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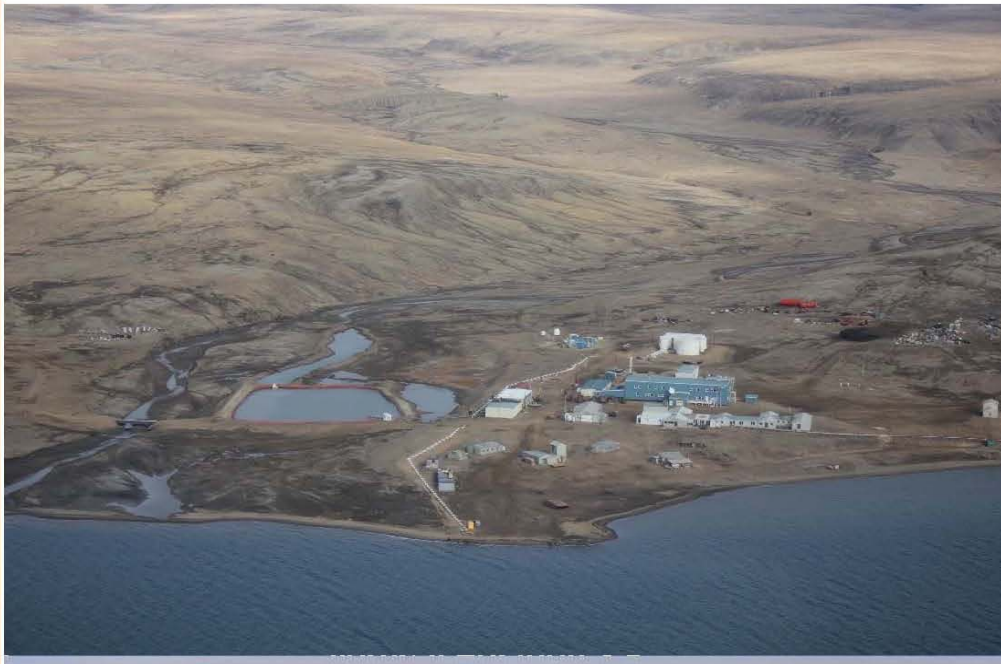
Final Report

Public Works Government Services Canada and Environment Canada

Environmental Impact Assessment

High Arctic Weather Station Project Improvements

January 2016



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Subject:
Final EIA for High Arctic Weather Station Project Improvements

Date:
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Dear Ms. Barz:

Please see attached a copy of the Final report referenced above. This version of the report addresses all combined Public Works and Government Services Canada (PWGSC) and Environment Canada (EC) comments as contained in versions 1 and 2 of the comment tables you provided.

We trust that this report satisfies your requirements. Please do not hesitate to contact the undersigned should you have any questions or require clarifications.

Yours truly,

Arcadis Canada Inc.

Frederick Bernard

Frederick Bernard, M.A., B.A., (Hon.)
Senior Environmental Specialist

ARCADIS Design & Consultancy for natural and built assets

Public Works
Government Services
Canada and Environment
Canada

ENVIRONMENTAL IMPACT ASSESSMENT

High Arctic Weather Station Project Improvements

January 2016

ENVIRONMENTAL IMPACT ASSESSMENT

High Arctic Weather Station Project Improvements

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ABBREVIATIONS AND ACRONYMS

AANDC	Aboriginal Affairs and Northern Development Canada
AEC	Area of Environmental Concern
AO	Aesthetic Objective
APEC	Area of Potential Environmental Concern
ASTRO	Arctic Stratospheric Observatory
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Total Xylenes
CCME	Canadian Council of Ministers on the Environment
CDWQG	Canadian Drinking Water Quality Guidelines
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act
COC	Contaminant of Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canada-Wide Standard
DND	Department of National Defence
DQRA	Detailed Quantitative Risk Assessment
EC	Environment Canada
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
ESA	Environmental Site Assessment
EQG	Environmental Quality Guidelines
FRANZ	Franz Environmental Inc.
ha	Hectares
HAWS	High Arctic Weather Station
MSC	Meteorological Service of Canada
NCLA	Nunavut Land Claims Agreement

NIRB	Nunavut Impact Review Board
NRCan	Natural Resources Canada
NTU	Nephelometric Turbidity Unit (NTU)
NU	Nunavut
NWB	Nunavut Water Board
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCSP	Polar Continental Shelf Project
PHC	Petroleum Hydrocarbon
PWGSC	Public Works and Government Services Canada
QA/QC	Quality Assurance and Quality Control
QIA	Qikiqtani Inuit Association
SARA	Species at Risk Act
SENES	SENES Consultants Ltd.
SBR	Sequencing Batch Reactor
TDS	Total Dissolved Solids

EXECUTIVE SUMMARY

Environment Canada (EC) proposes to undertake the following four (4) Improvement Projects at the Eureka High Arctic Weather Station (HAWS) in Eureka, Nunavut (NU):

- Eureka Runway Recap
- Construction of New Multipurpose Building
- Reservoir Upgrades
- Sewage and Wastewater System Upgrades

The project components will generally include the following activities:

- extraction and crushing of aggregate;
- earthworks (excavating, grading);
- material handling (loading and dumping);
- vehicle travel; and
- refueling of vehicles.

Arcadis Canada Inc. (Arcadis) was retained by Public Works and Government Services Canada (PWGSC) on behalf of Environment Canada (EC) to prepare a due diligence Environmental Impact Assessment (EIA) for the four proposed Improvement Projects. This EIA is to be completed in accordance with the *Canadian Environmental Assessment Act* (CEAA, 2012 or CEAA), although it is recognized that CEAA does not apply in Nunavut; however, completing this EIA as a due diligence in accordance with CEAA ensures that all components of the projects are considered and assessed. To this end, all of the basic elements of an EIA are addressed in this report. The key elements of the report include: Project description, description of the background and baseline environment, potential effects to the environment, residual effects, and mitigation measures.

The EIA considers key environmental components including:

- Atmospheric – air quality and noise
- Geological – hydrology, and soil quality
- Aquatic – including sediments
- Terrestrial – vegetation communities and species rare and sensitive species
- Physical and cultural resources
- Socio-economic

The evaluation is focused on the construction and operations activities of the Improvement Projects. All of these activities are of limited scope and duration and will cause temporary effects, with no residual effects and therefore no cumulative effects. Operations effects will be similar to current operations at the HAWS site, as they do not greatly deviate from the site activities and daily operations which are currently ongoing (including site maintenance and facility use).

As an active and operating site, the HAWS is subject to and compliant with a number of Federal and Territorial regulations. Adherence to regulations, implementation of existing mitigation obligations, in addition to those proposed within this report, will ensure the Improvement Projects do not cause significant adverse effects on the environment.

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by Public Works and Government Services Canada (PWGSC) on behalf of Environment Canada (EC) to prepare a due diligence Environmental Impact Assessment (EIA) for four proposed Improvement Projects at the Eureka High Arctic Weather Station (HAWS) in Eureka, Nunavut (NU).

The project was completed under the "as and when" standing offer agreement EW699-141143/001/NCS with PWGSC project number R.015446.003. This report is the EIA of four Improvement Projects at the Eureka HAWS.

1.1 Project Background and Rationale

The Project site is located on land owned by EC (land reserve #1021) and the Meteorological Service of Canada (MSC) and has been operating since 1947. Regular improvements and upgrades have been made to the buildings and infrastructure since that time as required and in response to changing needs, and EC is currently undertaking several Improvement Projects at the HAWS and nearby Eureka runway. Four specific Improvement Projects have been identified, namely:

- Project 1 – Eureka Runway Recap
- Project 2 – Construction of New Multi-Purpose Building
- Project 3 – Reservoir Upgrades
- Project 4 – Sewer and Wastewater System Upgrades

The Improvement Projects are not subject to the *Canadian Environmental Assessment Act* (2012) (*CEAA*); however, EC identified the need to conduct an EIA as due diligence in order to identify and mitigate potential environmental impacts on the site and surrounding environment associated with Improvement Project activities. There are areas of known petroleum hydrocarbon (PHC) impacts in soil and/or sediment at the HAWS and nearby Eureka runway as a result of historical spills. Consequently, some of the Improvement Projects may involve reclamation, remediation or management of these areas.

