific consideration being given to expressed community and regional preferences as to benefits;
- Steps which the proponent proposes to take to compensate interests adversely affected by the project;
- The monitoring program that the proponent proposes to establish with respect to ecosystemic and socio-economic impacts;
- The interests in lands and waters which the proponent has secured, or seeks to secure;
- Options for implementing the proposal; and
- Any other matters that NIRB considers relevant.

During consultation, NIRB did not raise any other matters as being relevant to the project (Payette, pers. com., 2008).

Furthermore, Section 16(1) of CEAA identifies the following screening requirements which have also been incorporated in this review;

- The purpose of the project;
- The environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- The significance of the effects;
- Comments from the public that are received in accordance with CEAA and its regulations;
- Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- Alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternatives;
- The need for, and the requirements of, any follow-up program in respect of the project; and
- The capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

1.2.3 Scope of Factors

This assessment identifies potential impacts to the existing conditions surrounding the Site which may result from project activities during and after site remediation.

For most impacts the spatial extent of the assessment is limited to the footprint and duration of the project as described in Section 2.0 of the Project Description. For the consideration of cumulative impacts a regional assessment has been undertaken where there is potential for overlapping impacts from other projects and activities.

2.0 PROJECT DESCRIPTION

2.1 BACKGROUND

The DEW Line was a line of radar stations and military sites that stretched across Canada's 69th parallel of latitude from Alaska to Baffin Island and continuing through Greenland. The stations were meant to provide air defense and early warning using Doppler Radar Systems. The Station at PIN-B Clifton Point was constructed in 1957 by the Department of National Defense (DND). The Station was abandoned in 1963 at which time the site responsibility was assumed by INAC (PWGSC, 2008). In addition to the aging infrastructure, the years of operation of the Site have resulted in the following:

- Seven dump sites.
- Three small sites of partially buried debris.
- Fourteen main areas of surface debris.
- Over 820 used barrels, primarily in four stockpiles.
- Areas of petroleum, PCB and heavy metal contaminated soils.

A Phase II Environmental Site Assessment (ESA) was conducted by Environmental Services Group in 1994 (ESG, 1995). This study formed the basis of planning for a Phase III ESA conducted in 2007 by UMA Engineering (UMA, 2008b). The Phase lll ESA sought to collect all the data necessary to develop a detailed Remedial Action Plan (RAP). In 2008 at the request of Public Works and Government Services Canada (PWGSC), a RAP was developed by UMA Engineering (UMA, 2008ba) that sought to provide a plan for achieving the objectives for cleanup identified in the INAC Abandoned Military Sites Protocol (INAC, 2008), namely:

- Restoring the Site to an environmentally safe condition;
- Preventing the migration of contaminants into the Arctic ecosystem;
- Removing physical hazards for the protection of human health and safety; and
- Implementing a cost effective remediation solution.

2.2 SITE DESCRIPTION

2.2.1 Site Location and Dimensions

The Site is located in Nunavut, at 69º13' N, 118º 38' W, along the coast of the Amundsen Gulf, near the discharge of the Dolphin and Union Strait (See Figure 1). The nearest communities are Kugluktuk, located approximately 200 km to the southeast, and Paulatuk located approximately 220 km to the west in the Northwest Territories (NWT). The nearest air charter bases are located in Cambridge Bay, 550 km to the east on Victoria Island, and Yellowknife, located approximately 800 km to the south. The Site is situated about 1km from the coast on terrain that is relatively flat with several lakes and ponds and a maximum elevation of 30 m above sea level (asl). Surficial material at the Site is primarily coarse gravel.

The PIN-B station area is comprised of a five-module building train (the "module train"), a warehouse, a garage, a small house for Inuit staff (the "Inuit House"), a petroleum, oil and lubricants (POL) storage facility with associated distribution system, and a downed radar tower. In addition to the Station facilities, a cargo beaching area was constructed at the beach area (see Figure 2). A second POL storage facility was located at the beach, in the vicinity of the barge landing area. Two airstrips were constructed at the Site. The primary (operational) airstrip is approximately 1 km long and is located south of the beach area. The second (abandoned) airstrip is about 300 m long and located a short distance northwest of the primary airstrip. Gravel roads were built linking the airstrip, water supply lake and beach landing area to the station area. A small construction camp was erected during building of Site facilities but was demolished once Site construction was completed. The former camp of an Inuit family, constructed from material salvaged from the PIN-B site, is located approximately 1.5 km southeast of the station area.

2.2.1.1 Dump Sites

Seven dump sites and three small areas of buried debris have been identified for remediation at the Site, these are shown in Figures 3a and 3b and identified as Station West Dump Area, Construction Camp Dump A, Construction Camp Dump B, Construction Camp Dump C, Beach Dump, Beach Dump South A, Beach Dump South B, Beach POL Buried Debris, Beach Inuit Camp and West Beach POL Buried Debris.

2.2.1.2 Surface Debris

Fourteen surface debris areas were identified during the Phase lll ESA (UMA, 2008a) covering approximately 430 acres. These are located mainly to the east of the Site, although areas also exist near the Station West Dump Area, adjacent to the east end of the active airstrip, around the Station Area and associated with the construction camp. Wastes within these sites are considered predominantly non-hazardous.

2.2.1.3 Barrels

The 2007 inventory of barrels at PIN-B indicated that there are 820 barrels on Site, including 124 that were identified with aqueous contents (UMA, 2008a). Barrels are stockpiled in four main areas at the Site, two areas close to the construction camp, one to the southeast of the main airstrip and one associated with the Beach POL.

2.2.1.4 Contaminated Soils

Contaminated soils have been identified in various locations around the Site, including around the Station Area, the Beach POL area and in volumes expected to arise from dump excavation. Contaminants at varying concentrations include heavy metals, PCBs and PHCs.

2.3 SITE ACCESS

2.3.1 Off-site Access

The Site is located along the coast and was historically accessed by barge. Information obtained from a local elder whose family lived at the nearby Inuit Camp during site operation indicates that barge access to the Site was never a problem during operation (UMA, 2008a). Furthermore, there are no nearby mining operations, and therefore, no potential for independent development of an ice road that would be of use for contractor mobilization. Additionally, because of the long distance from any communities, combined with the availability of barge access, it is considered unlikely that overland mobilization (i.e. cat train) would be a viable option for contractor mobilization. Therefore, the primary access to the Site for mobilization and demobilization of contractor equipment and supplies during remediation will be via barge.

An inspection of the primary airstrip at the Site was completed in 2007 (UMA, 2008a). The airstrip is about 1,000 m long. The granular materials at the airstrip are well compacted. The airstrip is generally considered to be in good condition and considered suitable for landing the following aircrafts (with full loads) during dry conditions at the Site: DC-3, DC-4, Hercules C-130, Otter DHC-3, Twin Otter DHC-6, Shorts Skyvan, and Buffalo DHC-5. Although the primary mobilization of contractor equipment will be via barge, options for use of aircraft for mobilization, demobilization and supply are available.

2.3.2 On-site access

There are a number of gravel roads throughout the Site connecting the Station Area with the airstrip and beach areas. There are also several trails where vehicular and tracked equipment have traveled in the past. (UMA, 2008a). The gravel roads are well elevated and in good condition with the exception of localized areas on the main access road where bears burrowing for ground squirrels have created a low spots in the road surface and will require infilling.

The roads are in good condition for heavy equipment although regular grading will be required. Construction of widened or pull out sections will be required for two way heavy equipment traffic. The existing trails would require upgrading for hauling routes. Small extensions of the existing road system will be required to access some of the other site areas (UMA, 2008a).

2.4 DESCRIPTION OF PROJECT ACTIVITIES

The RAP (UMA, 2008a) includes the following tasks:

- delineation of all impacted environmental media (particularly soils and building wastes);
- construction of new containment facilities (landfills and landfarm);
- excavation and removal or landfarming of contaminated soils;
- demolition of all Site structures and tanks and burial on Site;
- collection of miscellaneous surface debris;

- containerisation and disposal of all hazardous liquid and solid (soil) wastes; and
- collection and crushing of empty barrels.

There are a number of project tasks that have not been determined or are yet to be finalized. This screening report covers only the elements currently established but is structured so that additional project elements and tasks may be incorporated into the assessment as they are defined by PWGSC and INAC.

2.4.1 Project Schedule

Based on an anticipated project tendering date of fall/winter 2008, the proposed schedule for Site remediation is as follows:

- Contract tendering (Winter 2008).
- Contract award (Spring 2009).
- Mobilization (Fall 2009).
- Year 1 remedial activities (Fall 2009).
- Year 2 remedial activities (Summer 2010).
- Year 3 remedial activities (Summer 2011).
- Demobilization (Fall 2011).

2.4.2 Project Activities

Environmental issues at the Site requiring remediation are related to:

- contaminated soils;
- existing dumps;
- areas of surface and partially buried debris, including (abandoned barrels);
- demolition debris; and
- hazardous materials.

Contaminated soils will be excavated, and depending on their classification will either be buried in an on-site non-hazardous waste landfill (NHWL), shipped off-site for disposal or, landfarmed on-site, or landfarmed on-site. Existing areas containing landfill materials will either be excavated and relocated to a newly constructed NHWL, or covered with additional granular material and regraded. Buildings will be demolished and, as appropriate, debris will either be buried in an on-site NHWL or shipped off-site to a licensed facility for proper disposal.

In accordance with protocols established by INAC, hazardous materials, including PCB and/or lead-based paint on building components will be collected and shipped off-site to a licensed facility for proper disposal. Asbestos containing material will be double-bagged and disposed of in an on-site landfill, creosote treated timbers will be wrapped in polyethylene sheets and disposed of in an on-site landfill, and compressed gas cylinders with known contents will be

vented and land filled on-site. Barrels containing fluids will be excavated and tested, and treated according to the *DEW Line Cleanup Barrel Protocol* ("DLCU"; INAC, 2008).

A summary of the main environmental concerns and associated remedial methods are presented in Table 2 (adapted from UMA, 2008a).

Table 2: Summary of Clifton Point Environmental Concerns and Recommended Remedial Actions

Environmental Concern	Site Assessment Findings	Remediation Method
DCC Tier I Contaminated Soils	570 m^3 of soils with concentrations of zinc and polychlorinated biphenyls (PCBs) that exceed the DCC Tier I criteria were identified onsite, including 550 m^3 from dump excavations.	Excavate and dispose of soils in a NHWL.
DCC Tier II Contaminated Soils	1,210 m^3 of soils with concentrations of heavy metals (Cd, Cu, Pb and Zn) and PCBs which exceed the DCC Tier II criteria were identified onsite. This volume includes 880 m^3 of soil from dump excavations, and 330 m^3 from delineated contamination areas.	Excavate and ship off-site for disposal.
Petroleum Hydrocarbon Contaminated Soils F3 and F4 Fractions	Approximately 1,120 m^3 of hydrocarbon contaminated soil (F3 and F4 fractions) in exceedance of the Tier I Canada Wide Standards for Petroleum Hydrocarbons (Eco Soil Contact/Protection of Groundwater for Aquatic Life).	Excavate and dispose of soils in a NHWL.
Petroleum Hydrocarbon Contaminated Soils F1-F3 Fractions	Approximately 6740 m^3 of hydrocarbon contaminated soil (F1 to F3 fractions) in exceedance of the Tier I Canada Wide Standards for Petroleum Hydrocarbons (Eco Soil Contact/Protection of Groundwater for Aquatic Life).	Excavate and treat on-site, ex-situ (i.e. landfarm).
Existing Dumps	Seven existing dump sites and three small areas of buried debris were identified at Clifton Point, with a total volume for excavation estimated as 6,600 m^3 and approximate total area for regrading is 6,800 m^2.	Where the recommended remediation is excavation, waste segregation during excavation will be conducted to separate hazardous and non-hazardous waste, with subsequent appropriate disposal.
Surface Debris (non-hazardous) (excluding barrels)	Approximately 374 m^3 of non-hazardous debris (crushed) consisting of heavy equipment, scrap metal, scrap wood.	Consolidate and dispose in a non-hazardous landfill constructed on-site; hazardous materials disposed of as appropriate.

Table 2: Summary of Clifton Point Environmental Concerns and Recommended Remedial Actions

Environmental Concern	Site Assessment Findings	Remediation Method
Barrels	Of 820 barrels, 124 have aqueous contents, 38 have hydrocarbon contents, and 7 have mixed phase contents.	During clean-up, all barrels must be approached using the DLCU barrel protocol. Barrels in main stockpile areas (A-D) with aqueous contents can be discharged, while those with hydrocarbon contents can be incinerated. Samples identified with hydrocarbon concentrations exceeding the barrel criteria will require consolidation and off-site disposal. Many of the scattered barrels should be consolidated and sampled to confirm disposal requirements. In addition, the estimated 100 partially or fully buried barrels at the Beach POL will require assessment of their contents following removal.
Demolition Debris (non-hazardous)	Approximately 589 m^3 of non-hazardous demolition debris including concrete, timbers, electrical equipment and plumbing parts.	Consolidate and dispose in NHWL; hazardous materials disposed of as appropriate. Hazardous building materials and related components, including asbestos containing materials and PCB wastes will be removed prior to demolition of the structures.

It should also be noted that the Contractor and Client will be required to develop an Environmental Protection Plan (EPP) and Environmental Management Plan (EMP) to support project activities by providing mitigative measures (refer to Section 4.3). In addition to this, and in the event of an environmental incident (i.e. oil spill) or emergency situation, an Emergency Response Plan (ERP) will also be required. Development of these plans will be conducted prior to the start of the project and implemented when needed.

The detailed project description outlining the remediation and related support activities described in the RAP (UMA, 2008a) is outlined below.

2.4.3 Contractor Support Activities

2.4.3.1 Mobilization

Mobilization to the Site is anticipated to be conducted via sealift, with the proposed barge landing area located at the existing beach area. Prior to use, the landing area will be inspected by a sealift contractor to ensure that barging can be utilized. Aircraft from the community of Cambridge Bay or Yellowknife will be chartered to re-supply the camp and move personnel as required during remediation activities.

2.4.3.2 Contractor Camp

To support the remedial activities, a temporary on-site construction camp will be constructed, and where feasible, will be situated in a previously disturbed location to minimize the extent of new disturbance. The camp will be large enough to support all site workers and camp staff. The camp will include a potable water source, sewage collection and treatment in accordance with all applicable guidelines and regulations, bear safety measures, emergency rations, and an emergency rescue contingency plan. If the existing water supply lake is utilized, it will be sampled prior to setting up the camp to determine if the water source can be used to support the camp requirements. Additional testing will be required on an on-going basis for potable use during remediation. Contingencies for water supply will include filters and a supply of bottled water.

Waste generated by the camp will either be disposed off-site or incinerated on-site with the ash placed in the constructed landfill or shipped off-site, as appropriate. Sewage will be treated using an appropriately sized treatment system, and effluent quality will adhere to applicable licenses. Fuel required to operate the camp and to complete remedial activities will be stored on-site in accordance with applicable legislation and licenses.

Measures will be taken during the off-season (i.e., winter 2009/2010) to reduce the potential for bears and other wildlife to be attracted to infrastructure associated with clean-up activities. Although it will be necessary to leave heavy equipment, tools, and hard-sided camp infrastructure over the winter, all kitchen supplies (stoves, fridges, food, etc) and other mobile infrastructure will be removed from the Site during the winter.

2.4.3.3 Existing Infrastructure

Where the contractor plans to utilize the existing 1000 m airstrip, the contractor and operational pilots will evaluate the runway condition prior to and continually during use in particular for aircraft the size and weight of a Hercules C-130, especially during saturated conditions. If excessive erosion and/or rutting are noted, the airstrip will be repaired immediately to the satisfaction of the operational pilots. Once remediation activities have been completed, the airstrip will be left in place, as the airstrip is currently referenced on aviation maps and is available to be used in the event of an emergency.

Due to lack of maintenance and erosion, some of the existing roads to be utilized during remedial activities will require minor repair and upgrading with borrow material. Upon completion of the remediation program, with the exception of removing any fabricated materials and re-grading to re-establish natural drainage patterns, the existing roads will be left in place.

2.4.4 Remedial Activities

2.4.4.1 Borrow Sources

Borrow sources for granular material will be required for the construction of the new NHWL and the landfarm and for general site grading purposes. Borrow sources will be developed in accordance with the *Abandoned Military Site Remediation Protocol* ("AMSRP"; INAC, 2008). A combination of existing and new borrow sources, stockpiled materials and existing pads (station and abandoned airstrip) will be utilized as outlined in the Phase III ESA (UMA, 2008b).

Upon completion of remedial activities, all borrow areas will be re-contoured to restore natural drainage, match surrounding topography and minimize changes to the existing permafrost.

2.4.4.2 Proposed New Containment Facilities

New containment facilities are required at Clifton Point for the proper disposal of non-hazardous materials contaminated soils. As such, a new NHWL and a Landfarm will be constructed.

These containment facilities will be constructed in a controlled manner with minimal lifts to control compaction and settlement. Surface water run-on and run-off will be controlled through proper grading to positively shed water and to prevent ponding and seepage into the landfill. Consideration to the landfill cap and berm angles will be designed as to not to encourage erosion of material. Descriptions of the new containment facilities are provided below.

Non-Hazardous Waste Landfill (NHWL)

The total volume of non-hazardous waste from all sources is approximately 2,180 m^3, and will require the construction of a 72 m by 72 m NHWL to accommodate this volume. The NHWL location is on the high ridge beach southeast of the station pad. Based on existing ground conditions, the landfill will be place as close as possible to the northwestern limit of the landfill area identified in the ESA (UMA, 2008b) as the ground is already disturbed. Construction of the facility will be completed during the first year of cleanup, and disposal of waste can commence during this first season.

Landfarm

The total volume of PHC F1-F3 soil identified for remediation is approximately 6,740 m^3, the majority of which is located at the Station Area. The proposed Landfarm location is located on partially disturbed land, on the second (lower) beach ridge northeast of the proposed NHWL, with an estimated footprint of approximately 60 m by 380 m.

It may be difficult to achieve soil remediation within a two-year period, and therefore third year for landfarming may be required, or remaining soil in exceedances of criteria may warrant shipping off-site for disposal. The construction of the landfarm will be the contractor's priority for

year one. It is expected that construction can be completed within the early stages of the year one cleanup, with excavation and placement of soil by August 1 to allow for the addition of nutrients and several tilling events before the close of the season.

2.4.4.3 Dump Remediation

Seven existing dump sites and three small areas of buried debris were identified at Clifton Point, with a total volume for excavation estimated as 6,600 m^3. Table 3 summarizes the recommended remedial requirements for each of the dumps. Each dump site was assigned as a Class A, B or C dump according to INAC protocol, and remedial requirements for each dump determined. Based on the evaluations in the ESA (UMA, 2008b) four dumps of buried debris were recommended for regrading: Station West Dump, Construction Camp Dump A, West Beach POL Buried Debris, and the Inuit Camp Meat Cache. Five dumps were recommended for excavation: Construction Camp Dump B, Construction Camp Dump C, Beach Dump, Beach Dump South A, and Beach Dump South B.

Table 3: Summary of Dump Remedial Requirements (from UMA, 2008a)

Dump	Size (m^2) & Depth (m)	Environmental and Geotechnical Investigation	Dump Classification	Recommended Remediation Based on Engineering Considerations
Station West	3,550 0.8	• No evidence of contaminant migration. • Small area of Tier II soil associated with surface debris near edge of dump. • Lush vegetation downgradient. • Lake located 150 m downgradient. • No evidence of erosion.	Class C	Excavate Tier II contaminated soil. Regrade dump.
Construction Camp Dump A	320 0.5	• No evidence of contaminant migration, and no potential for surface contaminated soil identified. • Drainage channel located near toe.	Class C	Regrade dump. Provide armouring along toe in vicinity of drainage channel.
Construction Camp Dump B	240 0.5	• No evidence of contaminant migration, and no potential for surface contaminated soil identified. • Well-vegetated. • Within drainage basin with drainage channels cutting through and adjacent to dump. • No existing erosion, but likely due to existing vegetation.	Class C, upgraded to A	Excavate because within significant drainage basin and potential for erosion when additional cover placed overlying existing stabilizing vegetation.
Construction Camp Dump C	180 0.5	• No evidence of contaminant migration, and no potential for surface contaminated soil identified. • Moderate vegetation. • Existing dump toe located within 20 m of a large lake. • No erosion noted.	Class C, upgraded to A	Excavate because of proximity to lake.
Beach Dump	2,550 2.0	• Some evidence of contaminant migration. • No potential for surface contaminated soil identified. • No erosion noted. • Existing toe is located 50 m from high water mark at an elevation of 3 m higher. • Leachate contain toe will be within 1 m elevation difference from existing high water mark so is considered at potential risk for long-term erosion.	Class B	Excavate, based on results of cost estimate and concerns with long-term geotechnical stability with leachate containment.

Table 3: Summary of Dump Remedial Requirements (from UMA, 2008a)

Dump	Size (m^2) & Depth (m)	Environmental and Geotechnical Investigation	Dump Classification	Recommended Remediation Based on Engineering Considerations
Beach Dump South A	3,930 0.75-1.0	• Some evidence of contaminant migration. • Localized Tier II surface contamination detected associated with surface debris. • No erosion noted. • Existing toe is located 40 m from high water mark and 2.5 m higher. • Leachate contain toe will be within less than 1 m elevation difference from existing high water mark so is considered at potential risk for long-term erosion.	Class B	Excavate, based on results of cost estimate and concerns with long-term geotechnical stability with leachate containment.
Beach Dump South B	3,170 0.75-1.0	• No evidence of contaminant migration. • Potential for surface contamination investigated near suspect surface debris but no contamination detected. • No evidence of erosion. • Existing toe is located within 15 m of high water mark, with 0.75 m elevation difference so is considered at risk for long-term erosion.	Class A	Excavate because of concerns with long-term geotechnical stability.
Beach POL Buried Debris	100 1.2	• Within an area of PHC contaminated soil identified for excavation. It could not be discerned whether barrels had contents. • The quantity of fully buried barrels could not be identified because of the large quantity of overlying partially buried barrels.	Class C	Will be mostly excavated with contaminated soil excavation at Beach POL. Excavate any remaining debris along contaminated soil excavation margins.
Beach Inuit Camp	125 2.0	• Is comprised of a meat cache freezer, with portal from surface and internal void. • Should be infilled for long-term geotechnical stability and to remove physical hazard.	Class C	Backfill subsurface void. Regrade surface.
West Beach POL Buried Debris	25 0.5	• No investigation of contaminants because of its small size. • Primarily an aesthetic concern.	Class C	Regrade

Where the recommended remediation is excavation, waste segregation during excavation will be conducted to separate hazardous and non-hazardous waste. Non-hazardous waste will be disposed of in the NHWL on-site. Hazardous waste will be disposed of off-site, and will be segregated based on PCB-containing waste (for disposal at a licensed PCB disposal facility), or other hazardous waste, which will be disposed of in a licensed Hazardous Waste Landfill. Soil will be separated from debris during excavation, and stockpiled in such a manner to allow sampling and classification according to the contaminant criteria outlined under the INAC AMSRP (INAC, 2008). Soil that does not exceed any contaminant criteria may be used as intermediate fill and not for surface backfilling. Dump excavations will not proceed until the construction of the NHWL is completed. Based on construction of the NHWL during Year 1, it is likely that dump excavations will not proceed until Year 2.

For dumps where the recommended remedial action is regrading, this work can likely commence upon completion of the NHWL construction, when surface debris pickup can be completed efficiently.

2.4.4.4 Non-Hazardous Surface Debris

Fourteen surface debris areas are present at Clifton Point, and the estimated crushed volume of hazardous materials is 4.5 m^3, while the volume of non-hazardous waste is 374 m^3. These volumes also include barrels and their contents. A detailed breakdown of surface debris areas and debris volumes is provided in Table 4, and their locations are presented in Figures 3a and 3b. Non-hazardous waste will be disposed of in the NHWL, and hazardous waste will be packaged in accordance with TDGA regulations for shipping to an off-site licensed hazardous waste disposal facility. In addition, all debris within 50 m of existing pads and roadways will be picked up and disposed of as appropriate. Collection of surface debris will proceed upon completion of the NHWL construction.

Of 820 barrels identified at Clifton Point, 124 have aqueous contents, 38 have hydrocarbon contents, and 7 have mixed phase contents. All barrels will be disposed of in accordance with the *DEW Line Clean-Up Barrel Protocol* (INAC, 2008). Empty barrels will be crushed and disposed in the NHWL. Barrels in the main stockpile areas (A-D) with aqueous contents can be discharged, while those with hydrocarbon contents can be incinerated. Scattered barrels will be consolidated and sampled to confirm disposal requirements. In addition, the estimated 100 partially or fully buried barrels at the Beach POL will require assessment of their contents following removal. Samples identified with hydrocarbon concentrations exceeding the barrel criteria will require consolidation and off-site disposal.

Table 4: Summary of Non-Hazardous Surface Debris by Area and Crushed Volume

Location	Area Extent (m^2)	Crushed Volume (m^3)	Percentage of Total (% by volume)	Comments
Site Debris 1	213,100	27.0	7.22	Scattered debris away from station area, more concentrated piles at station. Volume and description does not include debris within buildings.
Site Debris 2	97,000	25.0	6.68	Debris is mostly scattered, locally. More concentrated in vicinity of dumps.
Site Debris 3	1,600	2.0	0.53	Debris is concentrated mainly near the dump toe (some partially buried) and scattered away from dump.
Site Debris 4	1,900	0.2	0.05	-
Site Debris 5	1,400	0.1	0.03	-
Site Debris 6	2,900	0.2	0.05	-
Site Debris 7	7,200	0.5	0.13	-
Site Debris 8	1,300	0.1	0.03	-
Site Debris 9	1,000	0.1	0.03	-
Site Debris 10	15,000	0.8	0.21	-
Site Debris 11	60,300	6.0	1.60	-
Site Debris 12	644,500	13.0	3.48	Debris is located along shoreline and is not submerged within lake itself.
Site Debris 13	682,300	109.0	29.14	Debris is more concentrated along the beach in the vicinity of the POL pad, dumps, and Inuit camp, then scattered towards airstrip and along beach to north and south of the Site.
POL Line	1,400	190.0	50.80	-
Totals	**1,730,900**	**374.0**	**100**	-

2.4.4.5 Non-Hazardous Demolition Debris

An estimated 589 m^3 of non-hazardous demolition debris was identified on-site. All buildings/infrastructure will be demolished to the foundations in accordance with the AMSRP (INAC, 2008). Demolition debris will be consolidated and disposed of in the NHWL. Hazardous building materials and related components, including asbestos containing materials and PCB wastes, will be removed prior to demolition of the structures and disposed of off-site. A summary of the expected demolition debris is presented in Table 5.

Table 5: Summary of Non-Hazardous Demolition Debris by Crushed Volume

Structure	Crushed Volume (m3)	Percentage of Total (% by volume)	Comments
POL pumphouse	7	1.2	Concrete foundation may require removal for contaminated soil excavation, depending on the PHC remedial criteria selected.
Inuit house	21	3.6	-
Radar tower	160	27.2	Paint and substrate samples collected from CAM-F and FOX-C were below criteria for PCBs and leachable Pb.
Module train	196	33.3	-
Warehouse	42	7.1	Concrete foundation to be left in place and regraded.
Garage	106	18.0	Concrete foundation to be left in place and regraded.
Camp Building 1	22	3.7	-
Camp Building 2	14	2.4	-
Boat	21	3.6	Main body painted orange, this paint not typically PCB amended.
Totals	**589**	**100**	**-**

2.4.4.6 Contaminated Soils

Soil conditions at Clifton Point were assessed by UMA (2008b) using the AMSRP (INAC, 2008) as the governing criteria.

Approximately 9,640 m^3 of contaminated soils were identified. These soils will either be:

- excavated and buried in the on-site NHWL (DCC Tier I contaminated soil and petroleum hydrocarbon [PHC] F3 and F4 fractions contaminated soil);
- excavated and shipped off-site for disposal (DCC Tier II contaminated soil); or
- excavated treated on-site, ex-situ (PHC F1 to F3 fractions contaminated soil).

Table 6 presents a summary of the contaminated soils identified in the RAP (UMA, 2008a).

Table 6: Summary of Contaminated Soils at Clifton Point

Location	Contaminant Exceeding Criteria	Tier I (m^3)	Tier II (m^3)	PHC F3&F4 (m^3)	PHC F1,F2&F3 (m^3)	Comments
Module Train	Zn, PCBs	0	84	0	0	-
Module Train	Zn, PCBs	0	39	0	0	Tier I at depth to be backfilled.
Module Train	PCBs	9	0	0	0	Eastern limits not delineated.
Module Train	PHC F2	0	0	0	4	Impacts limited to the depth interval of 0.8-1.0.
Sewage Outfall	Cu	0	23	0	0	Northern limit not delineated.
Incinerator	Cu	0	5	0	0	-
Garage	PCBs	9	0	0	0	-
Garage	PCBs	0	49	0	0	-
Garage	PHC F3	0	0	813	0	Small area of Tier I PCBs included.
Garage	PHC F1, F2, F3	0	0	0	969	Western limit not delineated.
Station POL	PHC F2, F3	0	0	0	2469	-
Station POL	PHC F2, F4	0	0	0	188	Impacts limited to the depth interval of 0.5-1.0.
Station POL	PHC F2, F3	0	0	0	1942	-
Barrel Stockpile A	PHC F3, F4	0	0	298	0	-
Beach POL	PHC B	0	0	0	1162	-
POL Line Battery Debris	Pb	0	69	0	0	Depth delineation not achieved.
North of Airstrip	Cu	0	12	0	0	-
Station West Dump	Pb	0	21	0	0	-
Beach Dump South A	Pb, Cu	0	25	0	0	-
Estimated from dump excavations	-	550	880	0	0	-
Total Estimated Volumes		**570**	**1210**	**1120**	**6740**	**-**

The total estimated volume of Tier I and PHC F3-F4 Soil is 1,690 m^3. This includes Tier I soil area located at the garage and module train, and PHC F3-F4 soil by the garage and Barrel Stockpile A. This volume also includes the estimated Tier I component of soil that will be encountered during dump excavations. These soils will be disposed of in the on-site NHWL.

Five areas of PHC F1-F3 impacted soil require remedial action: at the module train, garage, station POL and beach POL. The total volume of PHC F1-F3 soil identified for remediation is 6740 m^3. These soils will be remediated via on-site ex-situ biological treatment (i.e.,

landfarming). It is anticipated that ex-situ biological treatment may be completed within a 2-3 year period provided site conditions are monitored and optimized where possible (i.e., moisture conditioning, nutrient amendment). To preclude the requirement for a third year of treatment, any remaining hydrocarbon impacted soil that does not meet the remedial levels at the end of the cleanup schedule will be disposed of off-site.

Tier II levels of PCBs and/or inorganic elements were identified in nine areas of the Site, including the module train (2), sewage outfall, incinerator, garage, POL battery debris area, north of the airstrip, Station West Dump, and Beach Dump South A. The total volume of Tier II soil identified for remediation is 1,210 m^3, of which 880 m^3 is the estimated Tier II soil component from dump excavations. Off-site disposal will occur for all Tier II contaminated soil.

2.4.4.7 Hazardous Materials

Hazardous materials present at Clifton Point are comprised of 4.5 m^3 of hazardous site debris including asbestos, creosote timbers, and barrel contents, and 79 m^3 of hazardous demolition debris including asbestos insulation, lead batteries and PCB amended paint. Hazardous material remedial measures are as follows:

- Asbestos waste will be collected, double bagged and disposed of in the NHWL;
- Barrels at the small barrel cache containing fluids will be excavated and tested, and treated according to the *DEW Line Cleanup Barrel Protocol* (INAC, 2008). Petroleum products, such as gasoline or diesel, which do not contain other hazardous products according to the Barrel Protocol (chlorine, PCB, heavy metals, etc.) will be incinerated on-site under appropriate emissions controls. Heavier petroleum products such as lubricating oil will be disposed of off-site or mixed with lighter petroleum products and incinerated on-site under appropriate emissions controls;
- Compressed gas cylinders with known contents will be vented. Once empty, the metal cylinder will be disposed on-site in the NHWL;
- Creosote Treated Timbers will be wrapped in polyethylene sheets and disposed on-site in the NHWL;
- PCB Paint on Building Components will be collected and transported off-site to a licensed PCB disposal facility; and
- Lead-based paint materials considered to be hazardous (leachable lead greater than 5 mg/L) will be dismantled and disposed off-site. Care will be taken during the dismantling to prevent dust and paint chips from being released into the environment and to protect the workers that are conducting the dismantling from PCB and lead contamination. All dismantled lead contaminated paint material will be packaged, transported and disposed of in accordance with the current regulations governing the handling and disposal of hazardous materials. Painted components considered non-hazardous will be disposed in the on-site landfill.

2.4.4.8 Site Grading

After remediation activities are complete, disturbed areas will be graded and contoured to blend in with the natural contours and to eliminate potential hazards for wildlife and humans accessing the Site in the future. Disturbed areas will include contaminated soils excavations, existing and new landfills, debris areas, disturbed areas resulting from demolition activities, borrow areas, and any areas disturbed as a result of remediation activities.

2.4.5 Closure

Closure activities will involve a demobilization of equipment and project associated structures (e.g. camp), followed by final site grading.

2.5 REGULATORY AND PERMIT REQUIREMENTS

2.5.1 Nunavut Land Claims Agreement

The framework for Nunavut's regulatory system is derived from the *Nunavut Land Claims Agreement* (NLCA). The NLCA establishes Inuit/government co-management boards for land use planning (Nunavut Planning Commission (NPC)), environmental assessment and monitoring (Nunavut Impact Review Board (NIRB)), water use and waste disposal (Nunavut Water Board (NWB)), and wildlife management (Nunavut Wildlife Management Board (NWMB)). Although these boards, known collectively as Institutes of Public Government (IPG's), will eventually all be established in federal legislation, with the exception the NWB and NWMB the implementing legislation is yet to be developed. Of the IPG's, NPC, NIRB and NWB are the most relevant to this project. In the absence of legislation, Articles 11, 12 and 13 of the NLCA provide guidance on their roles and functions.

2.5.1.1 Nunavut Planning Commission (NPC)

Nunavut Planning Commission (NPC) is responsible for land use planning in the Nunavut Settlement Area. A project proposal, as defined in the NLCA under Article 1 must be in conformity with the requirements of the applicable regional land use plan. When a regulatory/permitting authority receives an application they will forward this application to the NPC to determine its conformity with the relevant land use plan.

Clifton Point PIN-B DEW Line Site is located in the West Kitikmeot Planning Region. A draft land use plan for the region was developed in 2005 but remains unapproved by government (NPC, 2004). However, the draft plan does contain a Conformity Requirement relevant to remediation of DEW line sites as follows;

'All waste will be disposed of in accordance with the more stringent of:
a) applicable `best practices' standards of industry, or
b) applicable standards in government policy or regulatory practice'

2.5.1.2 Nunavut Impact Review Board (NIRB)

The NIRB was established in 1996, under Article 12.2.1 of the *NLCA*, as an institution of public government with responsibilities for environmental assessment. Article 12 of the *NLCA* establishes processes for the screening and review of project proposals on land and marine areas within the Nunavut Settlement Area (including Inuit Owned Lands, Commissioners lands, and Crown lands) and to the Outer Land Fast Ice Zone. The functions of NIRB are to:

- Screen project proposals to determine whether or not a review is required;
- Review the ecosystemic and socio-economic impacts of proposed projects;
- Measure and define the extent to which regions and communities will be impacted;
- Determine, on the basis of its review, whether project proposals should proceed, and if so, under what terms and conditions, and then report its determination to the Minister; and
- Monitor projects in order to collect and analyze information on the long term state and health of the ecosystem and socio-economic environment of the Nunavut Settlement Area.

The initial steps of the screening involve notification of the proponent and authorizing agencies, establishment of a timeline for a screening determination and distribution of the project proposal to appropriate stakeholders. NIRB then reviews the potential effects of the project and the level of public concern about and/or in support of the proposed project. Once the screening has been completed, NIRB will produce a Screening Decision Report that documents its determination as to whether the project proposal should be approved without further review, abandoned or modified by the proponent, or subject to review under Part 5 or 6 of the NLCA.

It is anticipated that the assessment of the site remediation of the PIN-B Clifton Point will only be subject to screening level of assessment under the NIRB process.

2.5.1.3 Nunavut Water Board (NWB)

The NWB, created pursuant to Article 13 of the NLCA, came into existence on July 9, 1996. It has responsibilities and powers over the use, management and regulation of inland water in Nunavut and its objectives are to provide for the conservation and utilization of waters in Nunavut in a manner that will provide the optimum benefits for the residents of Nunavut in particular and Canadians in general.

The powers and responsibilities of the NWB have been defined further by the implementing legislation the *Nunavut Waters and Nunavut Surface Rights Tribunal Act***.** The NWNSRTA states that no person may use water or dispose of waste into water without the approval of the NWB. Once a license is issued by the NWB, the jurisdiction of the NWB ceases. Compliance and enforcement of water licenses and provisions of the *Act* fall under the jurisdiction of INAC, whose Minister appoints Inspectors for that purpose. Water use at the Site and disposal of

waste into water will require a license from NWB. The type of license will depend on the volumes of water used and the amounts of waste.

2.6 FEDERAL AND TERRITORIAL LEGISLATION

In addition to the regulatory context provided by the NLCA, both the Federal and Territorial governments have their own jurisdictions and legislative requirements related to this project. The *Canadian Environmental Assessment Act* (CEAA) is normally triggered by Federal involvement in a project. In accordance with (Section 5(1)) of CEAA, an EA is required if a Federal Authority exercises or performs one or more of the following powers, duties, or functions relating to a project:

- proposing the project (known as the "proponent trigger");
- granting money or any other form of financial assistance to the proponent (the "funding trigger");
- granting an interest in land to enable a project to be carried out (e.g., sell, lease, or otherwise transfer control of land) (the "land trigger"); and/or
- exercising a regulatory duty in relation to a project, such as issuing a permit or license, that is included in the Law List prescribed in CEAA's regulations (the "Law List trigger"); this would include such items as permits under Section 5.1 of the *Navigable Waters Protection Act* (NWPA), Section 35(2) of the *Fisheries Act* or Section 8 of the *Territorial Lands Act*.

Remediation of the PIN-B DEW Line Site is being proposed by INAC, funding for the project will be from the Federal government and authorizations related to land use under the *Territorial Lands Act* will also be issued.

Historically, where a proposed project in Nunavut involves a CEAA trigger, federal and territorial governments and the NIRB work together to harmonize the environmental screening process. This process is intended to provide information for the Federal authorities to support the screening of the project pursuant to the requirements of *CEAA*. However, recent amendments to the NLCA have resulted in the NIRB process being the sole environmental assessment process applicable in Nunavut; but as requested by PWGSC and INAC, this study has been conducted in a manner that is consistent with both the NLCA and CEAA requirements. Guidance documentation of the NIRB (NIRB, 2006a and 2006b) and the Canadian Environmental Assessment Agency (CEAA, 1994 and 2003) have been utilized in formulating this EA.

In addition to CEAA requirements there are a number of other Federal and Territorial Regulatory requirements that must be met; a list of these is contained in Table 7.