All of the proposed Improvement Projects subject to this EIA have been identified through facility reviews as infrastructure that has reached their end of life service[1]. Studies to review and identify appropriate design solutions were undertaken for the proposed Improvement Projects that are described in Section 2. The proposed Improvement Projects are planned to meet existing regulatory conditions and anticipated capacity demands over the next 30 years.

[1] P.Ducharme (personal communication August 22, 2015).

1.2 Location and Study Areas

The Eureka HAWS is located on the north side of Slidre Fjord, at the northwestern tip of Fosheim Peninsula, Ellesmere Island, NU (see Figure 1.1). EC's parcel of land extends from Station Creek at the western boundary, east to Black Top Creek. The HAWS is located within this boundary directly east of Station Creek. The coordinates at the HAWS are 79°59'41"N and 85°56'W. The total area of the site is approximately 2.23 hectares. There are presently 15 primary buildings and other facilities at the HAWS, as shown in Figure 1.2. Buildings and infrastructure include (SENES and Franz, 2013):

- Main complex and warehouse;
- Former main complex;
- New garage;
- Powerhouse and water storage;
- Hydrogen shed;
- Department of National Defense (DND) warehouse;
- Old transient barracks;
- Building #17 (Plumbing shack) (storage) with former water tanks;
- Former bunkhouse;
- Carpentry/plumbing shop;
- Greenhouse;
- Storage shed;
- Original Quonset / storage shed;
- Sea canisters;
- Red Quonset;
- Active and closed landfills;
- Two contaminated soil treatment facilities;
- Roads;
- Drinking water reservoir;
- Sewage lagoon; and
- Tank farm and fuel pipeline.

In addition to the above, outdoor storage of old equipment, referred to as the "dead line", is located north of the tank farm and operations complex. A photographic inventory of buildings and associated infrastructure is provided in Appendix A.

The HAWS is located in an extreme climate with long, very cold winters and short, cool summers. Most of the activities and research work is carried out during the summer months of July and August.

The topography of the area is rolling and ridged. Soils are primarily sand/gravel fill underlain by silty, sandy clays. Permafrost is present with an active layer ranging between 0.6 and 1.2 m in thickness.[2]

The Eureka runway is located 1.5 km northeast of the HAWS main site and is the primary way by which the HAWS is accessed year-round. The coordinates at the centre of the runway are 79°59'40"N and 85°48'42"W. The DND maintains Fort Eureka, located south of the Eureka runway. The Fort is occupied for approximately three weeks a year during the summer (typically in July).[3]

Numerous investigations have been carried out at the HAWS over the years, which have identified several Areas of Environmental Concern (AECs) and Areas of Potential Environmental Concern (APECs) at both the main HAWS site and the nearby Eureka runway, as shown in Figures 1.2 and 1.3. Of particular interest for this EIA (in terms of which A(P)ECs and Project Improvements may have the potential to impart effects on one another, as discussed in this report) are the following:

- AEC A-9: Former First Air Lease (at the Eureka runway; see Figure 1.3)
    - Contaminants of concern include nickel, BTEX (Benzene, Toluene, Ethylbenzene, Total Xylenes) and PHCs (Petroleum Hydrocarbons);
- AEC B-2: In-Situ Landfarm
    - Contaminants of concern include BTEX, PHCs and PAHs (Polycyclic Aromatic Hydrocarbons);
- AEC D: Powerhouse

Contaminants of concern include BTEX, PHCs, naphthalene, 1-methyl naphthalene, 2-methyl naphthalene, phenanthrene, arsenic, selenium, and zinc.

[2] Jacques Whitford, 2005.

[3] J. MacIver (personal communications August 2015).