Table 7: Key Regulatory Organizations and Permit Requirements for the PIN-B Remediation Project

Issuing/ Lead Agency Details		Contact
Federal		
INAC	Permits required for land access, camp construction, laydown and borrow sources under the *Nunavut Land Claims Settlement Act* *Territorial Lands Act and Regulations** *Federal Real Property Act & Regulations* **Notes:** Permits for land use and borrow sources will be required based on current project description and discussions with INAC contact	Spencer Dewar Manager of Lands. PO Box 100 Building 918 Iqaluit, Nunavut X0A 0H0 Tel 867 975 4280
Department of Fisheries and Oceans	*Fisheries Act* (authorizations or letter of advice for works or undertaking affecting fish habitat) **Notes:** Authorizations from DFO will not be required based on the current project description and discussions with DFO contact	Amy Liu Habitat Biologist Department of Fisheries and Oceans PO Box 358 Iqaluit, Nunavut X0A 0H0 Tel 867 979 8007
Transport Canada	*Navigable Water Protection Act* authorizations (for structures built in, on or over navigable waters) **Notes:** Authorizations from Transport Canada will not be required based on the current project description	Jim Morrell Environment Officer 344 Edmonton Street Winnipeg, Manitoba R3C 0P6 Tel 204 983 5857 morrejp@tc.gc.ca
Environment Canada (EC)	*Species at Risk Act* *Migratory Birds Act* and Regulations Section 36(3) of the *Fisheries Act* *Canadian Environmental Protection Act* **Notes***:* No authorizations are required from EC; however, based on discussions with the EC contact inventories of Species at Risk should be compiled for the project area, using the mapping function on the EC website.	Siu-Ling Han Section Head Northern Conservation Qimugjuk Building Box 1870 Iqaluit, Nunavut X0A 0H0 Tel 867 975 4633 Amy Sparks Contaminated Sites Officer 4999-98 Avenue Edmonton, Alberta T6B 2X3 Tel 780 951 8746
Natural resources Canada	Explosive Storage, Explosive Handling, Magazine Permits and permit for transportation of explosives under the *Explosive Act and Regulations* **Notes:** Authorizations from Natural Resources Canada will not be required based on the current project description.	Andrew McAllister Senior Environmental Assessment Officer 580 Booth Street Ottawa, Ontario K1A 0E4 Tel 613 995 3153 amcallis@nrcan.gc.ca
Nunavut Water Board	Water License Required for use of water and deposit of waste into water under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*. **Notes:** A water license for the project will be required, based on discussions with eth Nunavut Water Board	Dionne Filiatraut Executive Director Nunavut Water Board PO Box 119 Gjoa Haven, Nunavut XOB 1JO Tel 867 360 6338 Email: Dionne@nunavutwaterboard.org

Table 7: Key Regulatory Organizations and Permit Requirements for the PIN-B Remediation Project

Issuing/ Lead Agency Details		Contact
Territorial		
Government of Nunavut (GN) Department of Environment	*Environmental Protection Act* (spill response plans, waste management guidelines). *Transportation of Dangerous Goods Act,* requirement for Waste Manifests. Regulatory Requirements related to land use and disturbance of wildlife also exist in the *Wildlife Act* **Notes:** Waste Manifest documents are required for hazardous waste movements. Wildlife species have been included in this assessment based on discussions with GN biologists	Helen Yeh Manager of Environmental Assessment and Land Use PO Box 1000 Iqaluit Nunavut X0A 0H0 Tel 867 975 7733 Email: hyeh@gov.nu.ca
GN Department of Economic Development and Transportation	Registration for use of vehicles in Nunavut under the *Motor Vehicles Act*. **Notes:** Vehicles for project use will need to be registered. No contact made	Lorna Gee Director PO Box 10 NCC Building Gjoa Haven, Nunavut X0B1J0 Tel:(867)360-4614 Fax: (867) 360-4619 Email: lgee@gov.nu.ca
GN Department of Culture Language Elders and Youth (GN CLEY)	Permit required to disturb and archeological site under the *Nunavut Archaeological and Paleontological Site Regulations.* **Note:** Based on discussions with the contact, a permit will be required for excavations of contaminated soils within 1m of archeological site.	Julie Ross Chief Archeologist Box 310 Igloolik, Nunavut, X0A 0L0 Tel 867 934 2040 Email:jross@gov.nu.ca
GN Department of Health and Social Services	*Public Health Act & Regulations*, Contains criteria for camp sanitation, refuse disposal drinking water and medical facilities. **Notes:** Criteria within the regulations will have to be met. No contact made.	Isaac Sobel Chief Medical Officer PO Box1000 Building 11076 Iqaluit, Nunavut X0A 0H0 Tel 867 975 5774 Email: lsobel@gov.nu.ca

3.0 ENVIRONMENTAL DESCRIPTION

3.1 CLIMATE AND AIR QUALITY

3.1.1 Climate

The climate at the Site and the region in general is heavily influenced by the freezing of coastal waters. According to the *Draft West Kitikmeot Land Use Plan* (NPC, 2004) this region of Nunavut is a sub-arctic desert with limited rainfall. Prevailing northwest winds are strongest in the fall and winter. Most precipitation falls as rain during the summer, peaking in July and August at around 40 mm a month. In July 2007, Kugluktuk experienced a 500 year rainfall event with 178 mm of rain falling in 2 days.

The average snowfall throughout the region during the winter months is less than 10 cm per month. Seasonal freezing usually starts around mid to late September and seasonal melting generally begins around mid to late June. Lakes and other inland bodies of water thaw earlier than ocean ice, which is an important consideration for overland transportation. As well, the freeze/thaw cycle of lakes affects the migration routes of large mammals and the arrival/departure of migratory birds (NPC, 2004).

The nearest weather stations are located in Kugluktuk and Clinton Point (69^0 34' N, 120^0 48' W). Data is available from between 1971-2000 (EC, 2008) and is a summarized in Table 8 below.

Table 8: Summarized Canadian Climate Normals 1971-2000

Station	Coldest month (Average Daily Temp ^{0}C)	Warmest Month (Average Daily)	Annual Average Snowfall (cm)	Annual Average Rainfall (mm)
Kugluktuk	January (-27.8)	July (9^0C)	165.7	133.4
Clinton Point	January (-25.7)	July (8^0C)	77.2	90.8

3.1.2 Air Quality

Air quality information from the National Pollution Release Inventory (NPRI) summarizes release of Criteria Air Contaminants (CACs) for Nunavut and allows comparison with Canada as a whole. It is evident from Table 9, that emissions of contaminants in Nunavut are a small fraction of those in Canada as a whole and are unlikely to influence air quality regionally.

Table 9: NPRI 2006 CAC Emissions for Nunavut

Category	TPM	PM_{10}	$PM_{2.5}$	SOx	NOx	VOC	CO	NH_3
Industrial Sources	190	41	24	20	216	11	46	0
Non-industrial Fuel combustion	257	214	214	93	3105	135	626	0
Transportation	90	90	85	50	1256	1141	7743	5

Table 9: NPRI 2006 CAC Emissions for Nunavut

Category	TPM	PM_{10}	$PM_{2.5}$	SOx	NOx	VOC	CO	NH_3
Incineration								
Open Sources	7542	2162	381	0	3	24	37	0
Natural	0	0	0	0	12,048	505,151	0	0
Miscellaneous	8	8	8			239	3	2
Total Nunavut	8087	2515	711	164	16628	506701	8455	7
Total Canada	18,377,707	6,082,953	1,333,894	1,972,042	2,550,728	31,785,247	11,732,202	555,477

TPM=Total Particulate Matter. PM_{10} = Any particulate matter with a diameter less than or equal to 10 microns. $PM_{2.5}$= Any particulate matter with a diameter less than or equal to 10 microns. SO_X= Refers to all gaseous oxides of sulphur. NO_X=Consists of nitric oxide (NO) and nitrogen dioxide (NO_2). VOC = Volatile Organic Compounds refer to photochemically reactive hydrocarbons, excluding compounds such as methane, ethane, acetone, methylene chloride, methyl chloroform and several chlorinated organics. CO=Carbon Monoxide. NH_3=Ammonia

Additionally, in the Draft Environmental Impact Statement (EIS) submitted for the High Lake Project, located near Grays Bay 200 km to the southeast of Kugluktuk; a full analysis of baseline air quality was undertaken, using data from taken from Government of Northwest Territories ambient air monitoring stations in Yellowknife, Fort Liard, Norman Wells and Inuvik. The EIS concludes that given the remote setting of the project, baseline air quality is largely unaffected by local industrial, residential and transportation sources. However, they also conclude that air quality in the region is influenced by long range transportation of contaminants from industrial sources in other continents (Wolfden Resources Inc. 2006).

The North West Territories (NWT) Cumulative Impact and Monitoring Program and Audit (INAC, 2005) describes baseline conditions related to air quality in the NWT as generally near pristine or background conditions, but with local elevations above background near communities or industrial developments. Considering the proximity of the project to NWT and the scarcity of air quality data in Nunavut, these conclusions seem equally valid for Nunavut and the project Site.

The Clifton Point site is currently inactive and no emissions are being generated.

3.2 GEOLOGY AND GEOMORPHOLOGY

Clifton Point occurs within the Amundsen Gulf Lowland Ecoregion, which is characterized by gently sloping landscape with areas of drumlin ridges and deep continuous permafrost (NPC, 2004). It also occurs within the Arctic Platform Geologic Province, consisting of relatively flat, unmetamorphosed sedimentary rocks (NPC, 2004).

The study area is characterized by relatively flat terrain with several small ponds and lakes. Elevation ranges from sea level at the beach to a maximum of approximately 31 m in the vicinity of the station area. The overall grade for the Site is described as gentle, and consists of a series of beach terraces and strands grading towards the existing shoreline. There are localized areas of drops in elevation where the grade would be considered moderate (UMA 2007). Surficial geology reflects the effects of the most recent glaciation, and vuggy and weathered bedrock

outcrops are present along the beach area, north of the Beach Dump, and south of the Beach POL pad, and are comprised of limestone and dolostone (UMA, 2008b).
The predominant soil types in the vicinity of the work areas are stratified sand and sandy gravel with less than 5 percent fines on average derived from marine re-working of till (UMA, 2008b). Soil at higher elevations has been reworked by marine processes into beach ridges and terraces, with little to no fines, and soil at lower elevations off the beach ridges is generally finer-grained, comprised of sand and silt grading to silt and clay at depth (UMA, 2008b).

Clifton Point is also located within the boundary of continuous permafrost, with 90% to 100% of land area underlain by permafrost (NRC, 1995). The effects of frost action are prevalent across the Site, with well-developed frost wedges within the beach ridge areas near the Station, and frost boils in the finer-grained soil areas off the beach ridges.

3.3 HYDROLOGY

Clifton Point is located on the Amundsen Gulf, which receives its water from numerous rivers and other small watercourses along the north coast of Nunavut and the Northwest Territory mainland, and from Victoria Island. Surface hydrology in the region is strongly influenced by low annual precipitation and permafrost. Frozen ground is not able to absorb large amounts of water during spring thaw so there is a large amount of seasonal runoff. Summer rainfall is channeled into shallow waterbodies by permafrost. Because the landscape is relatively flat, a large number of small, shallow lakes are formed. River ice freezes up in lakes in mid to late September and rivers between mid September and mid October. Break-up generally occurs in late June (BMMDA, 2008).

A hydrological survey was not conducted in the study area, however, in the general vicinity there are several shallow ponds and lakes located on inland beach terraces. Regional overland drainage from the Site is generally towards the Amundsen Gulf to the northeast. Approaching the existing shoreline, surface drainage becomes concentrated into creeks flowing within well-developed gullies cutting through the lower-elevation beach deposits at several locations southeast of the Site (UMA, 2008b).

3.4 TERRESTRIAL ENVIRONMENT

3.4.1 Flora

Clifton Point is located within the Southern Arctic ecozone, a tundra landscape of shrub lands, hills and plains, wet sedge meadows, and ponds and lakes (NPC, 2004). Vegetation in the coastal areas consists of desert-like shrubs on hills, and open shrub land with sedge tundra on lower slopes, and lichen cover higher up.

Vegetation communities have not been characterized at Clifton Point. However, the area features typical low growing tundra vegetation, including lichens and short grasses on elevated areas, and grasses and sedges in saturated, low-lying areas (Golder Associates, 2008). Sixty-

seven vascular plants have been recorded at the PIN-B site, including 23 species of grasses, sedges, and rushes and 37 species of forbs (ESG, 1995). Shrubs in the area included willow species and white heather. A list of vascular plants identified at the Site in 1994 is provided in Table 10.

Undisturbed areas were considered to have moderate to abundant vegetation cover in August 2007 (UMA, 2008b). In addition, small mounds of vegetation had become established on the entire surface of the active airstrip.

Table 10: Vascular Plant Checklist for PIN-B, Clifton Point 1994 (source ESG, 1995)

Species	Common Name
Poaceae (Grass Family)	
Agropyron macrourum (Turcz.) Drobov	wheat grass
Arctagrostis latifolia (R.Br.) Griseb. ssp. *latifolia*	polargrass
Colpodium vahlianum (Liebm.) Nevski	-
Deschampsia caespitose (L.) Beauv. var*. littoralis* (Reut.) Richter	tussockgrass
Dupontia fisheri R. Br.	tundra grass
Elymus mollis (Trin.) Pilger	wild rye/lime grass
Festuca baffinensis Polunin	fescue
Festuca spp.	fescue
Poa ammophila Porsild	bluegrass
Poa arctica R.Br.	Arctic bluegrass
Poa laxa Haenke ssp. *flexuosa* (Sm.) Hyl.	bluegrass
Trisetum spicatum (L.) Richt. *S. lat.*	spike trisetum
Cyperaceae (Sedge Family)	
Carex aquatilis Wahlenb. Var. *stans* (Drej.) Boott	water sedge
Carex bigelowii Torr.	Bigelow's sedge
Carex capillaries L.	hair-like sedge
Carex maritima Gunn	curved sedge
Carex membranacea Hook.	fragile sedge
Carex misandra R.Br.	short-leaved sedge
Carex scirpoidea Michx.	northern singlespike sedge
Eriophorum angustifolium Honck.	cottongrass
Eriophorum scheuchzeri Hoppe.	white cottongrass
Kobresia bellardii (All.) Degl.	seep kobresia
Juncaceae (Rush Family)	
Juncus balticus Willd.	bog-rush
Lilliaceae (Lily Family)	
Tofieldia pusilla (Michx.) Pers.	false-asphodel
Salicaceae (Willow Family)	
Salix arctica Pall. *s. lat*	Arctic willow
Salix reticulate L.	net-veined willow
Salix richardsonii Hook	Richardson's willow
Polygonaceae (Buckwheat Family)	
*Oxyria digyna (*L.) Hill	mountain sorrel

Table 10: Vascular Plant Checklist for PIN-B, Clifton Point 1994 (source ESG, 1995)

Species	Common Name
Polygonum vivparum L.	bistort
Caryophyllaceae (Pink Family)	
Arenaria rossii R Br.	sandwort
Arenaria rubella (Wahl.) Sm.	sandwort
Cerastium alpinum L. *s. lat*	mouse-eared chickweek
Lychnis apetala L.	bladder campion
Silene acaulis L. *ssp. Acaulis*	moss campion
Stellaria sp.	chickweed
Ranunculaceae (Buttercup Family)	
Anemone parviflora Michx.	anemone
Papaveraceae (Poppy Family)	
Papaver radicatum Rottb.	Arctic poppy
Brassicaceae (Mustard Family)	
Draba sp.	draba
Saxifragaceae (Saxifrage Family)	
Chrysoplenium alternifolium L. var. *tenrandrum* Lund	golden saxifrage
Saxifraga caespitose L. *s. lat.*	tufted saxifrage
Saxifraga cernua L.	nodding saxifrage
Saxifraga oppositifolia L.	purple saxifrage
Saxifraga tricuspidata Rottb.	prickly saxifrage
Rosaceae (Rose Family)	
Dryas integrifolia M.Vahl.	mountain avens
Dryas octopetala L.	mountain avens/white dryas
Potentialla nivea L. *s. lat.*	snow cinquefoil
Potentialla pulchella R.Br.	cinquefoil
Potentialla vahliana Lehm.	Vahl's cinquefoil
Fabaceae (Pea Family)	
Astragalus alpinus L.	alpine milk-vetch
Astragalus richardsonii Sheldon	Richardson's milk-vetch
Astragalus sp.	milk-vetch
Hedysarum alpinum L.	liquorice-root
Oxytropis artica R.Br.	Arctic locoweed
Oxytropis maydelliana Trautv.	yellow oxytrope
Oxytropis nigrescens (Pall.) Fisch.	Blackish oxytrop
Onagraceae (Evening Primrose Family)	
Epilobium latifolium	broad-leaved willow herb
Ericaceae (Blueberry Family)	
Cassiope tetragona (L.) D.Don	Arctic white heather
Primulaceae (Primrose Family)	
Androsace chamaejasme L.	rock-jasmine
Plumbaginaceae (Leadwort Family)	
Armeria maritime (Mill.) Willd.	thrift
Gentianaceae (Gentian Family)	
Gentianella propinqua (Richards.) Gillett	gentian

Table 10: Vascular Plant Checklist for PIN-B, Clifton Point 1994 (source ESG, 1995)

Species	Common Name
Scrophulariaceae (Figwort Family)	
Castilleja raupii Pennell *s. lat.*	indian paintbrush
Pedicularis hirsuta L.	hairy lousewort
Pedicularis lapponica	Lapland lousewort
Asteraceae (Aster Family)	
Antennaria rosea Greene	pink pussy-toes
Artemisia arctica Less.	wormwood
Artemisia campestris L. *ssp. borealis*	wormwood
Aster sp.	aster
Chrysanthemum integrifolium Richards	ox-eye daisy

3.4.2 Wetlands

Several shallow ponds and lakes occur in the vicinity of PIN-B, and are located on inland beach terraces (UMA, 2008a; 2008). A number of these wetlands occur between the Station and the beach. A fairly large lake is located northwest of the Station (water supply lake) as well as another between the Station and the airstrip. Wetlands in these areas are likely to freeze throughout in winter (UMA, 2008b).

3.4.3 Birds

Birds observed/detected during the 1994 Phase II ESA field survey of the Site included Arctic (Pacific) loon adults and young, tundra swan, common eider, lesser golden plover, savannah sparrow, Lapland longspur, snow bunting, ptarmigan (rock/willow), and snowy owl (ESG, 1995). Savannah sparrows were recorded at several locations on the site (ESG 1995), and thus appear common in the area. Ptamigan sign was also noted at a number of locations on the site (ESG 1995). Both rock ptarmigan and willow ptarmigan may occur at the site, and likely represent the largest terrestrial bird species in the area.

During the 2007 Phase III ESA investigation, rough-legged hawk, tundra swan, Arctic (Pacific) loon, and semi-palmated plover were observed at the Site (UMA, 2008a). A rough-legged hawk nest site with adults and chick was observed at the module train building that is to be demolished during project activities. Large flocks of snow geese passing over the Site in mid- to late-August were observed, however did not land in the vicinity of the Site (UMA, 2008a).

Based on range maps and habitat preference, a variety of other species could occur in the area during breeding. These species include: red-throated and yellow-billed loons, sandhill crane, king eider, Canada goose, Brant, northern pintail, green-winged teal, long-tailed duck, red-breasted merganser, red-necked phalarope, sandpipers (least, semi-palmated, pectoral, Baird's, stilt), black-bellied plover, jaegers (pomarine, parasitic, long-tailed), glaucous gull, Arctic tern, short-eared owl, horned lark, American pipit, common raven, American tree sparrow, white-crowned sparrow, Smith's longspur, common redpoll, and hoary redpoll (Wyndham, 1997). A

number of passerines such as horned lark, snow bunting, and Lapland longspur, are considered abundant breeders for the Arctic region (Wyndam 1997). Gyrfalcon may also be present. However, suitable habitat at the project site may be more limited for those species which are associated with shrubby vegetation (e.g., American tree sparrow, redpolls).

3.4.4 Wildlife

Mammals recorded at the Site during the 1994 Phase II ESA field survey included barren-ground caribou, fox (Arctic/red), Arctic ground squirrels, lemmings (collared and brown), and Arctic hare (ESG, 1995). Fox, hare, and lemming sign was observed in the vicinity of the station area, and caribou sign was observed at several locations. During the 2007 Phase III ESA field survey, grizzly bear tracks and diggings were recorded near the beach, in addition to the other species with the exception of Arctic hare. Other mammals which could potentially occur in the area include polar bear, wolf, wolverine, musk-oxen, ermine, voles (tundra, northern red-backed), and Arctic shrew (Anane-Wheeler, 2002).

Most larger mammals are expected to occur at low densities in the vicinity of the project. However, the northwest portion of the range of the Blue-nose East barren ground caribou herd is in proximity to Clifton Point during the summer months (Nagy et al., 2005; NPC, 2004). The Blue-nose East population was estimated to be approximately 104, 000 in 2000 (Patterson et al. 2004) and had declined to approximately 66,000 by 2005 (Nagy et al. 2005). The main concentration of this herd is south/southwest of the Clifton Point area. Although lower densities of caribou are associated with the portion of range in the vicinity of the project site, there is potential for a number of caribou to be in the area. Caribou move into the area in early summer following calving and most have left by October (Nagy et al., 2005; UMA, 2008b).

Tundra voles and lemmings populations undergo cyclic fluctuations and thus may be very abundant during some years. Voles and lemmings play an important role in the food chain of the Arctic ecosystem, as they serve as a major food source for carnivores, and thus influence populations of such species as foxes, rough-legged hawk, and short-eared owls. Ground squirrel colonies, where present, are also an important food source for carnivores.

3.4.5 Species at Risk

An index search of the Species at Risk Act (SARA) website (SARA, 2008) was conducted on both SARA and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for listed species in Nunavut. Species at risk included species listed as Special Concern, Threatened or Endangered by COSEWIC/SARA. Range maps and habitat preference information was then used to identify species at risk which had potential to occur in the vicinity of the Site.

3.4.5.1 Flora

No flora species at risk were identified for the Clifton Point PIN-B area.

3.4.5.2 Fauna

Ecological assessments at Clifton Point PIN-B in 1994 and 2007 revealed evidence of only one species of concern in the area. Grizzly bear diggings/tracks were noted along the beach in 2007 (UMA, 2008a, UMA, 2008b). A search of COSEWIC and SARA listed species and their ranges indicated that four other species of concern, the polar bear, short-eared owl, wolverine, and tundra peregrine falcon also occur in the region and could interact with the project. In addition to these species, a number of the bird species listed as occurring in the region (see Section 3.4.3) are listed as Sensitive species in Nunavut (CESCC, 2006). These include: common eider, king eider, American golden-plover, black-bellied plover, semi-palmated sandpiper, snow bunting, American tree sparrow, and white-crowned sparrow.

Table 11: Listed Species with Potential to Occur at Clifton Point PIN-B

Species (Common Name)	Species (Latin Name)	Nunavut Status[1]	COSEWIC Status[2]	SARA Status (Schedule)
Grizzly Bear	*Ursus arctos*	Sensitive	Special Concern	No Status[4]
Polar Bear	*Ursus maritimus*	Sensitive	Special Concern	No Status[4]
Short-eared Owl	*Asio falmmeus*	Sensitive	Special Concern	Special Concern (Schedule 3) [3]
Tundra peregrine falcon	*Falco peregrinus tundrius*	Secure	Special Concern	Special Concern (Schedule 3) [3]
Wolverine	*Gulo gulo*	Sensitive	Special Concern	No Status[4]

[1] CESCC. 2006. Wild Species 2005 General Status of Species in Canada. Nunavut Status. Sensitive species are species not believed to be at risk of immediate extirpation or extinction but may require special attention / protection to prevent them from becoming at risk.
[2] Committee on the Status of Endangered Wildlife in Canada. 2008. Special Concern is a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
[3]Species at Risk. 2008. Schedule 3 refers to species listed as Special Concern prior to 1999. These species must also be reassessed with revised criteria before they can be added to Schedule 1(the official list of wildlife species at risk (SARA, 2008a).
[4] Species at Risk. 2008a. No Status refers to species whose status is being reviewed prior to being added to Schedule 1.

Grizzly Bear

Grizzly bears occur in low densities, reproduce slowly, use a variety of habitats in different seasons, and are sensitive to human disturbance (COSEWIC, 2002a). They thus require relatively large areas of undisturbed land. Grizzly bear home ranges can extend over 2000 km^2 for males and about half of that for females (GNWT, 2007).

Grizzly bears usually den from October to April or May (COSEWIC 2002a). Cubs are born in the den between mid-January and mid-March. Grizzly bears are active from den emergence until October, moving around to take advantage of high energy food sources (Nagy and Branigan, 1998).

Barren-ground grizzly bears inhabiting Canada's central Arctic, including the study area, are located near the northernmost and easternmost extend of grizzly range in North America, and the population is characterized by relatively low density and small bears that live in areas of low productivity and high seasonality (Ferguson and McLoughlin, 2000, McLoughlin et al., 2000), and thus may be at particular risk of population decline (McLoughlin et al., 2003).

Polar Bear

See section 3.5.3.3.

Short-eared Owl

The short-eared owl is a bird of the open country, primarily of marshland and grass fields (SARA, 2008a). It is widely distributed in Canada, with a breeding range that extends to tundra. The short-eared owl is a diurnal, ground nesting species that is susceptible to predation or mortality from machinery (SARA 2008b). It is considered a nomadic species, as distribution and abundance are largely influenced by that of small mammals (mainly voles) on which it preys.

Tundra Peregrine Falcon

The tundra peregrine falcon breed from the north slope of the Yukon east across the low Arctic islands and Nunavut north to Baffin Island, Hudson Bay, Ungava and northernmost Labrador (COSEWIC, 2007). No known nesting sites of the tundra peregrine falcon occur in the vicinity of Clifton Point (COSEWIC, 2007, NPC, 2004), and suitable nesting sites (cliff ledges, crevices) are likely lacking in the vicinity of PIN-B. Known falcon nest occur approximately 100-200 km east, west, and north of the project site, thus it is unlikely that falcons would even forage in the vicinity of the site, except during migration. Although the tundra peregrine falcon range encompasses the project site, known nesting areas for falcons are some distance away and thus foraging is unlikely in the area; however, falcons are known to make use of man-made structures for nesting. Falcons in the tundra prey on small birds, ptarmigan, and small mammals. Falcons are adversely affected by some chemicals (e.g., DDT/DDE) through the process of bioaccumulation. The tundra peregrine falcon is listed as “Secure” in Nunavut (CESCC, 2006).

Wolverine

Wolverines are distributed throughout much Nunavut at low densities and are active year round. Wolverines inhabit a variety of tundra and forest wilderness habitats; year-round food supply and sparse human inhabitation appears to be more important than vegetation communities and topography (COSEWIC, 2003).
The wolverine has a low reproductive rate and requires vast secure areas to maintain viable populations. Home ranges vary from 50 to 400 km^2 for females and 230 to 1580 km^2 for males (COSEWIC, 2003, EC, 2006). The density of wolverine appears to be influenced by food availability and proximity to humans (Banci, 1994; Hatler; 1989, Kelsall, 1981). Wolverines exhibit fidelity to discrete areas and are non-migratory (EC, 2006). Although wolverines typically avoid humans, they are attracted to camps where food and/or shelter are present.

Wolverines are mainly carnivorous and are largely dependent on scavenging of carrion in winter and fresh prey in summer. The wolverine is most abundant where large ungulates, and therefore carrion, are common (EC, 2006).

3.5 AQUATIC ENVIRONMENT

3.5.1 Freshwater Environment

There are a number of small shallow lakes interspersed around the Site. There is little information on the limnology of these lakes but they are thought be similar in character to those described in the High Lake Project (Wolfden Resources Inc., 2006) with low nutrient availability, poor macro-invertebrate species diversity and no vascular plant life. According to residents of Kugluktuk, including Mr. Kapakatoak whose family lived at the Inuit Camp on the beach near the Site, fishing is very poor along the coast and none of the lakes within the project footprint and downstream support fish. The biggest lake on-site, between the station and the airstrip, is thought to freeze to the bottom during the winter months (UMA, 2008a).

3.5.2 Water Quality

It is reported that debris, including barrels containing Jet B fuel litter the perimeter of some lakes on-site (ESG, 1995). Little is known about the water quality of lakes within the project footprint although water and sediment samples were taken from the large lake between the airstrip and station, known as Station Drinking Water Lake, and compared to a reference lake 3 km to the southeast (UMA, 2008b). UMA concludes that, based on their 2007 sampling results, chronic inputs of inorganic elements may have occurred at the Drinking Water Lake. However, contaminant levels are low and no significant impacts were identified. They also suggest that further water samples be taken and analyzed for coliform concentrations before use of the water for drinking during remediation activities.

Waters bodies on the Site are also likely used by wildlife and birds. The ESG report (1995) observes caribou tracks and bird prints in sediment around Water Supply Lake.

3.5.3 Marine Environment

3.5.3.1 Specific NIRB Requirements.

The NLCA, Article 12.12.1 states that with exception of community re-supply, shipping associated with project proposals shall be subject to review by NIRB. Therefore this description of the existing environment has been included.

3.5.3.2 General Characteristics and Fish

The marine environment around Clifton Point is heavily influenced by seasonal changes in air temperature and sunlight. For much of the year, with the exception of August and September the sea remains frozen. The under-ice ecosystem is fueled by the production of algae attached to the underside of the ice itself. Algal production usually commences in mid-April and peaks in late May. This algae is grazed upon by copepods, amphipods; which in turn are grazed upon by locally common fish species such as arctic cod and arctic char.

3.5.3.3 Marine Mammals

There is limited information on marine mammal populations in this marine region (Wolfden Resources Inc. 2006). However, the Remedial Action Plan developed by UMA (UMA, 2008a) indicates that the remains of a bowhead whale were found along the shoreline at the Site. Furthermore, the High Lake EIS (Wolfdfen Resources Inc, 2006) concludes the possible occurrence of the additional marine mammal species namely;

- ringed seals;
- bearded seals;
- beluga whales; and
- polar bears.

Bowhead whales, if encountered close to the Site, likely emanate from the Bering-Chukchi-Beaufort Sea stock that is known to summer in the Amundsen Gulf (McLaren & Davis, 1982). Bowhead whales are only likely during the open water season. They are currently designated by the COSEWIC as 'Special concern'.

Both Ringed seal and bearded seals are designated 'not at risk' by COSEWIC. The most sensitive period for seals is during the pupping season which usually occurs during the spring. During the open water season they are widely dispersed and less sensitive to disturbance.

Occurrences of beluga in the vicinity of Kugluktuk are likely from the Eastern Beaufort Sea Population, this population is not listed under the Species and Risk Act and is designated "not at risk" by COSEWIC.

Polar bears are found on ice covered waters throughout the circumpolar Arctic, and are common along coastal areas (COSEWIC, 2002b; SARA, 2008b). Their distribution is closely tied to the distribution and abundance of ringed seals. The *Draft West Kitikmeot Land Use Plan* (NPC, 2004) states that the regions polar bear population resides mainly in the M'Clintok Channel to the east of Victoria Island, approximately 1000 km from the Clifton Point Site. However, polar bear biologists from the Government of Nunavut (personal communication, Elizabeth Peacock) believe individuals from the North Beaufort Sea Population may also occur in the project area. Polar bears were recently listed as 'threatened' under the United States Endangered Species Act and are currently listed as 'Special Concern' by COSEWIC.

3.5.3.4 Marine Sediments

It is uncertain whether contamination on the Site has impacted marine sediments. According to UMA is was not possible to sample marine sediments , down gradient of the Beach Dumps where contamination is most likely as they were considered too course for meaningful analysis, consisting of gravel and cobble (UMA, 2008).

3.6 CULTURAL AND HERITAGE RESOURCES

3.6.1 Cultural Features, Heritage Resources and Special Places

The spatial boundary of the Archaeological Impact Assessment ("AIA"; Golder Associates Ltd., 2008) was limited to the areas identified for remediation and three potential borrow source areas. Two previously identified heritage resource sites (noted as NhPt 1 and NhPt 2 in the AIA) were revisited during the AIA. These sites were investigated and catalogued in 1989 (Golder Associates Ltd., 2008). One additional new site, NhPt 3 – a cairn, was identified as a result of the work conducted during the AIA. It is believed that the cairn may be a possible burial site and therefore a designated special place (Golder Associates Ltd., 2008).

The NhPt 1 site has been identified as a campsite containing a beached boat, tent rings and cabins (Golder Associates Ltd., 2008). The site has prehistoric and historic elements, and was occupied during the time that the DEW Line site at PIN-B was operational and was constructed of the site materials (Golder and Associates Ltd., 2008). This Site has been identified for partial remediation during the overall site remediation as it contains asbestos and PCB-based paints, posing a potential health risk to any people or animals that may traverse the Site.

The NhPt2 site is located north of the main area of PIN-B and is comprised of three tent rings and a possible blind. It is prehistoric in age (Golder Associates Ltd., 2008). The site is located a short distance (0.3 m) away from contaminated soils requiring remediation as part of the general remediation activities planned (Golder Associates Ltd., 2008).

The newly identified NhPt 3 site is a cairn, or mound of rocks, that potentially signifies a burial. Site investigations during the AIA also found a humerus bone from a large bird, lithic flakes and fragments of cut wood in the vicinity of the cairn (Golder Associates Ltd., 2008). The age of the cairn is unknown, however, it was found to be visible on aerial photographs dating back to 1964 but is not clearly visible on aerial photographs taken in 1950 (Golder Associates Ltd., 2008).

Although no other heritage resource sites, special places or cultural features were found during the AIA, it was discovered that around 1915, a unilaterally barbed antler point for an arrow was found and later donated and catalogued by the Canadian Museum of Civilization (Golder Associates Ltd., 2008).

3.6.2 Aesthetic Value

The aesthetic value of the Site is low at present. The PIN-B site is littered with debris such as abandoned barrels and army tent debris in addition to the dilapidated structures including a fallen antenna, module train, garage, and warehouse (Golder Associates Ltd., 2008).

3.7 SOCIO-ECONOMIC ENVIRONMENT

There are no communities located in close proximity to the PIN-B Clifton Point site. The nearest communities are Kugluktuk, Nunavut and Paulatuk, Northwest Territories (NWT).

Kugluktuk, formerly known as Coppermine, is located along the Coronation Gulf in the Kitikmeot Region of Nunavut. It is the most westerly community in Nunavut. Kugluktuk's 2006 population was 1,302, 91.9% of whom are Aboriginal (Statistics Canada, 2006). The Hamlet's population is young, with a median age of 23.8 years (Statistics Canada, 2006). Participation and employment rates in Kugluktuk are lower than in Nunavut as a whole, and the unemployment rate is higher at 22.2% than the Nunavut average of 15.6% (Statistics Canada, 2006).

The traditional economy is strong in Kugluktuk with people engaging in traditional pursuits to provide food, clothing and materials required for cultural activities (Canada Business-Nunavut, 2008). Kugluktuk falls within the employment catchment area for the Northwest Territories' diamond mines, which have provided employment and capacity building opportunities for community residents. It is also home to government offices and a range of businesses and services.

Paulatuk is located along Darnley Bay in the Inuvialuit Land Claim area in the Northwest Territories about 300 km east of Inuvik (Legislative Assembly of the Northwest Territories, n.d.). The population was 294 in 2006, with 91.4% being Aboriginal (Statistics Canada, 2006). Paulatuk's population is younger than the NWT as a whole, with a median age of 23.8 years, nearly eight years younger than the territorial average (Statistics Canada, 2006). At 28.0%, the unemployment rate is almost three times that of the NWT average of 10.4% (Statistics Canada, 2006).

The economy in Paulatuk is centered largely on traditional activities such as hunting, trapping, fishing and arts and crafts production (Legislative Assembly of the Northwest Territories, n.d.). The Beaufort-Delta region has seen a large amount of oil and gas exploration activity in recent years, but it is unknown to whether this has resulted in economic benefits to the residents of Paulatuk.

4.0 PROJECT-ENVIRONMENT INTERACTIONS

4.1 ASSESSMENT METHODOLOGY

This screening level environmental impact assessment has been prepared in a manner that is consistent with both NIRB and CEAA requirements.

The *NIRB Guide 3, Filing Project Proposals and The Screening Process* (NIRB 2006a) identifies the type of information that must be submitted to NIRB as part of a screening, and includes:

- Proponent information.
- Project proposal description including purpose, scope, timing, authorizations and alternatives.
- Description of the existing environment (biophysical and socio-economic).
- Description of public participation (informing, consulting, participation).
- Identification of potential environmental and socio-economic effects.

Incorporating this guidance and the requirements of CEAA, the following general approach was used for the preparation of this EA:

- Review of relevant information pertaining to the Site, including past reports and site assessments commissioned and completed by INAC, and PWGSC.
- Review of environmental and socio-economic information relevant to the Site and the adjacent areas, obtained from government departments, literature searches, public consultations including Inuit Qaujimajatuqangit and EA's completed for mineral exploration and mining projects in the Kitikmeot Region of Nunavut.
- Review of similar EAs completed for similar sites in Nunavut such as the Cape Christian remediation (Gartner Lee Limited, 2007) and CAM-F DEW Line remediation (Jacques Whitford Ltd, 2005).
- Identification and review of the requirements of the approvals processes for proposed projects in Nunavut, including a review of the *Draft West Kitikmeot Land Use Plan* (NPC, 2004).
- The identification and analysis of potential project environmental interactions.
- Assessment of project impacts on the environment.
- The identification of proposed mitigation measures to reduce and/or eliminate project related impacts.
- The assessment of residual project effects and their significance.
- Consideration of the effects of the environment on the project along with accidents and malfunctions.
- Identification and assessment of cumulative effects assessment.
- The identification of management and monitoring plans.
- The use of professional judgment and experience.

4.1.1 VEC Identification and Selection

The basis for environmental impact assessment is the identification of environment and socio-economic components of concern that have potential to be impacted by the project. Beanlands and Duinker (1983) introduced the term Valued Ecosystem Components (VECs) and its use in now common place in EA practice. Both NIRB and CEAA use the term VEC in their guidance documents with NIRB defining them as follows;

> *'VECs are those aspects of the environment considered to be of vital importance to a particular region or community, including:*
>
> *a) Resources that are either legally, politically, publicly or professionally recognized as important, such as parks, land selections, and historical sites.*
> *b) Resources that have ecological importance.*
> *c) Resources that have social importance'.*

For this project a four stage process was implemented to identify potential VECs. Firstly, a review of government regulatory responsibilities was undertaken, followed by direct communication with those regulators. Secondly, VECs were identified through the careful review of other DEW Line and mine site remediation projects and mining projects in close proximity to PIN-B, specifically Zinifex's High Lake Project. Additionally, issues identified during consultations previously undertaken by PWGSC and INAC in the communities of Paulatuk and Kugluktuk we used to develop the list of VECs; these were complemented with additional consultations with Kitikmeot Inuit Association and Kugluktuk Hunters and Trapper Organization. Finally, the professional judgment of EA practitioners and remediation experts was used to identify any potential gaps in the list of VECs.

As a result of this tiered VEC selection process, a comprehensive list was developed. Table 12 lists the VEC's and the means by which they were identified.

Table 12: List of VECs and Selection Rationale

VEC	VEC Selection Rationale			
	Regulatory	Identified in other EAs	Public/Inuit	Professional Judgment
Air Quality	√	√		√
Wildlife	√	√	√	√
Vegetation	√	√	√	√
Landforms	√	√		√
Aquatic Resources	√		√	√
Water Quality	√	√		√
Marine Environment	√			√
Socioeconomic Environment	√	√	√	√

Table 12: List of VECs and Selection Rationale

VEC	VEC Selection Rationale			
	Regulatory	Identified in other EAs	Public/Inuit	Professional Judgment
Cultural/Archeological Features	√	√	√	√

4.1.2 Interactions and Potential Effects Assessment Methodology

Following a review of available baseline information and expert judgment the interactions between the project and the environment have been identified for each VEC by answering the following questions.

- How do interactions occur?
- Where do interactions occur?
- When do interactions occur?

As a tool for achieving this, matrices have been utilized as recommended by NIRB in the *Screening Part 2 Form, Project Specific Information Requirements*. The potential for each project component to interact with each VEC is identified.

Following the identification of potential project/VEC interactions an assessment of the impact has been undertaken. This assessment identifies the specific nature and extent of the interactions between the project and the VECs. Where appropriate, the assessment includes a summary of major concerns or hypotheses of relevance regarding the effect of each activity on the VECs being considered.

Where existing knowledge or the application of standard mitigation indicates that an interaction is not likely to result in an impact, certain issues may warrant only limited analysis.

4.1.3 Mitigation

For each VEC, mitigation measures are suggested within each assessment section. The suggested mitigation measures are designed to minimize the potential environmental impacts of the remediation activities.

Impact mitigation focuses on design elements, alternative construction techniques and long-term operational practices with the avoidance of impacts as the preferred option.

A mitigation summary section is also provided in this report.

4.1.4 Determining the Significance of Residual impacts.

Residual effects are those impacts remaining after all appropriate mitigation measures have been implemented. It is usual practice within EAs to determine the significance of environmental impacts after mitigation has been considered. Guidance on the determination of significance of residual impacts is provided by NIRB as follows:

'Significance is a consideration of the context of the project and the intensity of adverse effects, by giving particular regard to the following:

a) the environmental sensitivity of the geographic area likely to be affected by the project;
b) the historical, cultural and archeological significance of the geographic area likely to be affected by the project;
c) the extent of the effects of the project, including the geographical area that will be affected, the size of the affected human populations, and the size of the affected wildlife populations and related habitat;
d) the extent of the effects of the project on other regional human populations and wildlife populations, including the extent of the effects on Inuit Harvesting activities;
e) the magnitude and complexity of adverse effects;
f) the probability of adverse effects occurring;
g) the frequency and duration of adverse effects;
h) the reversibility or irreversibility of adverse effects; and
i) the potential for cumulative adverse effects given past, present and future relevant events.'

Incorporating this determination and the guidance provided by CEAA, the following criteria (Table 13) have been used to determine the significance of residual impacts for this proposed project.

Table 13: Residual Impact Rating Criteria

Attribute	Options	Definition
Sensitivity of Area	Low	The sensitivity of the environment from the impact is considered low
	Medium	The environment is considered fairly sensitive to the impact
	High	The environment is considered very sensitive to the impact
Direction	Positive	Beneficial impact to population or resource
	Neutral	No change to population or resource
	Negative	Adverse impact to population or resource
Scope	Local	Impact restricted to area within 1km of the Project Site
	Regional	Impact extends up to several kilometers from the Project Site
	Territorial	Impact extends throughout Nunavut
Duration	Short-term	Impacts are significant for less than a year before population or resource returns to it's previous state; or for a species, less than one generation
	Medium-term	Impacts are significant for 1 to 10 years; or for a species, for one generation

Table 13: Residual Impact Rating Criteria

Attribute	Options	Definition
	Long-term	Impacts are significant for greater than 10 years; or for a species, significant for more than one generation
Frequency	Once	Occurs only once
	Intermittent	Occurs occasionally at irregular intervals
	Continuous	Occurs on a regular basis and regular intervals
Magnitude	Negligible	No measurable change from background in the population or resource; or in the case of air, soil or water quality, if the parameter remains less than the standard, guideline or objective
	Low	Impact causes <1% change in the population or resource (where possible the population or resource base is defined in quantitative terms)
	Moderate	Impact causes 1 to 10% change in the population or resource
	High	Impact causes >10% in population in resource
Probability	Low	The impact is unlikely to occur
	Medium	The impact is fairly likely to occur
	High	There is a high probability of the impact occurring
Significance	Insignificant	Minimal or no measurable change from background conditions that may last over a long-term period
	Significant	Measurable change from background conditions that may last over a long-term period
	Unknown	Insufficient data available to make a professional judgment, more study required.