Figure 1.1. Site Location – Eureka High Arctic Weather Station

Figure 1.2. AECs and APECs at the Eureka HAWS Site

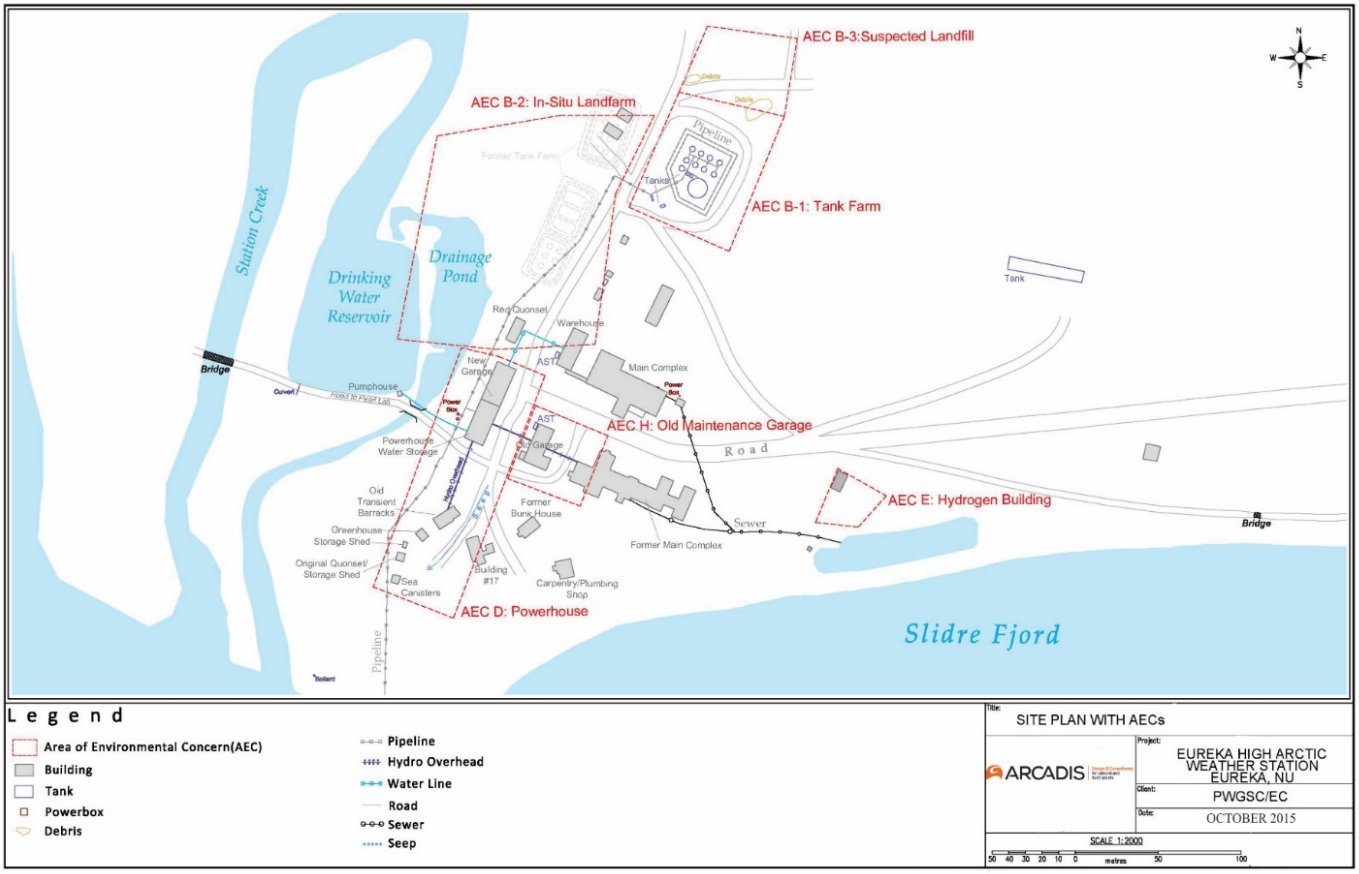
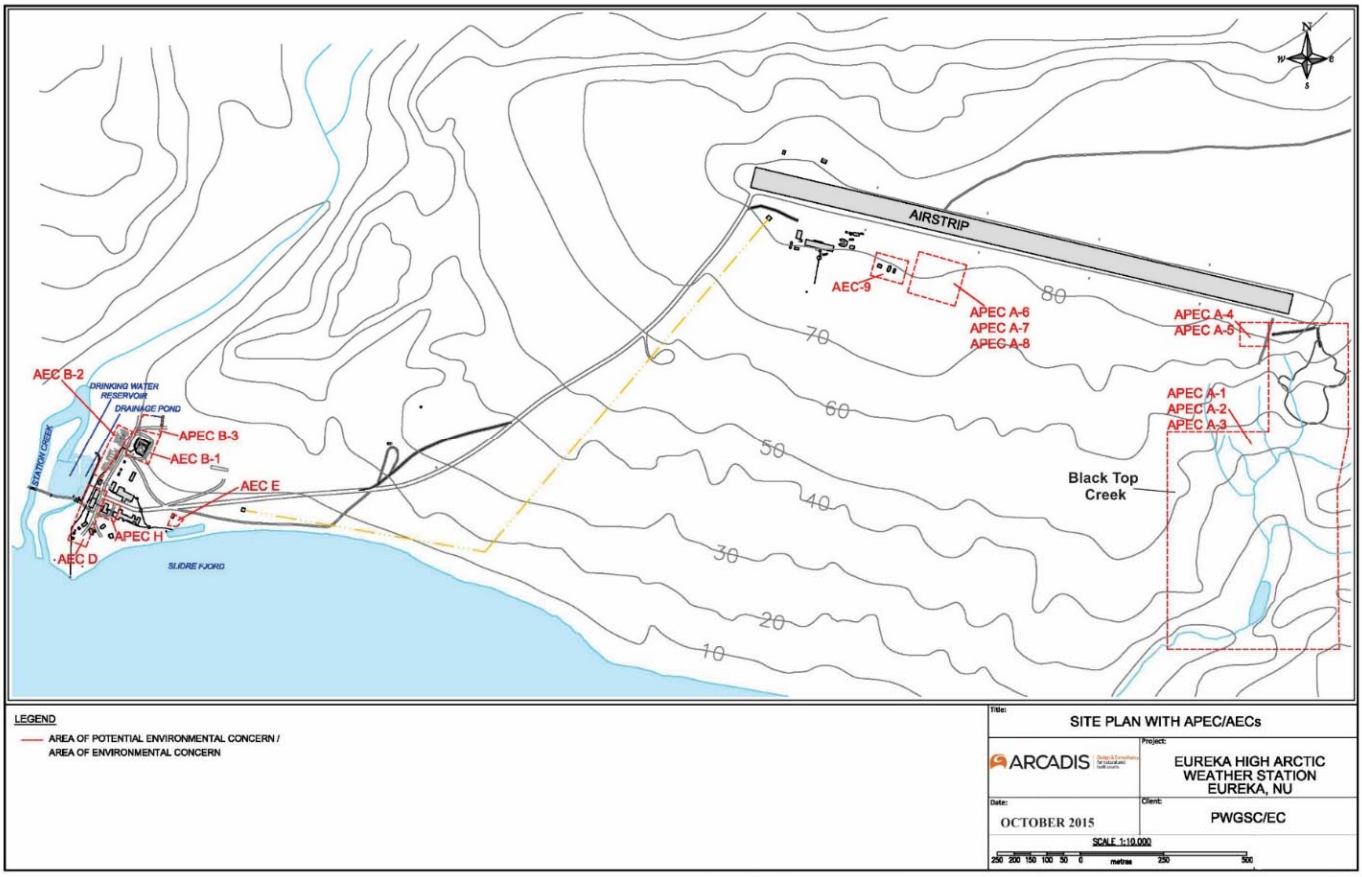


Figure 1.3. AECs and APECs at the Eureka HAWS and Runway Locations



1.3 Legal Framework & Regulatory Requirements

The Improvement Projects are subject to the environmental review and screening process established by the Nunavut Land Claims Agreement (NLCA). The agreement was signed between the Government of Canada and Nunavut Tunngavik Incorporated in 1993 and is the primary legislation directing the regulatory process in Nunavut. Reviews under Article 12 of the NLCA are conducted by the Nunavut Impact Review Board (NIRB) with numerous federal and territorial departments and Inuit Organizations participating and providing technical expertise.

In Nunavut, Crown Land is administered by Aboriginal Affairs and Northern Development Canada (AANDC), whereas Inuit-owned Land is administered by the regional Inuit association. The Qikiqtani Inuit Association (QIA) is the regional Inuit association responsible for Ellesmere Island, where the project site is located. Nevertheless, ownership of the project site predates the NLCA and the site is administered by AANDC.

As provided in the scope of work for the EIA, under Sec.12.12.7 of the Nunavut Land Claims Agreement Act (1993), amended 2008,

“The Canadian Environmental Assessment Act, and any successor legislation replacing that Act, shall not apply within the geographic area to which this Article applies.”

The following table (Table 1.1) outlines the regulatory requirement for projects in Nunavut.

Table 1.1. Regulatory Requirement for Projects in Nunavut

Land Ownership	Surface/Mineral Rights	Grandfathered Rights	Administered By:	Legislation
Crown	Surface		AANDC	Territorial Lands Act
	Mineral		AANDC	Canada Mining Regulations
Inuit-owned Surface	Surface		Regional Inuit Association (QIA)	NLCA
	Mineral		AANDC	Canada Mining Regulations
Inuit-owned Surface/ Subsurface	Surface		Regional Inuit Association	NLCA
	Mineral	No pre-existing rights at signing of Land Claim	Nunavut Tunngavik Incorporated	NLCA
	Mineral	Pre-existing rights at signing of Land Claim	AANDC	Canada Mining Regulations
Commissioner			Government of Nunavut – Department of Community and Government Services	Commissioners Land Act

***Notes**: AANDC =. Aboriginal Affairs and Northern Development Canada; NLCA = Nunavut Land Claims Agreement; QIA = Qikiqtani Inuit Association.*

1.3.1 Nunavut Land Claims Agreement

The Nunavut Comprehensive Land Claim Agreement (NLCA) outlines the rights to environmental protection resulting from non-renewable resource development and established a development decision-making process. The NLCA also established five (5) Institutions of Public Government with a mandate to manage resources for the benefit of all. These institutions are:

- The Nunavut Planning Commission (NPC) which is responsible for land use planning;
- The Nunavut Impact Review Board (NIRB) which is responsible for assessing and monitoring ecosystem and socio-economic impacts associated with project proposals;
- The Nunavut Water Board (NWB) which has responsibility and licensing authority for the use and management of inland waters (i.e., the issuing of a water withdrawal licence);
- The Nunavut Surface Rights Tribunal (NSRT) which is a quasi-judicial body with a mandate to settle disputes regarding access, compensation for access, wildlife compensation claims, and rights to carving stone or specified substances; and
- The Nunavut Wildlife Management Board (NWMB) which is the main regulator for wildlife management and access to wildlife.

Under the NLCA, Nunavut Tunngavik Incorporated (NTI) represents the Inuit beneficiaries and ensures that Inuit and other parties to the NLCA meet their obligations. NTI has a Regional Inuit Association in each of three regions: the Kivalliq, Kitikmeot and Qikiqtani.

The project site is located on Ellesmere Island, which is in the Qikiqtani region.