4.1.5 Considering Cumulative Effects

Cumulative effects will occur when two or more concurrent project activities interact either additively or synergistically to further exacerbate the effect on a VEC. Other activities that have or are likely to take place in the foreseeable future (i.e., projects currently planned and scheduled) can also lead to cumulative effects on VECs.

The analysis of the cumulative effects of the proposed project includes the following steps:

- identification of other activities that may overlap cumulatively with the project;
- analysis of residual effects of proposed project;
- mitigation measures; and
- determination of significance of cumulative effects.

4.2 IDENTIFICATION OF PROJECT INTERACTIONS

The environmental assessment process involves evaluation of the likely interactions between the project activities and the environment (specifically the VECs). Table 14 summarizes the potential project interactions between the main project components and the VECs.

Table 14: Identification of Project Interactions

	SITE PREPARATION ACTIVITIES					REMEDIATION ACTIVITIES					CLOSURE ACTIVITIES	
PROJECT ACTIVITIES	**Mobilization**	**Construction of Contractor Camp**	**Upgrading of roads and airstrip**	**Borrow Source Development**	**NHWL and Landfarm Construction**	**Clean-Up of Physical Debris/Demolition/ Dump Remediation**	**Contaminated Soil Removal/Disposal**	**Hazardous Materials Removal/Disposal**	**Camp Waste Disposal**	**Site Grading**	**Site Grading**	**Demobilization**
VECs												
Air Quality	X	X	X	X	X	X	X	X	X	X	X	X
Wildlife	X	X	X	X	X	X	X	X	X	X	X	X
Vegetation		X	X	X	X	X	X	X	X	X	X	
Landforms	X	X	X	X	X	X	X	X		X	X	X
Aquatic Resources (including Water Quality)	X	X	X	X	X	X	X	X	X	X	X	
Marine Environment	X											X
Cultural Features	X	X	X	X	X	X	X	X	X	X	X	X
Socio-economics	X	X	X	X	X	X	X	X	X	X	X	X

4.3 ASSESSMENT OF PROJECT INTERACTIONS

An assessment of all project interactions with identified VECs is provided in the following tables. A brief summary for each VEC is also included. Only those residual impacts considered to be significant will be further analyzed.

4.3.1 Air Quality

Table 15: Assessment of Impacts and Effects on Air Quality

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilisation				
• All site preparation and road grading	• Dust and green house gas emissions from traffic and heavy equipment	• Dust control measures will be implemented (i.e. water will be used for dust suppression, exposed soil piles will be covered etc.) • Development of EPPs and EMPs	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant
Remediation				
• *Excavation of contaminated soils and hazardous material.* • *Landfarming* • *General movements of heavy equipment* • *Site grading*	• Dust/exhaust emissions and noise from traffic and construction equipment	• Dust control measures will be implemented (i.e. water will be used for dust suppression, exposed soil piles will be covered etc.) • Development of EPPs and EMPs	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant
• *Excavation of contaminated soils and hazardous material*	• Removal of the contaminated soil from the environment will reduce the risk of effects on air quality	• None required	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: Positive Scope: local Duration: long-term Frequency: intermittent Magnitude: negligible Probability: high Significance: Beneficial, not evaluated

Table 15: Assessment of Impacts and Effects on Air Quality

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
• *Incineration of Camp waste*	• Possible exceedances of Canada Wide Standards for Dioxins and Furans	• On-site diversion and segregation programs • If incineration is required, ensure diligent operation and maintenance of the incineration device and provide appropriate training to the personnel operating and maintaining the incinerator. • Waste wood treated with preservatives such as creosote, pentachlorophenol or heavy metal solutions will not be burned. • Plastics, electrical wire, asbestos and building demolition wastes (except clean wood) are wastes likely to produce dioxins and furans when burned and should be excluded from incineration and disposed of in the non-hazardous waste landfill. Non-painted asbestos should be double bagged before on-site landfill disposal. Under no circumstance should hazardous wastes be managed through burning or incineration	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant
Upset Conditions				
• *Extreme weather events during mobilisation, demobilisation and remediation*	• High precipitation events, coupled with project activities may result in erosion, slumping or sliding of surficial materials • High wind events will lead to decreased air quality as surficial materials become air borne	• Avoiding work with equipment during extreme precipitation events and during associated adverse ground conditions • Implementation ERPs	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant

Summary of Air Quality Related Issues:

Adverse potential impacts to air quality are associated with all phases of the project, including mobilization/demobilization, remediation and in the event of extreme precipitation and high wind events. In order to complete the proposed project, heavy machinery will be utilized. Consequently, there will be low emissions of greenhouse gases, nitrogen oxides (NOx), sulphur dioxide (SO_2) particulate matter, and carbon monoxide (CO) due to combustion of diesel fuel or gasoline and burning of non-hazardous waste. Emissions from vehicles and construction equipment however will be short term and intermittent and will not have a significant residual effect on air quality within the local study area or regionally. Dust generation is expected to also be low in volume and infrequent. Overall positive effects are expected as a result of removal of contaminated soils and hazardous materials.

A number of measures will be implemented to mitigate the potential adverse effects associated with project activities. These will include, though not be limited to: dust suppression/control measures, implementation of good practice measures and avoidance of work during extreme weather events. There is potential for emissions of dioxins and furans through the incineration of camp wastes, these will be managed by ensuring on-site diversion and segregation of waste, thus ensuring only appropriate waste streams are incinerated. Additionally, the amount of soil exposed and disturbed will be limited to the areas requiring remediation and the movement of soils will be minimized whenever possible. Exposed soil piles will be covered. EMPs and EPPs are also important along with a general ERP.

Following implementation of mitigation measures, adverse effects associated with project activities to air quality will be local, short-term and insignificant. Additionally, these impacts are not expected to contribute to any adverse cumulative effects and it is expected that the Project will have long-term beneficial effects on air quality.

4.3.2 Landforms

Table 16: Assessment of Impacts and Effects on Landforms

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilization				
Use of heavy machinery and equipment	• Disturbance and degradation soils and landforms	• Existing roads and pathways will be utilized to the extent possible.	• No cumulative adverse effects identified	Sensitivity of the Area: low Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: negligible Probability: high Significance: insignificant
Contractor Camp Construction	• Establishment of temporary camp facilities may disturb or degrade surficial materials and landforms	• The camp will be located on previously disturbed areas.	• No cumulative adverse effects identified	Sensitivity of the Area: low Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: negligible Probability: high Significance: insignificant
Upgrading of Site Roads/Airstrip	• Where required, drainage to be improved during grading of roads and airstrips, and re-grading of Site at completion	• N/A	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: positive Scope: local Duration: short-term Frequency: once Magnitude: negligible Probability: high Significance beneficial, not evaluated
Borrow Source Development	• Granular material extraction will result in alteration of landforms in the immediate vicinity of the borrow areas	• Upon completion, borrow areas boundaries will be re-contoured and graded to match adjacent areas to the extent possible.	• No cumulative adverse effects identified	Sensitivity of the Area: medium Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: low Probability: high Significance: insignificant

Table 16: Assessment of Impacts and Effects on Landforms

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
NHWL and Landfarm Construction	• Excavation for new NHWL and landfarm construction may degrade permafrost and existing land contours • Alteration of existing terrain	• Surface area and time of permafrost exposure will be minimized. • Land surface will be re-contoured to match pre-remediation conditions to the extent possible.	• No cumulative adverse effects identified	Sensitivity of the Area: medium Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: low Probability: high Significance: insignificant
Remediation				
Clean-up of physical debris/demolition/dump remediation	• Remediation of old dumps, building demolition, general clean-up of debris and movement of equipment and personnel may disturb or degrade soils (including permafrost) and landforms	• Existing roads and pathways will be utilized as much as possible. • Land surface will be re-contoured to match pre-remediation conditions to the extent possible. • Surface area and time of permafrost exposure will be minimized.	• No cumulative adverse effects identified	Sensitivity of the Area: medium Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: low Probability: high Significance: insignificant
Excavation/removal and disposal of contaminated soils and hazardous material	• Excavation and removal of contaminated soil may degrade permafrost and existing land contours • Alteration of existing terrain	• Surface area and time of permafrost exposure will be minimized. • Land surface will be re-contoured to match pre-remediation conditions to the extent possible.	• No cumulative adverse effects identified	Sensitivity of the Area: medium Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: low Probability: high Significance: insignificant
Site grading	• Grading activities may disturb or degrade soils and landforms • Alteration of existing terrain	• Existing roads and pathways will be utilized to the extent possible.	• No cumulative adverse effects identified	Sensitivity of the Area: low Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: negligible Probability: high Significance: insignificant

Table 16: Assessment of Impacts and Effects on Landforms

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Upset Conditions				
Extreme precipitation events	• High precipitation events, coupled with project activities may result in erosion, slumping or sliding of surficial materials	• Avoiding work with equipment during extreme precipitation events and during associated adverse ground conditions	• No cumulative adverse effects identified	Sensitivity of the Area: medium Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: medium Significance: insignificant

Summary of Landforms Related Issues:

Adverse potential impacts to landforms are associated with all phases of the project, including mobilization/demobilization, remediation and in the event of extreme precipitation. Adverse effects may include degradation of surficial materials (including permafrost) and landforms through establishment of support facilities, general movement of equipment around the Site, excavation of materials for remediation or borrow, and general clean up of materials. The excavation and movement of contaminated soils is likely to alter the existing terrain. However, the existing terrain is currently not in its natural form. As such the effects of further excavation would be minimal. Adverse effects associated with extreme precipitation events include erosion, slumping or sliding of surficial materials, which may be exacerbated by project activities.

A number of measures will be implemented to mitigate the potential adverse effects associated with project activities. These will include, though not be limited to: locating access routes and camp facilities on previously disturbed areas, limiting the area and time that permafrost is exposed, re-contouring and grading to ensure that landforms match pre-remediation conditions as much as possible, and avoiding working with equipment during extreme precipitation events and associated adverse ground conditions.

Overall, the removal of abandoned site infrastructure will improve the visual aesthetics of the local terrain, drainage will be improved with grading of the Site and historically disturbed areas will be blended into the landscape.

Following implementation of mitigation measures, adverse effects associated with project activities to landforms will be local, short-term and insignificant. Additionally, these impacts are not expected to contribute to any adverse cumulative effects.

4.3.3 Vegetation

Table 17: Assessment of Vegetation Impacts and Effects

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilization				
• *Site preparation* • *Surface/road grading*	• Dust from traffic and construction equipment.	• Dust control measures will be implemented. Water will be used for dust suppression.	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant
Remediation				
• *Excavation of contaminated soils and hazardous material* • *Land farming* • *General movements of heavy equipment*	• Vegetation community loss/alteration	• Limit remedial work to the footprint of disturbed sites, where possible • Maintain surface drainage patterns at the Site through regrading disturbed areas to promote runoff	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: negligible Probability: high Significance: insignificant
	• Impacts on natural re-vegetation	• Minimize smoothing and contouring of disturbed surfaces to encourage re-vegetation where surface drainage is not an issue	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: negligible Probability: high Significance: insignificant
	• Dust from traffic and construction equipment	• Dust control measures will be implemented. Water will be used for dust suppression. Exposed soil piles will be covered.	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant

Table 17: Assessment of Vegetation Impacts and Effects

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
	• Removal of the contaminated soil from the environment will improve growing conditions and decrease the potential for harm from contaminated surface and ground waters, and soil.	• None required.	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: positive Scope: local Duration: long-term Frequency: once Magnitude: medium-high Probability: high Significance: beneficial, not evaluated
Extreme Events/Upset Conditions				
• *Extreme high winds/extreme rainfall during mobilisation and remediation.*	• Increased windblown dust/erosion	• Avoidance of materials handling that is likely to increase particulate emissions during extreme wind conditions. Secure covering of stockpiled or exposed materials • Develop and implement an erosion and sediment control plan	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: medium-term Frequency: intermittent Magnitude: low Probability: low Significance: insignificant
• *Potential for hydrocarbon spills*	• Loss of vegetation • Impacts to sensitive environments (wetlands) • Degradation of land, surface and ground water	• Develop and implement EPPs and EMPs • Develop and implement hydrocarbon spill contingency plan as part of ERP • Use of appropriate controls (booms, berms, sediment control) to prevent deleterious substances from entering surface/ground water or movement of substances onto adjacent vegetation communities	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: medium-term Frequency: intermittent Magnitude: low-moderate Probability: low Significance: insignificant

Summary of Vegetation Related Issues:

Adverse potential impacts to vegetation are associated with the mobilization/demobilisation project phase: site preparation, surface/road grading and include fugitive dust from traffic and construction equipment. Dust suppression and control measures will be implemented, thus dust is not expected to have a significant effect on adjacent vegetation and wetlands.

The remediation stage of the Project will significantly reduce contaminant loadings in local soils and reduce the long-term potential for vegetation damage from the Site. Short term impacts on vegetation might be expected from disturbance/loss of some vegetated areas, and dust from the use of heavy equipment and from the excavation, handling and stockpiling of material. To minimize the potential for direct loss/alteration of vegetation, remediation activities will be, for the most part, limited to the footprint of previously disturbed areas and thus vegetated losses are expected to be minor. Remediation may also slow natural re-vegetation at the Site, however, removal of contaminated soils will improve conditions for overall natural re-vegetation.

Extreme windy conditions may exacerbate fugitive dust, extreme rainfall may exacerbate erosion, and accidental hydrocarbon spills have the potential to adversely effect vegetation and wetlands. However, with appropriate mitigation, the probability of significant adverse effects is anticipated to be low. A Contingency Plan for oil spills will be part of the ERP. This plan will be consistent with the GN Spill Contingency Planning and Reporting Regulations and guidance issued by NWB related to contingency planning. EMP and EPP development will assist in avoiding spill events.

Short-term, minor residual effects on vegetation may result from some site preparation and remedial activities until natural re-vegetation occurs. These impacts are not expected to contribute to any adverse cumulative effects. Overall, remediation of the Site will have a positive impact on vegetation communities.

4.3.4 Wildlife

Table 18: Assessment of Wildlife Impacts and Effects

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilization				
• *Site preparation and closure activities*	• Sensory disturbance of wildlife, including breeding activity of birds and caribou	• Schedule activities during non-breeding/nesting seasons for birds • Conduct pre-disturbance nest surveys; avoid active nesting structures when present • Confirm that the module train is not being used as a nest site for rough legged hawk and remove nest in the fall of the first remediation season to prevent future use • Suspend activities during the caribou calving season(May-July) if caribou cows are present • Suspend activities if large numbers (>100) caribou are migrating through or within 5 km of the Site • Restrict access to disturbed areas • Implement EPPs and EMPs that include noise abatement measures • Aircraft flights will maintain a minimum altitude of 610 m above ground level except for take off and landing.	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible - low Probability: high Significance: insignificant
	• Disruption of movement patterns caused by traffic, heavy equipment, and human activity	• Restrict access to disturbed areas • Limit extent of work at any one time • Operations will avoid caribou water crossings if any are identified • Concentrations of caribou should be avoided at all times.	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible-low Probability: high Significance: insignificant

Table 18: Assessment of Wildlife Impacts and Effects

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
	• Direct mortality caused by traffic and heavy equipment • Human/wildlife interactions resulting in wildlife mortality	• Schedule activities during non-breeding/nesting seasons for birds • Conduct pre-disturbance nest surveys; avoid active nesting structures when present • Suspend activities during the caribou calving season(May-July) if caribou cows are present • Wildlife must be given the right of way on-site roads. • Management of food waste at camps and throughout the Site • Develop a wildlife management plan that includes wildlife awareness training and review of Safety in Bear Country	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible-low Probability: high Significance: insignificant
Remediation				
• *All remediation activities*	• Sensory disturbance of wildlife, including breeding activity of birds and caribou	• Refer to the above mitigation measures	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible-low Probability: high Significance: insignificant
	• Disruption of movement patterns caused by traffic, heavy equipment, and human activity	• Refer to the above mitigation measures	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: moderate Significance: insignificant

Table 18: Assessment of Wildlife Impacts and Effects

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
	• Direct mortality caused by traffic and heavy equipment • Human/wildlife interactions resulting in wildlife mortality • Demolition of structures that may be presently used by wildlife	• Refer to the above mitigation measures • Avoid disturbance to ground squirrel colonies • Inspect structures prior to demolition for wildlife use (e.g., nesting rough-legged hawk)	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: low Significance: insignificant
	• Improve condition of wildlife habitat, reducing potential for adverse impacts to wildlife	• None required	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: positive Scope: local Duration: long-term Frequency: once Magnitude: low Probability: high Significance: beneficial, not evaluated
• *Camp waste management*	• Attraction of bears, wolverines and other carnivores to the Site, resulting in defence/ problem wildlife killings	• Containers for domestic waste and incinerators will be located in enclosed bear-proof structures • Garbage will be incinerated daily • Bear safety awareness training will be provided as will information on other wildlife encounters • All camp personnel will be familiar with 'Safety in Bear/Polar Bear Country' literature produced by GN Department of Environment • Bear deterrents will be kept on Site • The use of electric fencing within the camp design will be considered	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high/low Significance: insignificant

Table 18: Assessment of Wildlife Impacts and Effects

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Upset Conditions				
• *Extreme high winds/extreme rainfall during mobilisation, remediation,*	• Increased windblown dust emissions/increased erosion could impact wildlife habitat	• Avoidance of materials handling that is likely to increase particulate emissions during extreme wind conditions or extreme rainfall. Secure covering of stockpiled or exposed materials. Implementation of erosion control	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high/low Significance: insignificant
• *Potential for hydrocarbon spills*	• Degradation of land, surface and ground water, thus wildlife habitat	• Develop and implement EPPs and EMPs • Develop and implement hydrocarbon spill contingency plan as part of ERP • Use of appropriate controls (booms, berms, sediment control) to prevent deleterious substances from entering surface/ground water or movement of substances onto adjacent vegetation communities •	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: medium-term Frequency: intermittent Magnitude: low-moderate Probability: low Significance: insignificant

Summary of Wildlife Related Issues:

Potential adverse impacts to wildlife are associated with all phases of the project, including mobilization/demobilization, remediation, and upset conditions such as extreme winds/rainfall or spills. Adverse effects may include sensory disturbance, disruption of wildlife movement, direct and indirect wildlife mortality as a result of project activities and wildlife/human interactions. Noise from traffic, equipment, machinery, and human activity will likely result in the temporary avoidance of the area by most wildlife, and may result in changes in local movement patterns of wildlife. The impacts from noise are considered to be of negligible-low magnitude based on the species and number of individuals recorded in the area during previous studies. Maintaining equipment in good working condition, turning equipment off when not in use, and use of mufflers will reduce the effects of noise on wildlife.

There is some potential for nest sites/burrows to be disturbed during the project. Avoiding work during the nesting season for birds will reduce the probability of nest destruction. Buildings should be checked for nesting rough-legged hawks and other species, and the demolition of facilities used for nesting or near nest sites should be avoided while birds are nesting. In the event that remediation activities can not be completed without disturbing/destroying nests associated with migratory birds, the responsible wildlife officer should be contacted for additional guidance and/or to obtain a permit authorizing the removal of nests or disruption of habitat as required by the MBCA. Ground squirrel colonies should also be avoided, where possible.

There is potential for wildlife/human interaction during the life of the project, however, it is expected that such encounters will be infrequent and insignificant. Polar bears are an unlikely but possible occurrence at the Site during the project. Grizzly bear, wolverine, foxes, wolves, and ravens may also be attracted to camp facilities as a result of odors and activity. Camp design, proper containment and disposal of wastes/garbage, and training of workers in wildlife interactions and bear safety will reduce the probability of adverse wildlife encounters, and the potential adverse effects on low density bear populations in the area.

Disturbed areas will be re-graded to facilitate natural re-vegetation of the area and recovery of ecosystem function.

Adverse effects associated with extreme wind (dust) or precipitation (erosion) may also impact on vegetation and thus wildlife habitat, as may upset conditions such as hydrocarbon spills. A contingency plan will be prepared that addresses spills, and will be consistent with the *Spill Contingency Planning and Reporting Regulations* and guidance issued by NWB related to contingency planning. EMP and EPP development will assist in avoiding spill events.

The development of a Wildlife Management Plan (WMP) will assist in minimizing project impacts on wildlife. Example mitigation measures that could be included in a WMP are provided in Appendix A.

Overall, the removal of abandoned site infrastructure and remediation of contaminated soils will improve habitat quality and thus have long-term benefits for wildlife.

Following implementation of mitigation measures, adverse effects associated with project activities to wildlife will be local, short-term, and insignificant. These impacts are not expected to contribute to any adverse cumulative effects.

4.3.5 Aquatic Resources and Water Quality

Table 19: Assessment of Impacts and Effects on Aquatic Resources and Water Quality

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilisation				
• *Upgrading of roads and airstrip*	• Sediment in run-off from re-graded roads and surfaces has the potential to impact water quality	• Development of EMPs and EPPs • Development and implementation of temporary (during construction) and permanent erosion and sediment control measures (i.e. berms, silt fences)	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: low - moderate Probability: low Significance: insignificant
• *Refuelling of vehicles and development of fuel storage areas.*	• Fuel spills may contaminate local water courses and impact invertebrate, birds and wildlife using these	• Fuel storage and refueling must occur at least 30 m from the high water mark of any water body, in a natural depression or bermed area • All fuel storage containers will be situated in a manner that allows easy access and removal of containers in the event of leaks or spills. Fuel caches in excess of 20 drums should be inspected daily • Spill contingency plans have been developed and will be implemented as necessary • Contingency plans related to all materials and equipment will be available on-site. • All fuel will be handled in accordance with the spill contingency plan	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant
Remediation				
• *General remediation activities*	• Potential long-term reductions in contaminant levels in water and aquatic resources	N/A	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: Positive Scope: local Duration: long-term Frequency: intermittent Magnitude: negligible Probability: high Significance: Beneficial, not evaluated

Table 19: Assessment of Impacts and Effects on Aquatic Resources and Water Quality

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
• *Excavation/removal and disposal of contaminated soils and hazardous material*	• During disposal activities, hazardous materials have potential to impact local water quality, invertebrate, wildlife and water fowl using aquatic resources	• Transportation procedures in accordance with *Transportation of Dangerous Goods Act* will be implemented • All workers will be trained in proper handling procedures for all hazardous materials on-site • Hazardous materials will be stored at least 100 m away from the high water mark of any water body • Spill contingency plans have been developed and will be implemented as necessary (see below) • Contingency plans related to all materials and equipment will be available on-site (see below) • Development of EMPs and EPPs	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: low Significance: insignificant
• *Landfill construction*	Landfill surface runoff, leachate generation and seepage may have an effect on surface water quality and sediment, and could affect local aquatic environments	• New landfills will be sited away from natural drainages • Upon closure, existing landfills will be graded to promote surface runoff • The design cover of land fills should extend below the active permafrost zone and study to estimate the active zone thickness is important for landfill cover design • Landfill cover must be resistant to erosion, slope failures and freeze/thaw creep • Landfill cover thickness will be designed so that the waste materials are below the active layer • Development of EMPs and EPPs	▪ No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible - low Probability: low Significance: insignificant
• *Contaminated soil excavation and handling/ Hazardous materials handling*	• Disturbance and handling of hazardous material may result in accidental releases to local water courses	• Transportation procedures in accordance with *Transportation of Dangerous Goods Ac*t will be implemented • All workers will be trained in proper handling procedures for all hazardous materials on-site • Temporary stockpiles will be least 100 m away from the high water mark of nay water body	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant

Table 19: Assessment of Impacts and Effects on Aquatic Resources and Water Quality

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
• *Site Grading /borrow source development and general use of heavy equipment for remediation*	• 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	• Development and implementation of temporary (during construction) and permanent erosion and sediment control measures (i.e. berms, silt fences) • Equipment will not be operated within the wetted perimeter • Disturbed areas adjacent to water will be stabilized, if required • Erosion protection of excavated and fill slopes will be important to prevent sediment mobilization • Borrow development, remedial excavation and landfill slope designs should provide for proper drainage and consider soil strength when saturated in slope stability analysis • Environmental monitoring will take place during remedial activities to ensure compliance and functioning of drainage and sediment controls structures • Development and implementation of EPPs and EMPs	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: Positive Scope: local Duration: long-term Frequency: intermittent Magnitude: negligible Probability: high Significance: Beneficial, not evaluated
• *Camp operation*	• The operation of the work camp will include disposal of camp sewage, grey water, garbage and other non-hazardous wastes. impact water quality	• Camp sewage and grey water will be diverted to sumps that are located a minimum of 100 m from a drainage course or a water course. Sumps will be closed off at the end of remediation activities • All other camp waste will be disposed of in one of the new landfills or removed off-site on completion of the remediation activities	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: Positive Scope: local Duration: long-term Frequency: intermittent Magnitude: negligible Probability: high Significance: Beneficial, not evaluated

Table 19: Assessment of Impacts and Effects on Aquatic Resources and Water Quality

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Upset Conditions				
• *Extreme rainfall,*	• Increased erosion of exposed surfaces and engineered landfill caps, resulting in sediment and contaminant laden runoff, and possible failure of facilities.	• Engineer landfills to take account of extreme rainfall events such as the one in July 2007 • Borrow development, remedial excavation and landfill slope designs should provide for proper drainage and consider soil strength when saturated in slope stability analysis • Ensure capping materials has sufficient strength and are graded to promote run-off	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: high Significance: insignificant
• *Climate change*	• Loss of permafrost encapsulation within landfills with increased leachate production and potential for impacts on aquatic resources.	• Ensure appropriate thickness of landfill caps to account for possible climate change scenarios • Monitor permafrost freeze-back within the landfill. Consider the use of thermosyphons if freeze-back is slow	• No cumulative adverse effects identified	Sensitivity of the Area: low Direction: negative Scope: local Duration: Long-term Frequency: Continuous Magnitude: negligible Probability: Low Significance: Unknown
• *Potential for silt events*	• Impacts to sensitive environments (i.e. fen wetlands) • Degradation of land, surface and ground water	• Develop and implement EPPs and EMPs • Develop and implement ERPs that include an contingency plans to deal with events effectively • Development and implementation of temporary (during construction) and permanent erosion and sediment control measures (i.e. berms, silt fences) • Educate personnel on the potential impacts	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short - medium-term Frequency: once Magnitude: low - moderate Probability: low Significance: insignificant
• *Potential for oil spills*	• Impacts to sensitive environments • Degradation of land, surface and ground water	• See mitigation Above	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: medium-term Frequency: once Magnitude: moderate - high depending on size and location of the spill Probability: low Significance: insignificant

Summary of Aquatic Resources Related Issues:

Adverse potential impacts to aquatic resources and water quality at Clifton Point are possible during all phases of the project as well as upset conditions that pertain to spills and sediment events, and extreme rainfall events.

Silt generated by the use of heavy equipment, excavation of landfills/and borrow source and erosion of slopes and ditches, along with fugitive dust emissions and the potential for landfill leachate may have an effect on surface water quality and sediment, and could impact local aquatic environments and, through habitat usage, aquatic flora and fauna. Furthermore, possible fuel spills from general use of heavy equipment and from fuel storage areas are also a possibility. A number of common practice environmental protection measures will be incorporated to reduce this likelihood including, appropriate engineering design, following good practice in handling materials and implementing the Spill Contingency Plan that complies with *GN Spill Contingency Planning and Reporting Regulations* (see Appendix B). EMPs and EPPs are also important along with a general ERP. Erosion and sediment control can occur at any time during construction. The highest potential for erosion occurs during clearing, grading and during activities in or near wetlands and watercourses. Specific mitigation measures for the protection of the topsoil resource and water quality from erosion and sedimentation will be outlined in the EPP under an erosion and sediment control plan (ESCP). This ESCP will be developed and implemented on-site to protect aquatic resources and water quality.

It is also presumed that the operation of the temporary work camp will include treatment and disposal of waste, which has the potential to impact water quality. This waste will be handled in a manner that complies with guidelines issued by territorial and federal governments or the NWB. This will include placing sewage and wastewater collection sumps a minimum of 100 m from any drainage course or water course, and complying with *Guidelines for General Management of Hazardous Wastes* (GN, n.d.).

It should be noted that other northern sites have demonstrated, on occasion, that the granular overburden material can be potentially acid generating or can leach metals, affecting the water quality of adjacent rivers and lakes. Measures will be taken on-site to ensure that appropriate material is used.

Extreme weather conditions such as heavy rainfall have the potential to exacerbate impacts on aquatic resources and water quality. Knowledge of extreme event occurrence and subsequent sitting and design of facilities is the key mitigation in this regard.

Long term global warming could reduce the effectiveness of the remediation activities. Landfill designs must take account of this likelihood and ensure permafrost is maintained within the wastes. Monitoring of landfill freeze-back is also recommended.

Overall the remediation activities are expected to have positive impact on aquatic resources through the removal and isolation of contaminants from the environment. Following implementation of mitigation measures, adverse effects associated with project activities to aquatic resources and water quality will be local, short-term and insignificant. A monitoring program for water quality will implemented (refer to Section 8.0). These impacts are not expected to contribute to any adverse cumulative effects.

4.3.6 Marine Resources

Table 20: Assessment of Impacts and Effects on Marine Resources

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilization				
• *Barging of materials and equipment to the Site*	• Noise issues to marine mammals • Impacts to seal pupping activities and to seal behaviour (use of shore/beaches) • Potential boat collisions with marine mammals (belugas)	• Schedule activities during times when marine mammals are not likely to be in the area (refer to Section 3.5.5.7) • Boat monitors to watch for beluga pods • Use of barges to maintain straight courses and low speeds • Shipping scheduled during the normal open water season thus avoiding sensitive seal pupping season (March-June) • Make information available to personnel regarding marine habitat/fauna • Avoidance of all animals	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: low Significance: insignificant
Remediation				
• *General remediation activities close to marine environments*	• The proximity of the beach landfills to the marine environment has the potential to affect marine habitat, and animals through sediment or hazardous materials entering the water	• Surface water should be diverted away from landfills during excavation • Berms, booms, and sediment controls will be implemented to protect surface water from excessive sediment loading and to prevent deleterious substances from entering the marine environment • Development of EMPs and EPPs • Development of ERP with Spill Contingency Plan	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: low Significance: insignificant

Table 20: Assessment of Impacts and Effects on Marine Resources

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
• *Use of gas-powered heavy equipment*	• Loss of wildlife • Degradation of marine and shoreline habitat if the spill occurs in water • Degradation of land, surface and ground water if the spill occurs on land	• Develop and implement EPPs and EMPs • Implement the contingency plan to deal with oil spills on water (Appendix B) • Educate personnel on the potential impacts of the spills and contingency plans	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: low Significance: insignificant
• *Camp Operation e.g garbage, kitchens, chemicals, incinerator.*	• Attraction of polar bears to the Site resulting in defence kills and impacting already low population levels	• Bear safety awareness training will be provided. Containers for domestic waste and incinerators will be located in enclosed bear-proof structures • All camp personnel will be familiar with 'Safety in Polar Bear Country' literature produced by GN Department of Environment • Garbage will be incinerated daily. • Bear deterrents (cracker shells, thunder flashes and rubber bullets) will be on-site • Consider the use of electric fencing within the camp design, especially around sleeping quarters	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: long-term Frequency: intermittent Magnitude: moderate Probability: low Significance: insignificant
• *General remediation activities*	• Potential long-term reductions in contaminant levels the marine environment	None	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: positive Scope: local Duration: long-term Frequency: intermittent Magnitude: negligible Probability: high Significance: Beneficial, not evaluated

Table 20: Assessment of Impacts and Effects on Marine Resources

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Upset Conditions				
• *Extreme rainfall,*	• Increased erosion of exposed surfaces and engineered landfill caps, resulting in sediment and contaminant laden runoff entering the marine environment	• Engineer landfills to take account of extreme rainfall events such as the one in July 2007 • Borrow development, remedial excavation and landfill slope designs to provide for proper drainage and consider soil strength when saturated in slope stability analysis • Ensure capping materials has sufficient strength and are graded to promote run-off	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: intermittent Magnitude: negligible Probability: low Significance: insignificant
• *Climate change*	• Loss of permafrost encapsulation within landfills with increased leachate production and potential for impacts on marine resources.	• Ensure appropriate thickness of landfill caps to account for possible climate change scenarios • Monitor permafrost freeze-back within the landfill. Consider the use of thermosyphons if freeze-back is slow.	• No cumulative adverse effects identified	Sensitivity of the Area: low Direction: negative Scope: local Duration: long-term Frequency: continuous Magnitude: negligible Probability: low Significance: unknown

Summary of Aquatic Resources Related Issues:

Potential impacts to marine mammals are generally limited to barging operations during the limited open water season. The sensitivity of marine mammals to shipping operations is not fully understood (Finley et al, 1990) but is thought to be influenced by timing, location i.e. avoidance of sensitive life history times and locations, as well as the size, speed and number of the vessels involved. The barges to be used in this operation will be small, slow moving and limited in number. The avoidance of seal denning areas and times is achieved by shipping only in August and September; impacts are therefore expected to be low.

The greatest risk to marine resources in general is posed by the accidental release of existing on-site contaminants or spills of fuels. As described in the Aquatic Resources Assessment (Section 4.3.3) a number of environment protection measures will be implemented during mobilization, demobilization and remediation activities. These measures should minimize the chances of accidental release of contaminants into the marine food chain. Furthermore, a spill contingency plan has been developed dealing with spills of hazardous

materials into the environment, including the marine environment. This plan is consistent with the GN's *Spill Contingency Planning and Reporting Regulations* and guidance issued by Nunavut Water Board related to contingency planning.

Polar bears are an unlikely but possible occurrence at the Site during remediation activities. Polar bears are naturally inquisitive and are often attracted to odors and sounds from the camp. Consequently, preparedness for the occurrence of polar bears is vital in camp design, operation, and equipment.

Generally the impact on marine resources is expected to be positive with reduced likelihood of contaminant migrating from the Site into the arctic marine food chain.

4.3.7 Traditional and Non-Traditional Land Uses

Table 21: Assessment of Impacts and Effects on Traditional and Non-Traditional Land Uses

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Remediation				
Demolition of Inuit Cabin	Loss of accommodation for harvesters and Canadian Rangers	The hunters and trappers organisations of Paulatuk and Kugluktuk should be formally notified that the house will be demolished	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: negative Scope: local Duration: long-term depending on spill size and location Frequency: N/A Magnitude: low Probability: high Significance: insignificant
Upset Conditions				
None				

Summary of Traditional and Non-Traditional Land Use Related Issues:

Remediation activities at PIN-B should not adversely affect traditional and non-traditional land uses in the area. However, it was revealed through consultation that the Inuit house at the Site has been periodically inhabited by Canadian Rangers from Paulatuk as they traverse the land on their way to check the short range radar at the PIN-2 site at Cape Young (UMA Engineering Ltd., 2008). It is also used intermittently by hunters from Paulatuk and Kugluktuk. It is recommended that the hunters and trappers of Kugluktuk and Paulatuk, as well as the Canadian Rangers, be made aware of the proposed remediation schedule to ensure that they are aware that the Inuit house will be unavailable for use as shelter.

Overall, land use potential in this area will be enhanced by the removal and remediation of contaminated soils, debris, and decaying structures currently present at the Site.

4.3.8 Cultural Features/Heritage Resource and Aesthetic Value

Table 22: Assessment of Impacts and Effects on Cultural Features/Heritage Resource and Aesthetic Value

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilization				
All Activities	• Potential to disturb the known heritage resource sites (NhPt 1, NhPt 2 and NhPt 3)	• NhPt 1: Archaeological mapping and further documentation (i.e. appropriate interior and exterior photographs, interviews with previous occupants etc.) of the cabins and areas to be effected during the remediation efforts, be completed by a qualified archaeologist prior to remediation. • Systematic shovel testing should be employed to determine the presence/absence of precontact materials in areas of impact. • NhPt 2: Erect barricades prior to remediation to delineate the features so that they may be avoided by the heavy equipment. • NhPt 3: Avoidance of site during the remediation of the station area and will not be affected by the remediation program	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: medium - high Probability: low Significance: insignificant
	• Disturbance or destruction of new or unanticipated heritage resource or cultural sites	• No artifacts or other associated objects will be removed from the Site unless their integrity is threatened in any way. • The Site's visible boundaries will be marked and the area avoided. • A report of the discovery of the site will be made to the Archaeology Division of the Government of Nunavut Department of Culture Language Elders and Youth. • The discovery will be documented.	• No cumulative adverse effects identified.	Sensitivity of the Area: medium to high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: unknown Probability: low Significance: insignificant

Table 22: Assessment of Impacts and Effects on Cultural Features/Heritage Resource and Aesthetic Value

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
	• Discovery and documentation of new heritage resource sites or cultural features as a result of site disturbance or excavation during remediation activities	• No artifacts or other associated objects will be removed from the Site unless their integrity is threatened in any way. • The Site's visible boundaries will be marked and the area avoided. • A report of the discovery of the site will be made to the Archaeology Division of the Government of Nunavut Department of Culture Language Elders and Youth. • The discovery will be documented.	• No cumulative adverse effects identified.	Sensitivity of the Area: medium to high Direction: positive Scope: local Duration: short-term Frequency: unknown Magnitude: unknown Probability: low Significance: insignificant / beneficial
Remediation				
All Activities	• Potential to disturb the known heritage resource sites (NhPt 1, NhPt 2 and NhPt 3)	• Buffers will be created where possible around sites and the other known cultural features to ensure avoidance by remediation crews • No artifacts or other associated objects will be removed from the site unless their integrity is threatened in any way	• No cumulative adverse effects identified.	Sensitivity of the Area: high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: medium - high Probability: low Significance: insignificant

Table 22: Assessment of Impacts and Effects on Cultural Features/Heritage Resource and Aesthetic Value

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
•	• Disturbance or destruction of new or unanticipated heritage resource or cultural sites	• No artifacts or other associated objects will be removed from the site if their integrity is threatened in any way. • The site's visible boundaries will be marked and the area avoided. • A report of the discovery of the site will be made to the Archaeology Division of the Government of Nunavut Department of Culture Language Elders and Youth. • The discovery will be documented.	• No cumulative adverse effects identified.	Sensitivity of the Area: medium to high Direction: negative Scope: local Duration: short-term Frequency: once Magnitude: unknown Probability: low Significance: insignificant
•	• Discovery and documentation of new heritage resource sites or cultural features as a result of site disturbance or excavation during remediation activities	• No artifacts or other associated objects will be removed from the site unless their integrity is threatened in any way. • The site's visible boundaries will be marked and the area avoided. • A report of the discovery of the site will be made to the Archaeology Division of the Government of Nunavut Department of Culture Language Elders and Youth. • The discovery will be documented.	• No cumulative adverse effects identified.	Sensitivity of the Area: medium to high Direction: positive Scope: local Duration: short-term Frequency: unknown Magnitude: unknown Probability: low Significance: insignificant / beneficial
Upset Conditions				
None				

Summary of Cultural Features/Heritage Resource and Aesthetic Value Related Issues:

It is possible that the proposed remediation work will affect the known heritage resources at PIN-B Clifton Point. The known heritage resource site (NhPt2), tent rings, is located less than from an area of contaminated soil. . A "prehistoric house foundation", Inukshuk, and beached boat were also noted during the Archaeological Impact Assessment (Golder Associates Ltd., 2008). These are deemed cultural features and are also located within proximity of the proposed project area.

Remediation activities at the Site have the potential to disturb unrecorded heritage resources and potentially expose new sites. Effects on heritage resource sites are generally classified as negative, permanent and irreversible. However, implementing the proposed mitigations measures for the three identified heritage resource sites will effectively protect the sites from damage or

destruction, with the exception of the recommended removal of the cabin structures present at NhPt 1. The potential disturbance of unknown cultural features or heritage resource sites can also be positive in that it provides an opportunity to record and investigate new sites that can add to the knowledge of the region's history.

In the event that any heritage resources including fossils, artifacts, and archeological remains are encountered during Site remediation activities the following rules will apply:

1. no artifacts or other associated objects will be removed from the Site unless their integrity is threatened in any way.
2. the site's visible boundaries will be marked and the area avoided.
3. a report of the discovery of the Site will be made to the Archaeology Division of the Government of Nunavut Department of Culture Language Elders and Youth.
4. the discovery will be documented.

The erection of barricades surrounding NhPt 2 and NhPt 3 will protect these sites from possible impact resulting from remediation activities at PIN-B Clifton Point.