1.3.1.1 Permits Currently in Place for the Improvement Projects

The permits which are currently in place for the Eureka Improvement Projects include:

- Water Withdrawal Licence
    - This licence was amended for the Runway Recap and building projects due to an increase in water taken from Station Creek to meet water consumption requirements and effluent discharge resulting from an increase in population (workers) during the construction period.
    - An application for an amendment to the water licence for the Water Reservoir Upgrades Improvement Project was submitted by EC.
- Quarry Permit for Aggregate Extraction
    - The quarry permit was submitted by Nuna East Ltd., the construction contractor for the Improvement Projects.

1.3.2 Summary of Applicable Acts and Regulations

Articles under the Nunavut Land Claims Agreement which are applicable to projects in the jurisdiction of Nunavut are outlined below in Table 1.2, while applicable federal legislation and regulations are listed in Table 1.3.

Table 1.2. Applicable Under Nunavut Land Claims Agreement

Regulation	Responsible Agency
Implementation of the NLCA	NTI
Article 6 – Wildlife Compensation	
Article 11 – Land Use planning	NPC
Article 12 – Development Impact	NIRB
Article 13 – Water Management	NWB
Article 20 – Inuit Water Rights	Designated Inuit Organization (QIA)/NWB
Article 21 – Entry and Access	
Article 26 – Inuit Impact and Benefit Agreements	Designated Inuit Organization (QIA)

***Notes**: NTI = Nunavut Tunngavik Incorporated; NPC = Nunavut Planning Commission; NIRB = Nunavut Impact Review Board; NWB = Nunavut Water Board; QIA = Qikiqtani Inuit Association.*

Table 1.3. Federal Acts and Regulations

Act	Regulation	Responsible Agency
Aeronautics Act	Canadian Aviation Regulations	TC
	Aerodrome Standards	TC
Arctic Waters Pollution Prevention Act	Arctic Waters Pollution Prevention Regulations	EC/TC/AANDC
	Arctic Shipping Pollution Prevention Regulations	EC/TC/AANDC
Canada Wildlife Act	Wildlife Area Regulations	EC
Canadian Environmental Protection Act	Environmental Emergency Regulations	EC
	Federal Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum	EC
	Products on Federal Lands or Aboriginal Lands Regulations	EC
	Fuels Information Regulations No.1	EC
	Interprovincial Movement of Hazardous Waste Regulations	EC
	Release and Environmental Emergency Notification Regulations	
	Storage Tank Systems for petroleum Products and Allied Petroleum Products Regulation	EC
	Sulphur in Diesel Fuel Regulations	EC
Canada Labour Code	N/A	Labour Program
Explosives Act	Explosives Regulations, 2013	NRCan
Firearms Act	N/A	Public Safety Canada/ RCMP
Marine Transportation Security Act	Marine Transportation Security Regulations	TC
Migratory Birds Convention Act	Migratory Birds Regulations	EC
Navigation Protection Act	Navigable Waters Bridges Regulations	TC/DFO
	Navigable Waters Works Regulations	TC/DFO

Table 1.3. Federal Acts and Regulations (Cont'd)

Act	Regulation	Responsible Agency
Nunavut Act	Nunavut Archaeological and Paleontological Sites Regulations	GN-DCH
Nunavut Scientist's Act	Scientists Act Administration Regulations	Nunavut Research Institute (NRI)
Nunavut Waters And Nunavut Surface Rights Tribunal Act	Nunavut Water Regulations	AANDC/NWB
Species at Risk Act	N/A	EC
Territorial Lands Act	Nunavut Mining Regulations	AANDC
	Territorial Land Use Regulations	AANDC
	Territorial Lands Regulations	AANDC
	Territorial Quarrying Regulations	AANDC
Transportation of Dangerous Goods Act	Transportation of Dangerous Goods Regulations	TC

***Notes**: AANDC =. Aboriginal Affairs and Northern Development Canada; EC = Environment Canada; TC = Transport Canada; RCMP = Royal Canadian Mounted Police; DFO = Fisheries and Oceans Canada; NRCan = Natural Resources Canada; HC = Health Canada; GN = Government of Nunavut; DCH=Department of Culture and Heritage.*

In addition to the federal legislation above, a number of federal policies and guidelines were also considered for the proposed project including:

- AANDC Guideline for Spill Contingency Planning;
- Canadian Council of Ministers of the Environment (CCME) – Canadian Environmental Quality Guidelines;
- DFO Freshwater Intake End-of-Pipe Fish Screen Guideline (1995);
- DFO Guidelines for the use of explosives in or near Canadian Fisheries Waters (1998);
- DFO Operational Statements (2007);
- DFO Fisheries Protection Policy Statement (2013);
- DFO Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting (2013);
- EC Guidelines for the Preparation of Hazardous Material Spill Contingency Plans (1990);
- HC Federal Contaminated Site Risk Assessment in Canada: Guidance Documents related to Human Health Risk Assessment;
- National Fire Code of Canada (2010);
- National Building Code of Canada (2010).

Additionally, at the territorial level, there are a number of regulations and legislation which apply to projects taking place in Nunavut. These are outlined in Table 1.4 below.

Table 1.4. Summary of Applicable Territorial Acts and Regulations

Act	Regulation	Responsible Agency
Apprenticeship, Trade and Occupations Certification Act	Apprenticeship, Trade and Occupations Certification Regulations	GN-DE
Commissioners Land Act	Commissioners Land Regulations	GN-CGS
NWT Environmental Protection Act	Spill Contingency Planning And Reporting Regulations	GN-DOE
Explosive Use Act	Explosive Use Regulations	GN-WCB
Fire Prevention Act	Fire Prevention Regulations	GN-CGS
	Propane Cylinder Storage Regulations	GN-CGS
Gas Protection Act	The Gas Protection Regulations	GN-CGS

Table 1.4. Summary of Applicable Territorial Acts and Regulations (Cont'd)

Act	Regulation	Responsible Agency
Public Health Act	Camp Sanitation Regulations	GN-DOH
	General Sanitation Regulations	GN-DOH
	Public Water Supply Regulation	GN-DOH
	Public Sewerage Systems regulations	GN-DOH
Safety Act	General Safety Regulations	GN-WCB
Transportation Of Dangerous Goods Act	Transportation of Dangerous Goods Regulations	GN-CGS
Wildlife Act	Wildlife General Regulations	GN-DOE
	Critical Wildlife Areas Regulations	GN-DOE
	Polar Bear Defence Kill Regulations	GN-DOE
	Wildlife Management Barren-Ground Caribou Areas Regulations	GN-DOE
	Wildlife Management Grizzly Bear Areas Regulations	GN-DOE
	Wildlife Management Muskox Areas Regulations	GN-DOE
	Wildlife Management Polar Bear Areas Regulations	GN-DOE
	Wildlife Sanctuaries Regulations	GN-DOE
	Wildlife Preserves Regulations	GN-DOE
Workers' Compensation Act	Workers Compensation General Regulations	GN-WCB

Notes: *GN = Government of Nunavut; DE = Department of Education; DOJ = Department of Justice; CGS = Community and Government Services; DOE = Department of Environment; DOH = Department of Health; WCB = Workers Compensation Board;*

2 PROJECT DESCRIPTION

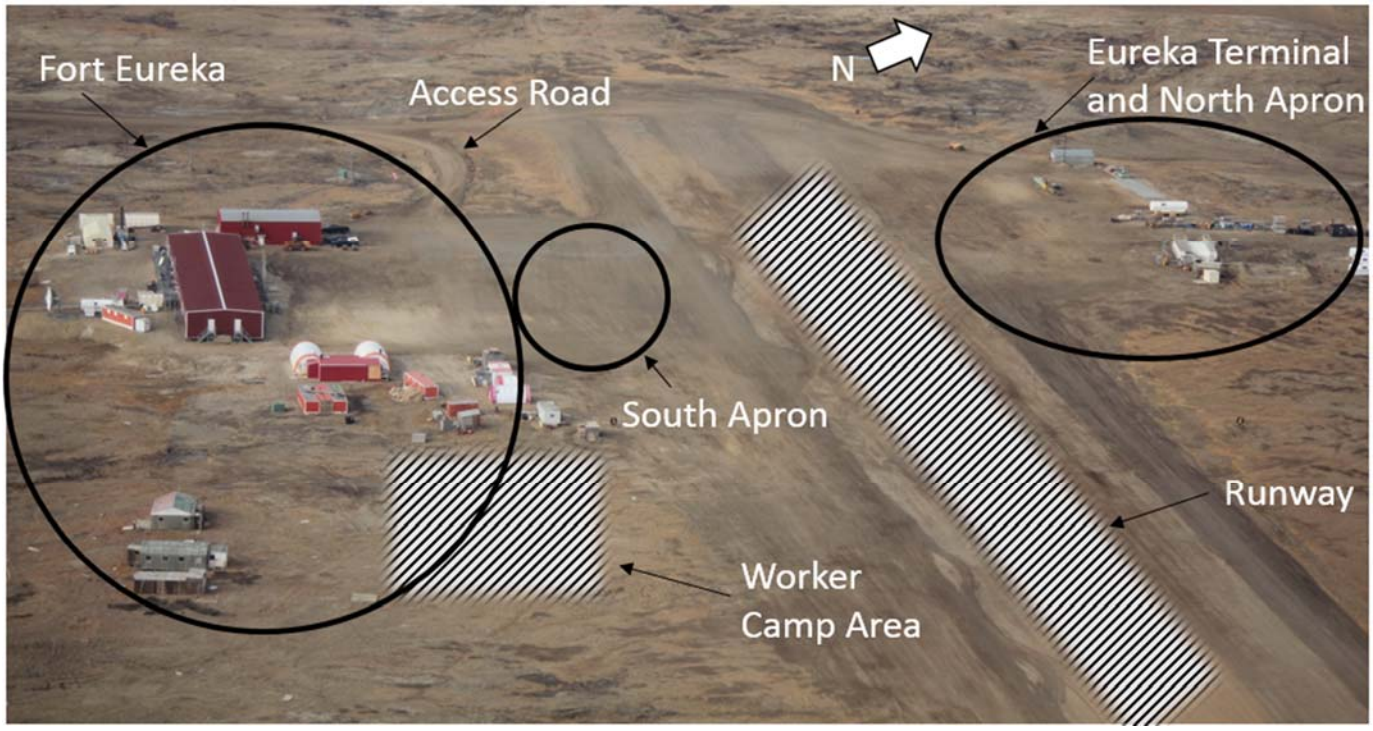
2.1 Description of Proposed Improvement Project Components

2.1.1 Eureka Runway Recap

EC is planning to carry out a major reconstruction/upgrade of the Eureka runway. The need to upgrade the Eureka runway was identified in order to improve functionality and service to the HAWS and Fort Eureka. Preliminary drawings for the reconstruction activities are provided in Appendix B. The work on the runway will be staged in order to ensure the runway remains functional the entire time.

The runway improvements include upgrading two fuel storage areas to include a fuel membrane on a concrete catch basin, reconstruction of the north and south aprons, and resurfacing the runway. All activities are located within the footprint of the existing runway and Fort Eureka (see Figure 2.1). A worker camp is proposed for the duration of the construction period and will be located east of Fort Eureka and west of the existing drum crushing site, near to the former First Air lease. The access road will also be realigned and resurfaced.

Figure 2.1. Location of Eureka Runway Improvements



Aggregate material will be extracted from and crushed in the Black Top Creek borrow pit area (also depicted in Figure 1.3 in the area outlined around Black Top Creek, and in Appendix A, Photos 27 and 28), located in the south east corner of the EC lease area and approximately 4 km east of Fort Eureka. In addition to the 85,900 m^3 of aggregate required for the runway project, approximately 75,000 m^3 will be extracted, crushed and stored in the vicinity of the sewage lagoon for use in the sewage and wastewater system Improvement Project, and for ongoing maintenance activities at HAWS.

2.1.1.1 Estimated Work Duration

The proposed schedule includes delivery of heavy construction equipment (e.g. bulldozers, dump trucks, etc.) and materials and supplies for the temporary worker camp on the 2015 sealift. The worker camp will be constructed in 2015 prior to commencement of runway construction in summer 2016. The construction period for the runway improvements (not including the worker camp) will span three construction seasons (2016-2018)[4].

2.1.2 New Multipurpose Building

The need for a new multipurpose building was identified by EC to provide better infrastructure support for the HAWS. The multipurpose building would provide cold and warm storage and a small carpentry shop. The existing storage buildings and carpentry shop, located south of the main operations complex (see Figure 2.6)), have reached the end of their service life and the new building is required to replace these buildings.

The site selected for the new building is located north of the main operations complex between the HADACS storage building (DND) and the incinerator building (EC) (see Figure 2.2). The rectangular building foundation was constructed during the summer 2015 construction season.

[4] P. Ducharme (personal communications, August 23, 2015).

Figure 2.2. Existing Incinerator, HADACS Building and New Multipurpose Building Foundation, August 2015

2.1.2.1 Estimated Work Duration

The foundation was constructed during the summer 2015 construction season. The pre-engineered building and materials were delivered to the site on the 2015 sealift and will be stored onsite until the summer 2016 construction season. It is anticipated that the building and all associated infrastructure will be installed and operational by fall 2016.[5]

2.1.3 Reservoir Upgrades

The existing water supply is from Station Creek, which is located west of the existing water reservoir. Two on site pumps bring water from Station Creek to the reservoir annually between July and August, when the turbidity of the water is lower than during the thawing period. The water available from Station Creek each summer is influenced by the previous winter snowfall levels and the amount of permafrost melt/runoff. This annual fluctuation due to varying melt/runoff can result in the filling up of the reservoir a second time, if there are above average snowfalls in the year, before freeze-up. If an insufficient volume of water is captured in any given year, a water shortage occurs.

The existing water reservoir is located at an elevation approximately 8 m below the main buildings. It has an active storage capacity of approximately 2,100 m^3. The water from the reservoir is pumped to storage tanks in the tank building that adjoins the maintenance garage, and is