4.3.9 Socio-Economics

Table 23: Assessment of Impacts and Effects on Socio-Economics

Project Component/Activity	Potential Impact	Mitigation	Cumulative Effects	Residual Impact
Mobilization/Demobilization				
All Activities	• Training and employment opportunities • Procurement opportunities for camp and equipment supply	• Communication of potential employment and procurement opportunities • Funding for training • Minimum Inuit employment content provisions • Minimum Inuit contracting content provisions • Incentive/penalty clause to ensure Aboriginal commitments are met by contractor(s)	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: positive Scope: territorial Duration: short-term Frequency: once Magnitude: unknown Probability: high Significance: beneficial, not evaluated
Remediation				
All Activities	• Training and employment opportunities • Procurement opportunities for camp and equipment supply	• Communication of potential employment and procurement opportunities • Funding for training • Minimum Inuit employment content provisions • Minimum Inuit contracting content provisions • Incentive/penalty clause to ensure Aboriginal commitments are met by contractor(s)	• No cumulative adverse effects identified	Sensitivity of the Area: high Direction: positive Scope: territorial Duration: short-term Frequency: once Magnitude: unknown Probability: high Significance: could be significant, beneficial, not evaluated
Upset Conditions				
None				

Summary of Socio-economic Related Issues:

The *Nunavut Land Claims Agreement* and the DND-NTI Economic Agreement and Cooperation Agreements serve as guides for the mitigation of socio-economic effects resultant from the proposed remediation activities for the PIN-B Clifton Point. Funding will be made available for training initiatives during the remediation project. Minimum Inuit employment content (MIEC) and minimum Inuit contracting content (MICC) will be employed to ensure maximum benefit to Inuit and Inuit firms. Project procurement proposals will

be evaluated based on criteria such as socio-economic benefit, technical content and cost. An incentive/penalty clause will be used to ensure that Aboriginal commitments are met by the contractor and bonuses will be awarded to contractors that exceed the guaranteed Aboriginal employment commitment.

The proposed remediation activities will result in positive socio-economic benefits to the communities of Kugluktuk, Nunavut and Paulatuk, Northwest Territories. Individuals and businesses will be able to benefit through training, employment and procurement opportunities and related economic benefits.

Remediation activities at the PIN-B site will provide economic development opportunities through training, employment and procurement. Employment opportunities provide positive economic benefit through skills acquisition and work experience. Some of the possible employment opportunities will include:

- Equipment operators;
- Mechanics;
- Surveyors;
- Trades;
- Labourers;
- Cooks/Housekeepers;
- Wildlife Monitors;
- Interpreters;
- Health and Safety Officer; and
- Sampling Scientist.

Potential business opportunities that may arise from the project will exist primarily in the areas of camp and equipment supply. There are a range of Inuit-owned businesses located in Kugluktuk that provide goods and services in the areas of: accommodation and food services; expediting, contracting and equipment supply; and transportation and shipping (Wolfden Resources, 2006).

5.0 MALFUNCTIONS AND ACCIDENTS

Malfunctions and accidents are of concern for the remediation project as they may result in adverse effects. Malfunctions and accidents for this project are related to the following:

- worker health and safety;
- wildlife;
- weather; and
- accidental spills of contaminants to the environment.

5.1 MITIGATIVE MEASURES

5.1.1 Worker Health and Safety

A Health and Safely Plan (HASP) will be prepared by the contractor for the project. Under government contracting policies and guidelines, contractors must abide by health and safety regulations and ensure the safety of their employees through adequate training and awareness programs, and by providing appropriate safety equipment and safe working conditions. The HASP will include bear safety training, archaeological awareness training, and training on working in potentially adverse weather conditions. Consideration will also be given for ensuring that site personnel have appropriate provisions and fuel supplies in the event of prolonged blizzard conditions. Proper handling procedures will be implemented and hazardous materials are to be containerized for shipment off-site. Implementation and adherence to an appropriate HASP should result in no residual effects to worker health and safety.

5.1.2 Wildlife

Refer to Section 4.3.3.

5.1.3 Weather

As part of the Project design a number of features will be considered to minimize the potential for adverse effects of weather on the Project. These measures include:

5.1.3.1 Extreme Weather Conditions

- Dimensioning stormwater management systems for low frequency storm events (1 in 100 year, 24 hour), and rain events. This measure will consider information provided by Environment Canada http://climate.weatheroffice.ec.gc.ca/prods_servs/index_e.html) as well as the latest research on the potential for the increased frequency of such events.
- Consideration of additional storm water volumes.
- Implementation of an ESCP during all project phases.
- Proper scheduling of Project activities, i.e., ensuring surface water management infrastructure is in place before the start of large excavation and earth works.

- Development and implementation of an Operations Plan that defines weather conditions during which land–based project activities (e.g., crane operation for loading and unloading) will be restricted or no longer permitted.

5.1.3.2 Extreme Marine Conditions

- Monitoring of site-specific (i.e. beach loading/unloading area) oceanographic conditions to generate site-specific design parameters that may be required.
- Detailed design of marine activities on the basis of existing marine data and modeling of potential (extreme) oceanographic conditions (wave height, currents, water levels, ice pressure).
- Development and implementation of Operations Plan that defines weather conditions at which marine project activities will no longer be permitted and vessels will be required to vacate.
- Monitoring of weather and marine conditions.
- Routine communication between approaching vessels and land personnel including briefing on-site-specific weather / marine conditions.

5.1.4 Accidental Spills

Spills are generally short term events that may result during re-fuelling of equipment or due to vehicle accidents (equipment spills). Soil, vegetation, the aquatic environment, and wildlife habitat have the potential to be impacted at the spill site. Liquids may coat the leaves of herbaceous plants and mosses, preventing photosynthesis and temporarily resulting in reduced plant health or mortality, and/or may directly burn or have immediate toxic effects on plants. Contaminants may also adversely affect soil quality, reducing the potential for plant growth. Changes in vegetation characteristics in turn may reduce the affected area's value as wildlife habitat. However, in terrestrial areas, spills are likely to be very localized in extent and associated with remediation areas.

Spills may occur near waterways or along slopes, and enter the aquatic environment affecting water quality, aquatic vegetation, invertebrates and other wildlife at the immediate Site and to downstream areas. Impacts to the aquatic environment would largely depend on the type and volume of contaminants involved, flow conditions of the watercourse.

Spill containment and remediation will occur in accordance with a Spill Contingency Plan (the Plan) prepared by the contractor for the project. The Plan will include all measures designed to mitigate accidental releases of contaminants during remediation activities. Overall, the potential effects of spills are likely negligible in the long term due to the low probability of occurrence, the small area involved, containment of most spills following implementation of the Plan, the temporary nature of impact, and the high potential for remediation.

5.2 CONCLUSION

Following implementation of the mitigation measures discussed above, there are no anticipated residual effects.

5.3 GENERAL EMERGENCY RESPONSE PLAN (ERP)

An ERP, including a spill contingency plan, has been developed and included in Appendix B. These plans provide a prescribed course of action to be followed in the case of unanticipated events during remediation works, and include:

1. fuel or chemical spills.
2. potentially dangerous wildlife encounters.
3. discovery of heritage resources.

The plans will enable persons in a particular contingency situation to maximize the effectiveness of the environmental response and meet all regulatory requirements for reporting to the appropriate authorities. The plans also describe the locations where hydrocarbons (fuel) and spill response equipment will be stored at the Site.

6.0 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

6.1 EXTREME WEATHER

The implementation of a remediation project in a remote Arctic environment such as at Clifton Point presents unique logistical issues. The seasonal work conditions limit the time allowed for remediation activities.

Extreme weather, such as rainfall events, early or late snowfall events, high winds and fog can impede construction progress through work stoppages and difficult working conditions. These delays may include work stoppage on-site or delays in the transportation of personnel and supplies to and from the island. Ice may delay marine transport to and from the Site. 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.

Although adverse weather conditions are relatively common in this northern environment, it is expected that the selected remediation contractor will be familiar with the site specific conditions and adequately prepared to perform the required measures to ensure the proposed project proceeds, including construction scheduling incorporating allowances for adverse weather. However, due to the relatively short duration of the project there is minimal potential for adverse environmental conditions to affect the proposed remediation activities.

6.2 LANDFORM INSTABILITY

Unstable lands in the Clifton Point study area are generally infrequent and lacking in severity compared to projects which occur on landscapes with steeper terrains. However, the potential for small slides or subsidence to disrupt remediation activities exists in areas of greater relief, such as the slope down to the beach area.

Mitigation of the potential for landslides and subsidence includes route selection to avoid areas of greater landslide risk, and implementation of engineering and design best management practices (BMPs). Instability will be identified during remediation and a geotechnical engineering specialist will be consulted to recommend any monitoring or remedial action.

The occurrence of landslides has the potential to induce additional erosion and/or sediment releases into aquatic environments. Geotechnical input and constraint-based design will be required during detail design to address potential issues with the project as it relates to landform instability, including the protection of regraded dump sites.

7.0 CUMULATIVE IMPACTS

7.1 IDENTIFICATION OF CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative effects, the combined effect of unrelated existing, proposed, and foreseeable future activities, were assessed for the project, as required under CEAA. 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);
- special or temporal crowding; and
- growth induction initiated by the project.

Effects considered in the cumulative effects assessment were based largely on the results of the residual impact assessment for each biophysical resource and socio-economic factors and the potential for spatial and/or temporal overlap with other projects. Residual impacts constituted project-related effects remaining following mitigation (where required, and where feasible) of identified project impacts. Residual impacts that were neutral or negligible were considered not to contribute to cumulative effects, and therefore were not included in the assessment. Potential cumulative effects are assessed only for those environmental components likely to sustain an adverse residual effect as a result of the proposed project.

7.2 SCOPING

7.2.1 The Project

The proposed remediation of the Clifton Point site includes the remaining infrastructure, non-hazardous waste, hazardous waste, and contaminated soils. Additionally, a non-hazardous waste landfill and a landfarm will be constructed, and sealift will be used to transport hazardous waste off-site. A temporary camp will also be established to provide accommodations for work crews.

At the time of report preparation, the proposed physical remediation program was estimated to take approximately eight months over three years, which includes mobilization, remediation, demobilization as well as the disposal of hazardous materials off-site.

7.2.2 Mining and Exploration

Unlike the rest of the Kitikmeot region of Nunavut, the area to the north west of Kugluktuk, up to the border with the Northwest Territories, has seen little mining and exploration activity. According to *Nunavut Overview 2007: Mineral Exploration, Mining and Geoscience* (INAC et al, 2007), the majority of mining and exploration projects occur about 300km to the south east of PIN-B, which is largely a function of geology and terrain.

7.2.3 Abandoned Military Sites

Within the region, there are a number of other abandoned military sites currently being remediated or with remediation schedules that overlap with PIN-B. These sites include PIN-2 (Cape Young), PIN-3 (Lady Franklin Point), PIN-4 (Byron Bay), PIN-C (Bernard Harbour), PIN D (Ross Point) and PIN E (Cape Peel).

7.3 ASSESSMENT

The remediation activities will initially disturb the existing terrain and environmental conditions of the study area. However, given the limited environmental footprint of the sites and the removal and disposal of contaminated soil and hazardous waste, it is expected that the overall impact of the remediation works will be positive. In the long term the remediation project facilitates the return of soil, water and vegetation and wildlife habitat to natural conditions.

Due to the limited time frame of the project it is not expected that it will contribute significantly to the cumulative environmental effects of other land use activities in the local area. However, with a number of remediation projects underway or expected to commence in future years, along with a large number of mineral exploration projects, there may be limited availability of qualified labor.

Remediation of the Clifton Point site will have an overall positive affect on the environment and mitigation strategies will be implemented to avoid and/or reduce potential project-related impacts.

7.4 MITIGATION

The remediation works will be implemented by following the mitigation measures contained within this report and BMPs that, when implemented, will effectively mitigate potential impacts on the environment.

Due to the remoteness of the study area and the sensitivity of the surrounding environment, care will be taken to ensure that the project does not impact or alter the landscape or marine environment outside of the remediation areas.

7.5 RESIDUAL EFFECTS AND SIGNIFICANCE

The remediation of the Clifton Point site is not expected to result in any negative residual or cumulative effects expected with respect to the current and foreseeable activities in the project area. The remediation will have a positive effect on the environment through the demolition of deteriorating buildings, the removal of hazardous materials, the land filling of non-hazardous debris and soils, the contouring of the Site to mitigate erosion, and the long term restoration of the Site to restore habitat to one that is similar to what was present before site construction.

The contribution of the effects of the remediation activities at the Site are therefore assessed as being positive and not significant.

8.0 KNOWLEDGE DEFICIENCIES/MONITORING AND FOLLOW-UP

8.1 KNOWLEDGE DEFICIENCIES

While conducting this EA a number of minor knowledge deficiencies were identified that could have implications for Project implementation and impact predictions. These deficiencies relate to uncertainties over long-term climate change and caribou fidelity to calving and post-calving areas.

8.1.1 Climate change

The International Panel on Climate Change (IPCC) reports that average global temperatures could increase by up to 6^0C by the end of the century (IPCC, 2007). It is also predicted that this change could result in an increased frequency of extreme weather events including increased precipitation. While likely climate change scenarios have been considered in this EA, there remains a great deal of uncertainty regarding climate change predictions and how these changes will impacts arctic regions. However, likely scenarios include changes in the range and depth of permafrost occurrences, issues relating to soil stability and impacts on site erosion and drainage. Monitoring provisions, anticipating some of these climate change related impacts are included in the monitoring section below (Section 8.2).

8.1.2 Caribou Calving/Post Calving Area Fidelity

It is recognized that caribou have a degree of fidelity to calving and post-calving areas. Throughout the 1990's up to 2008 the Bluenose-East Herd has calved about 200 km to the southeast of the PIN-B site. However, anomalies in the location of calving and post-calving are known to have occurred with many caribou herds (NPC, 2004) and considering PIN-B's proximity to the Bluenose-East calving area, it is possible that in any given year large numbers of calving and post-calving caribou could appear in the project area during the spring and summer. It is for this reason that the *INAC Caribou Protection Measures,* developed for the Qamanirjuaq and Beverly Herds in the Kivalliq region of Nunavut, have been integrated into the mitigation measures and wildlife management plan.

8.2 MONITORING AND FOLLOW-UP

Monitoring requirements at the Site will serve two purposes. Firstly, monitoring is required to monitor implementation of the project, to confirm compliance with the remediation objectives and accuracy of impact predictions. The second purpose of monitoring will be to monitor the long term success of the project; measuring environmental conditions against triggers and thresholds that would initiate adaptive management and contingency plans.

The following specific monitoring requirements are recommended:

- Confirmatory soil sampling of contaminated soil remediated areas is recommended to verify that the soil quality objectives outlined in the INAC Protocol have been met.

- Appropriate water quality monitoring of receptors downstream of the landfills and large remedial excavation area(s) to confirm that leachate, residual contaminants or sediment are not negatively affecting surface water quality. The Site is to be monitored a minimum of five years.

- During the first five years after remediation, visual monitoring at all constructed landfills will be conducted at least once a year, preferably in mid-August. This visual inspection will look for any settling, ponding, erosion or frost action that may have occurred. The performance of the landfill covers should also be monitored over time. Climate change, increased precipitation and wind erosion may cause degradation and limit effectiveness. If there are signs of instability such that buried material becomes exposed, then remedial action will be implemented. Finally, the establishment of vegetation and the impacts on the integrity of the cover material should be monitored.

- Annual visual inspection of the land farm to confirm cell and liner integrity. Upon decommissioning of the land farm confirmatory soil sampling is required.

- Monitoring of wells and surface waters downgradient from the land farm are to be monitored annually during its operation and at least once following decommissioning to confirm that leachate is not negatively affecting the receiving environment.

- For waste disposal areas where permafrost encapsulation is being relied on for long term containment, climate and ground temperature monitoring is recommended to confirm the cover thickness is sufficient and that waste is below the active zone.

- After five full years post-remediation monitoring a summary of all of the monitoring data collected will be prepared and a comprehensive assessment of the performance of the remediation work against the objectives, and a recommendation for an on-going monitoring program, be made at that time. If no additional issues are identified during this initial monitoring, the frequency of the program frequency will be reduced, with monitoring occurring in post-remediation years 7, 10, 15 and 25. The monitoring program will be re-evaluated after 25 years.

9.0 CONSULTATION

9.1 PUBLIC CONSULTATION

Consultation activities focused on traditional knowledge (TK) and traditional land uses in the PIN-B Clifton Point area. The TK collection involved four individuals, including two elders. One of the elders had lived at the Inuit camp on the Site between 1955 and 1964 and had some family members who worked at the PIN-B site (UMA Engineering Ltd., 2008).

As part of the preparation of this EA, the Paulatuk Hunters and Trappers Committee and Kugluktuk Hunters and Trapper Organization were also contacted to establish historic and current uses of the Site, and to identify potential issues and VECs.

No community meetings were conducted as a part of the consultation process.

9.2 AGENCY CONSULTATION

Officials from various agencies government departments were contacted in an effort to introduce them to the project and to discuss VEC selection as well as potential concerns and approval requirements. The following agencies and Federal and Territorial Government Departments were contacted:

- Nunavut Impact Review Board;
- Kitikmeot Inuit Association;
- Government of Nunavut, Department of the Executive and Intergovernmental Affairs;
- Government of Nunavut, Department of the Environment;
- Indian and Northern Affairs Canada;
- Department of Fisheries and Oceans;
- Environment Canada;
- Paulatuk Hunters and Trappers Committee; and
- Kugluktuk Hunters and Trappers Organization.

10.0 CONCLUSIONS

This proposed project for the PIN-B Clifton Point DEW Line Site will result in the remediation of a current contaminated site. Project activities will include the removal of contaminated soils and hazardous waste, and demolition and disposal of site infrastructure and non-hazardous waste resulting in restoration of the Site to near pre-disturbance conditions.

The effects of the project activities on the identified VECs have been assessed as not significant or as positive. Positive effects of project activities are outcomes from both environmental and socio-economic perspectives. Overall, the resulting restoration will improve the environment and consequently be a potentially important culture feature of this area. With no significant impacts, the project will not detrimentally alter the capacity of renewable resources to meet the needs of the present and those of the future.

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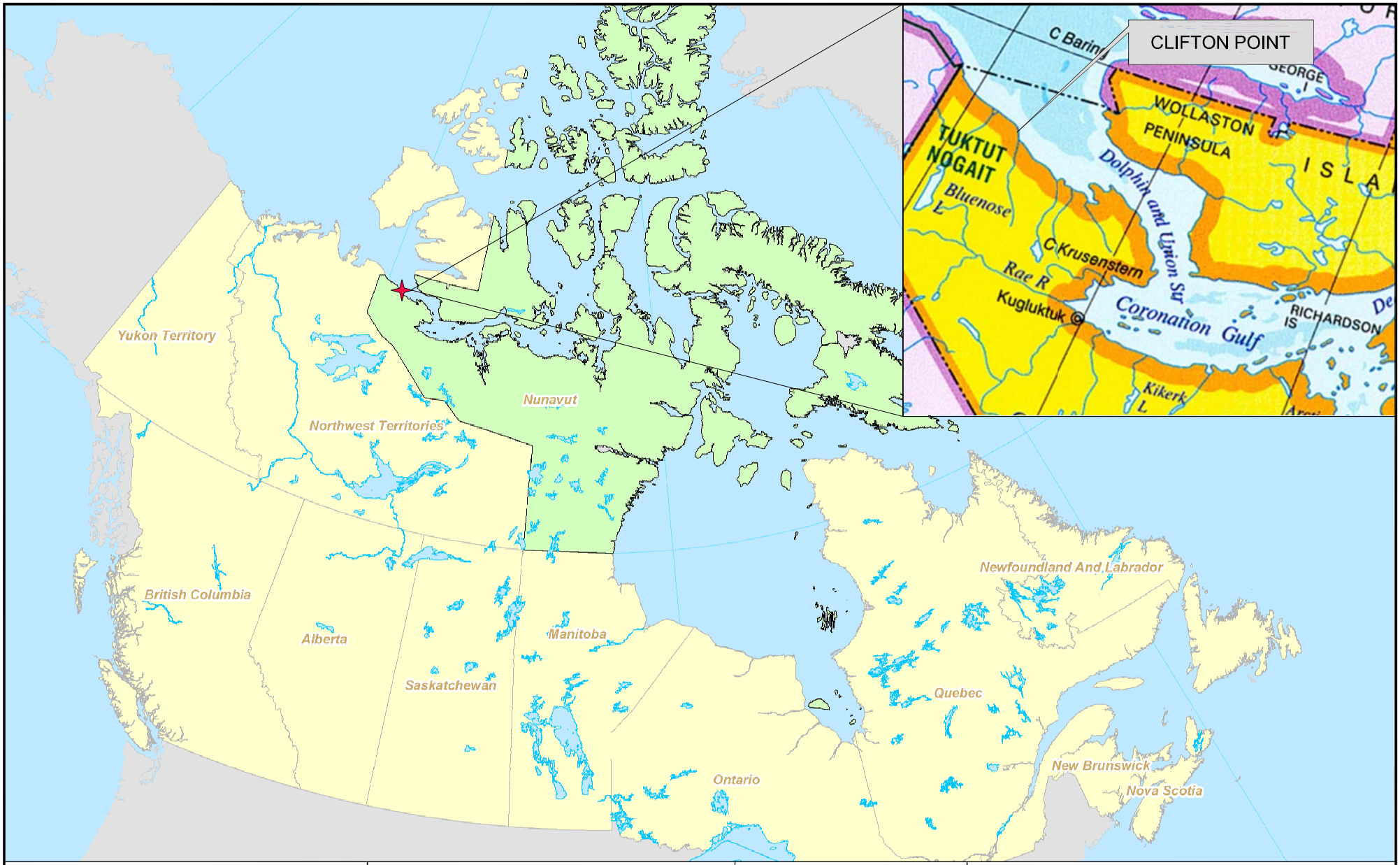
Agency	Contact	Date	Type of Contact	Issues Discussed
Government of Nunavut	G. Hope, Wildlife Technician	June 23, 2008	Telephone	Wildlife baseline data
Indian and Northern Affairs Canada	M. Yetman, Contaminated Sites Project Manager	June 19 & 24, 2008 July 21, 2008	Email	Issues surrounding land claims, regulatory environment
Indian and Northern Affairs Canada	S, Dewar, Manager of Lands	June 24, 2008	Telephone	VEC selection, regulatory environment
Nunavut Impact Review Board	L. Payette	June 25, 2008	Telephone	VEC Selection, EA format/requirements
Government of Nunavut	E. Peacock, Polar Bear Biologist	June 25, 2008	Telephone	Polar bear populations
Government of Nunavut	Julie Ross, Chief Archeologist	August 28, 2008	Telephone	Archeological sites
Department of Fisheries and Oceans	A. Liu, Habitat Biologist	July 2, 2008	Telephone	Permit requirements, VEC selection, baseline data
Environment Canada	S. Levenson, EA Specialist	July 15, 2008	Telephone	VEC and issue identification
Paulatuk Hunters and Trappers Committee	R. Ruben	August 20, 2008	Telephone	Traditional land use, wildlife
Kugluktuk Hunters and Trappers Association	P. Taptuna	August 22, 2008	Telephone	Traditional land use, wildlife, employment

FIGURES



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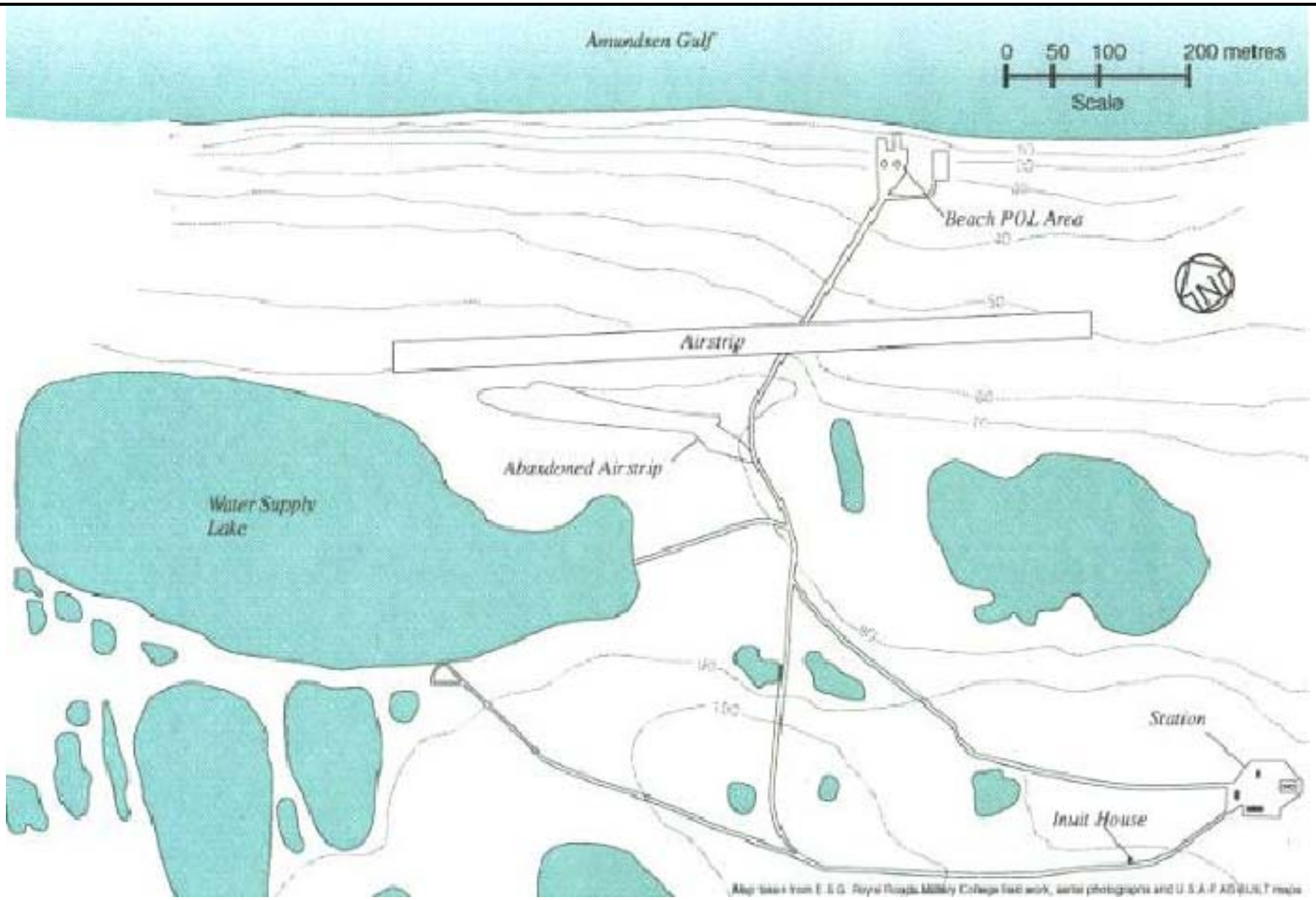
CLIENT

Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

PROJECT: PIN-B Clifton Point DEW Line Remediation	DWN BY: N/A	DATUM: N/A	DATE: August 2008
	CHK'D BY: N/A	REV. NO.: 0	PROJECT NO: N/A
TITLE: Clifton Point Site Location	PROJECTION: N/A	SCALE: N.T.S.	FIGURE No. Figure 1



Source:
Environmental Sciences Group, 1995. *Environmental Study of Abandoned DEW Line Sites One Auxiliary and Eight Intermediate Sites in the Canadian Arctic*

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PROJECT: PIN-B Clifton Point DEW Line Remediation	DWN BY: N/A	DATUM: N/A	DATE: August 2008
	CHK'D BY: N/A	REV. NO.: 0	PROJECT NO: N/A
TITLE: Site Layout	PROJECTION: N/A	SCALE: N.T.S.	FIGURE No. Figure 2

Legend:
- Buried Debris
- Borrow Area

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

PROJECT: PIN-B Clifton Point DEW Line Remediation	DWN BY: N/A	DATUM: N/A	DATE: August 2008
	CHK'D BY: N/A	REV. NO.: 0	PROJECT NO: EE26279
TITLE: Clifton Point Site Layout (Beach Area)	PROJECTION: N/A	SCALE: N.T.S.	FIGURE No. Figure 3A

AMEC Earth & Environmental 5681-70 St. Edmonton, Alberta, Canada, T6B 3P6 (P)780-436-2152 (F) 780-435-8425		CLIENT: Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada	
PROJECT: PIN-B Clifton Point DEW Line Remediation	DWN BY: N/A	DATUM: N/A	DATE: August 2008
	CHK'D BY: N/A	REV. NO.: 0	PROJECT NO: EE26279
TITLE: Clifton Point Site Layout (Station Area)	PROJECTION: N/A	SCALE: N.T.S.	FIGURE No. Figure 3B

APPENDIX A

Wildlife Management Plan

Implementation of a Wildlife Management Plan would ensure wildlife awareness training of the remediation work crew which would decrease the risk of disturbing local wildlife migration behavior.

Example mitigation measures that should be considered for inclusion in such a plan are as follows:

Traffic and Equipment Management

- minimize the amount of disturbed area;
- reduce noise by use of muffled exhaust systems;
- a requirement that all diesel powered equipment meet emission guidelines;
- restrict vehicles to designated roads and prepared work areas (i.e., recreational use of off-road vehicles prohibited);
- establish and enforce speed limits;
- give wildlife the right-of-way;
- implement non-chemical dust suppression methods (i.e., spraying with water) on roads during the snow/ice free period;
- prohibit hunting at the site;
- minimize grading where possible;
- conduct pre-project surveys to identify wildlife sensitive locations (i.e. birds nests) and develop plans to ensure avoidance;
- promote natural vegetation regeneration following remedial activities; and
- incorporate wildlife awareness and sensitivity training for on-site personnel.

Aircraft

Unless there is a specific requirement for low level flights, aircraft activities should maintain a minimum altitude of 610 meters above ground level in places where there are occurrences of wildlife. In areas where there are observed large concentrations of birds, flight level is restricted to 1,000 meters vertical distance and 1,500 meters horizontal distance from the birds. As a good practice, it is recommended to avoid critical and sensitive wildlife areas at all times by choosing alternate flight corridors.

In addition, to minimize flight disturbances, the following are recommended:

- Minimize the number of flights;
- Fly at a time when there are few migratory birds around (i.e., early spring, late fall and winter);
- Caribou calving grounds should be avoided between mid May and mid July. After July 15, post calving areas known to have large aggregations of caribou should also be avoided;
- Avoid areas where there are large concentrations of wildlife, (i.e., Migratory Bird Sanctuaries, breeding colonies and caribou calving grounds), and take alternate routes;
- Plan routes that are likely to have least occurrences of wildlife;
- Use small aircraft rather than large aircraft whenever possible;

- Hovering or circling may greatly increase disturbances and must be avoided;
- Use fixed-wing aircraft rather than helicopters whenever possible; and
- Inform pilots of the wildlife sensitive areas.

Waste Management

- educate and reinforce proper waste management practices to all workers and visitors to the site;
- implement appropriate waste management protocols, which may include burning all food wastes in an oil-fired incinerator and/or weatherproof and wildlife-resistant containers;
- eliminate attractants (e.g. food waste, oil products) at the landfill site;
- separate food waste and non-food waste at source;
- consider appropriate fencing around the landfill area;
- burn waste oil in waste-oil furnaces or take off-site for recycling;
- designate appropriate areas for worker lunch and coffee breaks;
- educate people on the risk associated with feeding wildlife and careless disposal of food garbage; and
- initiate an ongoing review of the efficacy of the waste management program and adaptive improvement.

Caribou

The following are taken from the Draft West Kitikmeot Land Use Plan (NPC, 2004):

- Between May 15 and July 15, works and Activities may not take place and, if operations have commenced, all operations must be suspended immediately if calving or post calving caribou are present in or near the area of work or activity.
- During migration of caribou:
  1. migration must not be blocked or substantially diverted.
  2. activities that may interfere with migration, such as airborne geophysics surveys or movement of equipment, must cease until the migrating caribou have passed.
- Between May 15 and September 1, camps may not be constructed, fuel may not be cached, and blasting may not be conducted within 10 kilometers of any “Designated Crossing” as shown on the “Caribou Designated Crossing Map”, as updated from time to time.

APPEDNIX B

General Emergency Response and Contingency Plan

PIN-B (Clifton Point)
Intermediate DEW Line Site
Remediation Project

Submitted by: Department of Indian Affairs and Northern Development
Northern Affairs Program
Nunavut Regional Office

Prepared by: Public Works and Government Services Canada
Real Property Services
Architectural & Engineering Services
Environmental Services
Western Region

August, 2008

1 GENERAL

1.1 The following contingency plans present the prescribed course of action to be followed in the case of unanticipated events during the site remediation such as fuel or chemical spills, potentially dangerous wildlife encounters, and the discovery of heritage resources. The plans will enable persons in a particular contingency situation to maximize the effectiveness of the environmental response and meet all regulatory requirements for reporting to the appropriate authorities. The plans also describe the locations where hydrocarbons (fuel) and spill response equipment will be stored at the site.

1.2 In addition, measures will be implemented, within the Contractor's Site Specific Contingency Plans, to prevent spill events. This includes, but is not limited to, the use of preventative measures such as secondary containment for all fuel storage areas and the use of designated fuelling areas to minimize impact to the surrounding region.

1.3 Spill contingency plans for the site will be included in the Contractor's Site Specific Contingency Plans and will be posted on-site during the remediation. The following information will be included:

1. a description of pre-emergency planning;
2. personnel roles, lines of authority and communication;
3. emergency alerting and response procedures;
4. evacuation routes and procedures, safe distances and places of refuge;
5. emergency alerting and response procedures;
6. directions/methods of getting to the nearest medical facility;
7. emergency decontamination procedure;
8. emergency medical treatment and first aid;
9. emergency equipment and materials;
10. emergency protective equipment;
11. procedures for reporting incidents; and
12. spill response and containment plans for all materials that could potentially be spilled.

2 FUEL AND HAZARDOUS MATERIAL SPILLS

2.1 The objective of the fuel-related contingency plan is to protect the environment and human health by minimizing the impacts of spill events through clear and concise instructions to all personnel.

2.2 A variety of fuels (diesel, gasoline and lubricating oils) may be used during remediation activities on-site. As fuels are usually stored and transferred in barrels of 205 litres or smaller capacity, any quantity spilled would likely be small.

2.3 Transportation of fuels must comply with the *Transportation of Dangerous Goods Act and Regulations.*

2.4 The most common pollution incidents would probably involve spills of diesel or gasoline onto land resulting from: human error during transfer, rupture of barrels from deterioration or damage, seepage from fittings or valves, or equipment failure. Daily checking of equipment and preventative maintenance would also identify damage to the fuel system and reduce the risk of spills or leaks.

2.5 In the event of a spill, protection of human health and safety is paramount. The potential for employees to come in contact with contamination is a real possibility as is contamination of the surrounding workplace and environment.

The individual responding to a spill shall:

1. Ensure personnel are appropriately trained.
   a. All employees working on the PIN-B Site Remediation project, including contractors and sub-contractors, will be trained in the safe operation of all machinery and tools, as well as in the handling of materials to help prevent and respond to hazardous material spills in a timely and effective manner. In addition employees will be trained in the proper fuelling, oiling and greasing protocols to minimize the chance of a spill occurrence. All employees on site will also be trained for initial spill response in the event of a spill.
2. Make use of materials and equipment available for adequate response to fuel spills, such as excavators for creating earthen dykes and hydrocarbon absorbent booms.
3. Warn people in the immediate vicinity and evacuate the area if necessary.
4. Wear protective clothing as required for handling spills.
5. Isolate and eliminate all ignition sources.
6. Identify the spilled material if possible, and take all safety precautions before approaching it.
7. Attempt to immediately stop the leakage and contain the spill, if safe to do so, by implementing the Spill Response Actions summarized on the following page.
8. Report to the Field Team Leader the spill location, type of material, volume and extent, status of spill (direction of movement), and prevailing meteorological conditions.
9. Follow all applicable federal/territorial regulations and guidelines or the disposal of spill materials.
10. Document all events and actions taken. Include information required by applicable regulations and guidelines.
11. Notify appropriate government agencies using the contact list. Report spills immediately on the 24-Hour Spill Report Line (867) 920-8130.

Petroleum Hydrocarbon
- SPILL RESPONSE ACTIONS –

ON LAND
- Do not flush into ditches or drainage systems.
- Block entry into waterways and contain with earth, snow or other barrier.
- Remove small spills with sorbent pads.
- On tundra use peat moss and leave in place to degrade, if practical.

ON SNOW & ICE
- Block entry into waterways and contain with snow or other barrier.
- Remove minor spills with sorbent pads and/or snow.
- Use ice augers and pump to recover diesel under ice.
- Slots in ice can be cut over slow moving water to contain oil.
- Burn accumulated diesel from the surface using Tiger Torches if feasible and safe to do so.

ON MUSKEG
- Do not deploy personnel and equipment on marsh or vegetation.
- Remove pooled diesel with pumps and skimmers.
- Flush with low pressure water to herd diesel to collection point.
- Burn only in localized areas, e.g., trenches, piles or windrows.
- Do not burn if root systems can be damaged (low water table).
- Minimize damage caused by equipment and excavation.

ON WATER
- Contain spill as close to release point as possible.
- Use spill containment boom to concentrate slicks for recovery.
- On small spills, use sorbent pads to pick up contained oil.
- On larger spills, use skimmer on contained slicks.
- Do not deploy personnel and equipment onto mudflats or into wetlands

RIVERS & STREAMS
- Prevent entry into water, if possible, by building berm or trench.
- Intercept moving slicks in quiet areas using (sorbent) booms.
- Do not use sorbent booms/pads in fast currents and turbulent water.

3 WILDLIFE ENCOUNTER

3.1 Preventative measures will be implemented to minimize probability of encounters. This includes, but is not limited to, keeping the site clean through the incineration, encapsulation or removal of wastes from site as soon as possible following generation.

3.2 Bears are a potential hazard to workers at all times and the situation can be exacerbated by the presence of any substance that a bear perceives to be food.

3.3 Employ dedicated wildlife monitors at all times during Remediation operations.

3.4 Be familiar with bear deterrent procedures. Be familiar with the GNWT "Safety in Bear Country" manual and make available a reference copy at the site.

3.5 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, which can be overcome by proper disposal of food wastes. Concentrations of scavenging animals, such as wolves, foxes and bears, increase the risk of diseases, particularly rabies, and danger to personnel. The following precautions and actions are to be taken at each site:

1. The killing of wildlife for any reason at variance with the Wildlife Act and regulations is an offence. Co-ordinate procedures for handling wildlife problems and incidents with the regional Nunavut wildlife office.
2. Use vehicle, noisemakers and, if necessary, a firearm to frighten the bear away from the site.
3. Shoot the bear only if the bear returns repeatedly, refuses to leave or directly threatens human safety. Killing is considered a last resort and, if at all possible, the appropriate wildlife officer should be contacted to alert them of the problem. If a bear is to be shot, assign the task only to a person familiar with and competent with the camp firearm. Wounded or otherwise aggravated bears can be extremely dangerous.
4. Report the death of a bear to the Field Team Leader and the appropriate wildlife officer who will issue instructions as to the disposal of the carcass and the formal reporting procedures to be followed.
5. Due to the possibility of rabies, shoot any animal that bites a human and retain the carcass intact pending instructions 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 of animal inflicted wounds.

4 HERITAGE RESOURCES

4.1 All site personnel are prohibited from knowingly disturbing any archaeological or other heritage site or collecting any artefacts. Removing artefacts is a criminal offence.

4.2 In the event of finding heritage resources:

1. Do NOT remove any artefacts or other associated objects from the site unless their integrity is threatened in any way.
2. Mark the site's visible boundaries and avoid the area.
3. Report the discovery of the site to the appropriate regulatory agency.
4. Document the discovery.

4.3 In the event of a discovery of human remains:

1. Advise the 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.
2. Halt all activities around the area of 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.
3. Secure the area and designate it as out of bounds to all personnel.
4. Depending on weather conditions, the human remains should be provided with non-intrusive protection such as a cloth or canvas tarp (non-plastic preferred).
5. Document the discovery.

5 KEY CONTACT LIST

5.1 24-Hour Spill Report Line

1. In the event of a spill, contact the 24-Hour Spill Report Line and provide them with all the relevant details.
   Telephone: (867) 920-8130
   Fax: (867) 873-6924
2. Environment Canada, as lead agency, shall then be contacted by officials to ensure the appropriate response. The lines are staffed 24 hours a day and can also be used to co-ordinate a response in the event of a non-spill emergency outside of normal working hours.

5.2 Other Contacts

1. In the event of a non-spill emergency (e.g. related to wildlife, fisheries, heritage resource, etc.), contacts are provided in Table 1.

Table 1: Contact List

Internal Resource	Contact	Phone Number
Indian and Northern Affairs Canada	Lou Spagnuolo Contaminated Sites Project Manager Gatineau, Quebec	(819) 934-9224 (819) 934-9229
Public Works & Government Services Canada	Brad Thompson Senior Environmental Engineer Edmonton, Alberta	(780) 497-3862 (780) 497-3842

External Resource	Contact	Phone Number
24 Hour Spill Line	NWT/Nunavut Spills Report	(867) 920-8130 (867) 873-6924
Iqaluit Fire Department	Tim Hinds Fire Marshal Iqaluit, Nunavut	(867) 975-5310 (867) 979-4221
Environment Canada	Curtis Didham Enforcement Officer Iqaluit, Nunavut	(867) 975-4644 (867) 975-4594
Indian and Northern Affairs Canada	Carl McLean Director, Operations Iqaluit, Nunavut	(867) 975-4546 (867) 975-4560
Government of Nunavut	Rob Eno Manager, Pollution Prevention Iqaluit, Nunavut	(867) 975-7748 (867) 975-5990