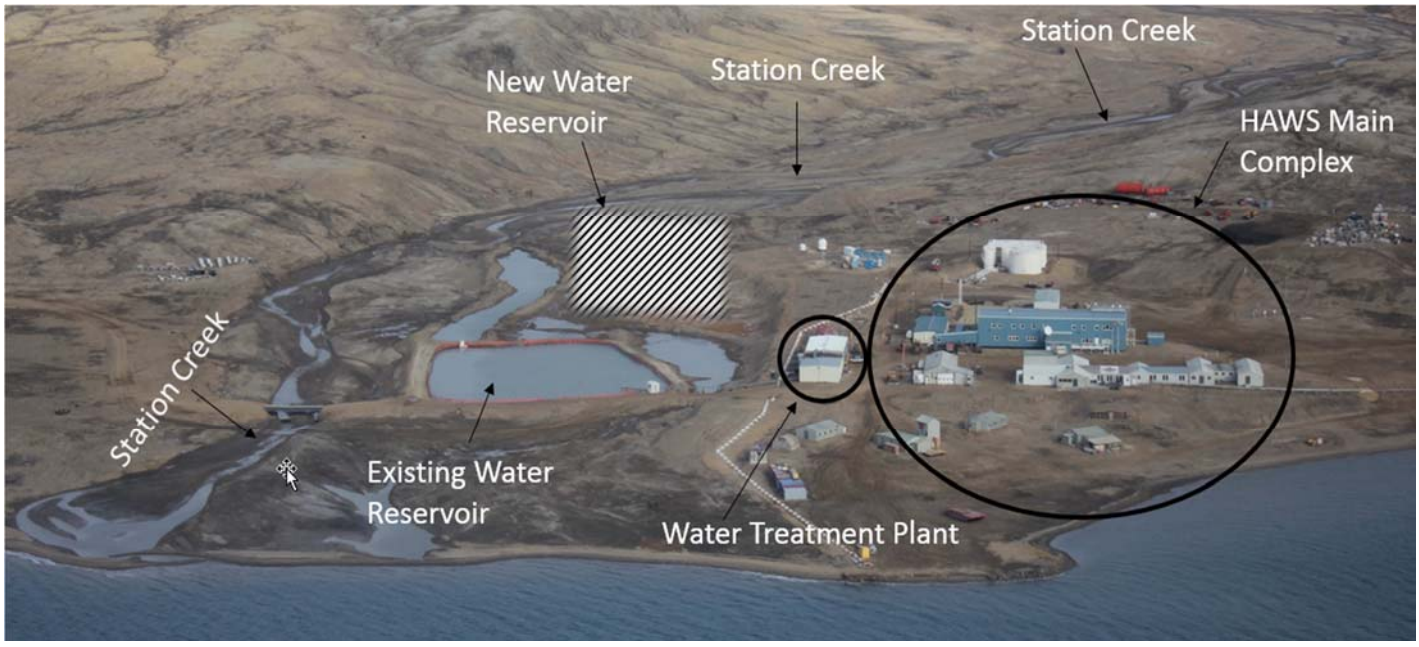
[5] P. Ducharme (personal communications, August 21, 2015).

subsequently pumped into tanks for further treatment located in the main complex building. The existing water treatment system produces potable and utility water.

Seepage, slumping and instability of the reservoir have been observed in recent years. Further, the reservoir has never been dredged for removal of accumulated silt; consequently, the capacity of the reservoir has significantly decreased over time. The existing water reservoir is currently operating at capacity with water usage restricted during high population periods at the HAWS. EC has identified the need to upgrade the water supply and treatment system at the HAWS.

A new above ground 26,400 m^3 water reservoir and water treatment system will be installed, including the Station Creek intake, new pumps and pump house, and water conveyance pipes and appurtenances. The new reservoir will be filled annually from Station Creek and provide sufficient supply for a maximum of 60 people. Preliminary drawings of water reservoir improvements are shown in Appendix B. Refer to Figure 2.3 for the location of the new water reservoir.

Figure 2.3. Location of New Water Reservoir



2.1.3.1 Estimated Work Duration

It is anticipated that construction materials will be delivered directly to the site on the 2016 sealift, which departs yearly from Montreal in late summer for a three week journey to reach Eureka. All items destined for Eureka on the sealift are ferried ashore to the site via barge. Construction of the reservoir will occur during the 2017 summer construction season with an anticipated October

completion date. Project phasing will ensure that disruption to the daily operation of the facilities is kept to a minimum and all water services are maintained.

2.1.4 Sewage and Wastewater System Upgrades

The existing wastewater facilities consist of a storage holding tank (located inside the weather station building), a pump house and a 2,230 m^3 facultative single celled sewage lagoon, as shown on Figure 2.4. Throughout the year, wastewater in the holding tank) is discharged to the sewage lagoon by a 150 mm heat traced effluent discharge pipe. Effluent is subsequently discharged from the lagoon into the Slidre Fjord twice per year, during the summer.

Figure 2.4. Existing Sewage and Wastewater System

In addition to the upgrade to the water supply and treatment system, EC has identified the need to upgrade the sewage and wastewater treatment system, as it is not considered adequate for the site. The upgrades will include a new chemical/physical treatment system and upgrades to the existing sewage lagoon.

The new wastewater sewage treatment system for the HAWS was designed based on recommendations by WorleyParsons (2010) and AECOM (2012) and includes the option to add aeration and/or mixing to the holding tank in order to enhance organics removal prior to discharge to the lagoon. This is a simple and effective way to reduce the Biochemical Oxygen Demand (BOD) in an Arctic environment. It is anticipated that this upgrade will improve the performance of

the wastewater treatment system, particularly during periods when conditions in the lagoon are not conducive to biological activity.

2.1.4.1 Estimated Work Duration

It is anticipated that construction materials will be delivered to the site on the 2016 sealift. Construction will follow during the summer 2017 construction season.

Project phasing will ensure that disruption to the daily operation of the facilities is kept to a minimum and all wastewater sewage services are maintained.

2.2 Spatial and Temporal Boundaries

The four Improvement Projects are located within EC's lease holdings. Spatially, the majority of potential environmental impacts associated with three of the Improvement Projects (i.e., new multipurpose building, reservoir upgrades, sewage and wastewater system upgrades) will be localized to the HAWS main site. Potential environmental impacts associated with the Eureka runway recap will be localized to the runway project site. Consequently, emphasis throughout this document has been placed on the evaluation of effects within the near vicinity of these project components, referred to subsequently as the study area (i.e. HAWS main site and runway site). Refer to Figure 2.5.

Temporally, the majority of potential environmental impacts associated with the Improvement Projects will be during the period from June through to September, coincident with the construction phases at the HAWS. However, the construction for any given component may extend into multiple construction seasons, e.g. 2016 and 2017, and 2018.

Figure 2.5. High Arctic Weather Station (HAWS) Main Site and Runway Recap Project Site

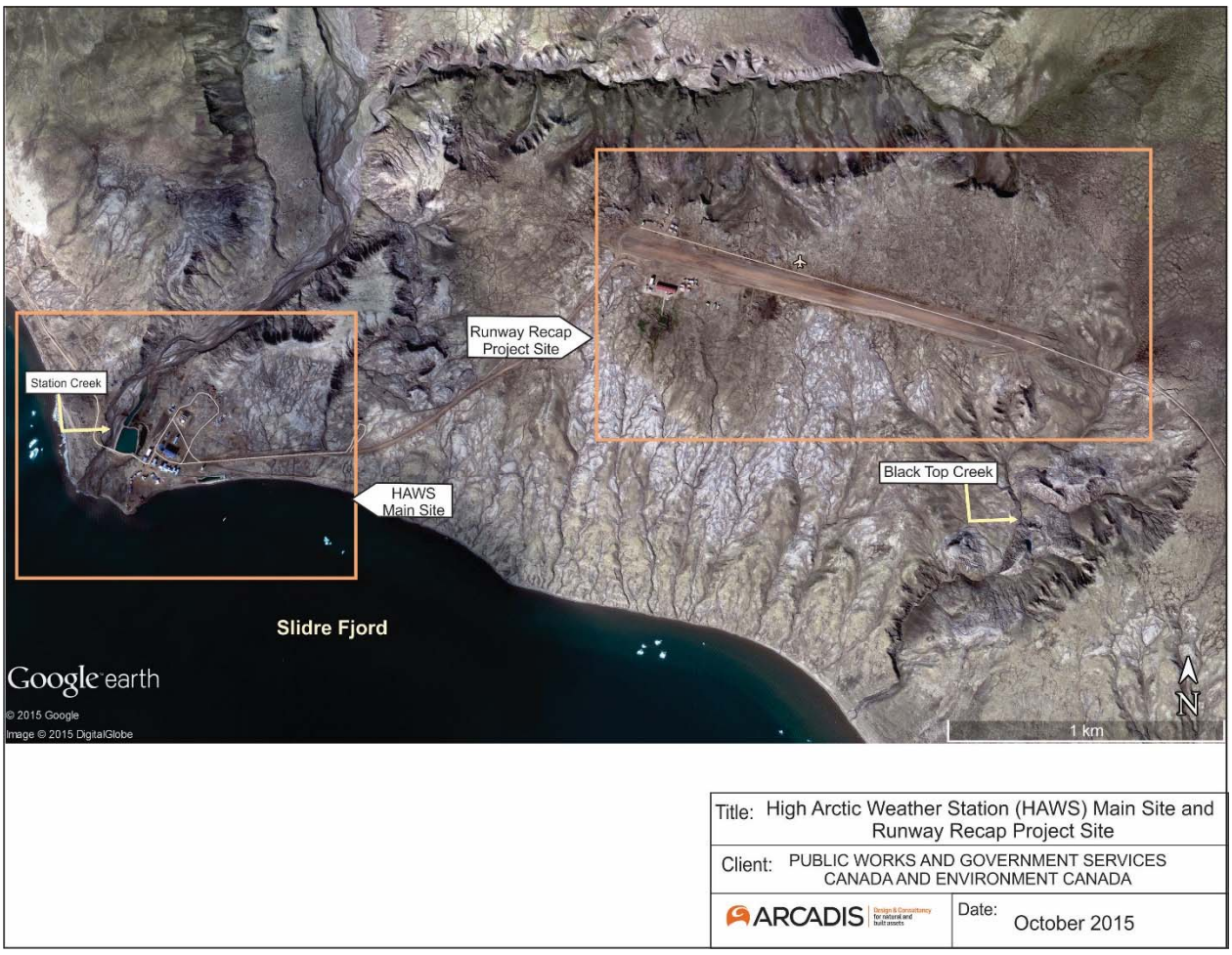


Figure 2.6. High Arctic Weather Station (HAWS) Main Site

Figure 2.7. Runway Recap Project Site

2.3 HAWS Site Visit

A site visit by the lead Environmental Planner to HAWS occurred August 20th to 26th, 2015. Activities during this time period included:

- Baseline air monitoring measurements at 7 stations corresponding to the location of the proposed works/activities;
- Baseline noise spot measurements at the same 7 locations;
- Runway project and associated activities (including borrow bit location) site reconnaissance;
- Multipurpose building project site reconnaissance;
- Water reservoir and associated activities site reconnaissance including a tour of the water treatment facility in the power house;
- Waste water treatment sewage lagoon site reconnaissance;
- Inventory of equipment observed;
- Photographic inventory of existing landuse/building uses at main HAWS site;
- Photographic record of each project site;
- Informal discussions with station staff regarding working/living at station;
- Informal interviews with Station Manager on all proposed projects, including a guided tour of each location;
- Informal interview with Station Manager on existing operations, procedures, staffing, infrastructure and supply coordination at the station;
- Recorded daily wildlife observations during site visit;
- Review of Station logs for 2012, 2013, 2014, and 2015;
- Discussion with Station employee and NWT bird observer regarding species observed, location of nests in the EC reserve area;
- Informal interview with PWGSC project manager for proposed project on project details and plans;
- Informal discussions with station staff regarding local conditions and observations relating to wildlife, archaeological sites, fish/habitat at Station Creek, and aquatic species and mammal observations during their time at HAWS.

2.3.1 High level Observations

Runway Project

- Proposed area for the worker camp has already been disturbed, vegetation is limited and consists of tuffs of grass;
- Existing access road running adjacent to the runway continues east past the landfill site to the borrow bit area at Black Top creek. Continued use of the existing access road proposed for the projects will not create a new footprint/disturbance area;
- Muskox are comfortable adjacent to the runway and seem undisturbed by vehicle or plane traffic. Station manager confirmed that a family of muskox are common in the vicinity;
- Access road, aprons, runway is local granular material.

Water Reservoir

- Very little water in Station creek during visit, water observed in reservoir and overflow area;
- Arctic hare observed throughout Station Creek area;
- Background noise from Power house noticeable;
- Snow buntings observed during noise and air monitoring;
- New reservoir site is disturbed by previous spring runoffs;
- Existing disturbance from vehicles observed in new reservoir area.

Wastewater sewage lagoons

- Arctic hare observed throughout the vicinity;
- Berms and access road comprised of local sand/gravel;
- Limited vegetation observed on edge of berm and access road;
- Area of lagoons generally disturbed.

Multipurpose Building

- Foundation under construction during site visit;
- Arctic hare observed throughout the vicinity;
- Pair of arctic wolves visited site;
- Operation of construction equipment did not appear to generate much dust with the exception of dumping of granular material from dump truck;
- Noise from power house contributes to background conditions.

Refer to Appendix C for a summary of wildlife field observations resulting from the site visit.

3 SCOPE OF PROJECT

Each of the four Improvement Projects which are mentioned and described above in Section 2 consists of core project components. These are outlined in further detail in the following sections:

- Eureka Runway Recap (Section 3.1.1);
- New Multipurpose Building (Section 3.1.2);
- Reservoir Upgrades (Section 3.1.3);
- Sewage and Wastewater System Upgrades (Section 3.1.4).

Table 3.1 through to Table 3.4 provide a list of these components for each of the four Improvement Projects according to the various project phases. Following each table is a description of project works and activities associated with the core components.

3.1.1 Eureka Runway Recap

The two phases of the Eureka Runway Recap Improvement Project include the construction phase and the operation phase. Decommissioning is not contemplated for the foreseeable future, and thus environmental effects from decommissioning of the runway are not considered in this report.

The project components will generally include the following activities:

- extraction and crushing of aggregate;
- earthworks (excavating, grading);
- material handling (loading and dumping);
- vehicle travel; and
- refueling of vehicles.

Table 3.1 below outlines the core project components and associated ancillary works for the Eureka Runway Recap Improvement Project in further detail, while each component is described in greater detail following Table 3.1.

Table 3.1. Eureka Runway Recap Project Components

Project Phase	Project Components	
Construction	• Aggregate extraction and crushing • Construction of gravel access roads to borrow pit • Stock piling of crushed aggregate (for use in the sewage and wastewater system upgrade phase of the project) • Construction of temporary camp • Membrane installation for fuel storage area • Preparation and resurfacing of runway and apron areas • Replacement of runway lighting • Realignment and resurfacing of access road	Not applicable
Operation	• Regular use and maintenance of runway • Refueling aircraft	Shipping of fuel for storage
Decommissioning	Not contemplated at this time nor in the foreseeable future	Not contemplated at this time nor in the foreseeable future

Aggregate extraction and crushing.

The identification of a borrow pit for extraction and crushing of granular material was conducted during the summer of 2015. The borrow bit is located in the Black Top Creek valley, south east of the runway and approximately 4 km from the Eureka Airport Terminal. Approximately 160,900 m^3 of material will be extracted in total.

Stock piling of crushed aggregate.

Following extraction, aggregate crushing will occur at the Black Top Creek extraction site. Crushed aggregate for use in the sewage and wastewater system upgrade phase of the project will be stockpiled in the vicinity of the sewage lagoon located at the HAWS site. The remaining aggregate will be used for ongoing maintenance projects at the HAWS.

Construction of temporary camp.

A temporary camp for 50 workers will be required for the duration of the construction period (i.e., summer 2016, 2017 and 2018). Refer to Figure 3.1 for a drawing of the camp. The modular style camp, composed of 14 ATCO trailers, will provide accommodations, washroom facilities, recreation rooms, and food services. The temporary ATCO trailer worker camp will be installed

on cribbing, and raised. The size of the footprint for the camp is approximately 3,700 m^3. The camp will be located between Fort Eureka and the existing barrel crushing area and north of the former First Air buildings (refer to Figure 2.1). Water for the facilities will be obtained from the water reservoir, which is the main water supply for Eureka. Water will be stored within one of the ATCO trailers within five 2.44 m diameter holding tanks. Waste will be transferred to the two-celled sewage lagoon to the south of Fort Eureka, thereby utilizing existing approved facilities

Membrane installation for fuel storage area.

Two fuel storage areas will be upgraded to include a fuel membrane on a concrete catch basin. The fuel storage areas are located at the north apron located on the north side of the runway adjacent to the airport terminal, and on the south side of the runway in front of Fort Eureka. The tank membrane will be placed below the driveway surface and will contain a berm around the perimeter. Vehicles will be able to drive over this berm. The purpose of the membrane area is to provide secondary containment for any fuel spills. Fuel drums will be stored within the membrane, as well, vehicle refuelling and fuel transfer activities will occur within the membrane area.

Preparation and resurfacing of runway and apron areas.

The resurfacing of the runway will be staged in order to ensure it remains functional throughout the construction phase. Staging will occur (see Appendix B) as follows:

- Stage 1: 632 m at the westerly end of the runway;
- Stage 2: 670 m at the easterly end of the runway; and
- Stage 3: 328 m in the middle of the runway.

The apron located on the north side of the runway and adjacent to the airport terminal will be reconstructed (i.e., earthworks, grading, resurfacing) and new edge lighting will be installed. The apron located on the south side of the runway in front of Fort Eureka will undergo similar improvements including the installation of new edge lighting.

In addition, approximately 280 tanks (5,000 L each) of fuel will be needed for the runway project, which will be stored temporarily at the proposed fuel storage area in the south apron. Existing regulations and standards for approved fuel tanks and storage and spill mitigation will be followed.

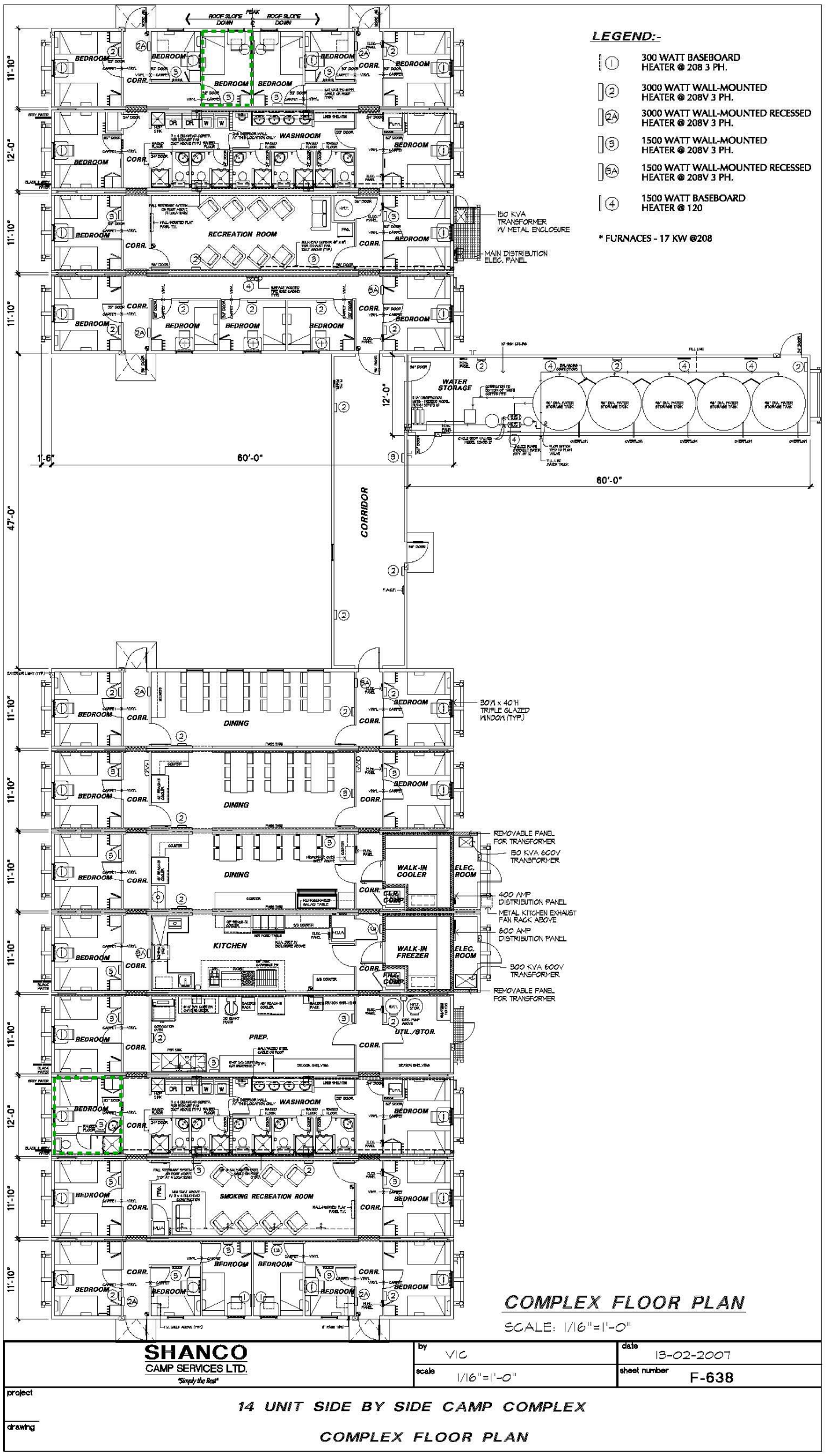
Replacement of runway lighting.

In addition to the replacement of existing runway lights, temporary lights will be required throughout construction. All temporary lights, landing markers and hazard markers will adhere to Transport Canada standards.

Realignment and resurfacing of access road.

The existing airport road located at the east end of the runway will be realigned and resurfaced to service the airport terminal.

Figure 3.1. Drawing of the Worker Camp



3.1.2 New Multipurpose Building

The two phases of the new Multipurpose Building Improvement Project include the construction phase and the operation phase. Decommissioning is not contemplated for the foreseeable future, and thus environmental effects from decommissioning of the Multipurpose Building are not considered in this report.

Unless specified below, project components will generally entail the following activities:

- extraction and crushing of aggregate;
- earthworks (excavating, tamping, grading);
- material handling (loading and dumping);
- vehicle travel; and
- refueling of vehicles.

Table 3.2 below outlines the core project components and associated ancillary works for the Multipurpose Building Improvement Project in further detail, while each component is described in greater detail following Table 3.2.

Table 3.2. Multipurpose Building Project Components

Project Phase	Project Components	
	Core Components	**Ancillary Works**
Construction	• Clearing and excavating footprint • Aggregate extraction and crushing • Construction of thermosyphons and concrete foundation • Construction of new pre-engineered Behlen steel building	HVAC system with chimneys, oil piping, valves Installation and connection of electrical system
Operation	• Regular use and maintenance of storage space and carpentry shop	Not applicable
Decommissioning	Not contemplated at this time nor in the foreseeable future	Not contemplated at this time nor in the foreseeable future

Clearing and excavating footprint.

The building footprint was excavated and leveled during the 2015 construction season and involved earthworks (removal of material, leveling and tamping of footprint area) (See Figure 2.2).

Aggregate extraction and crushing.

Granular material required for the foundation was extracted during the 2015 season from the borrow pit located west of the EC property. An extraction permit was obtained from the Nunavut government. Aggregate was crushed at the extraction site and transported in a dump truck to the project site for use.

Construction of thermosyphons and concrete foundation.

The thermosyphon system allows the permafrost to remain frozen. Installation of the flat-loop thermosyphon system was completed during the 2015 construction season following best practices in Arctic environments. Installation included preparing a foundation of fine granular material, laying of piping, and covering and tamping pipes with additional fine granular material.

Construction of new pre-engineered Behlen steel building.

The pre-engineered steel building to be constructed includes insulated metal panels and a steel roof and will consist of 200 m^2 of unheated storage space and 330 m^2 of heated space, including a second storey/mezzanine of approximately 80 m^2. The heated space will include overhead fuel-fired unit heaters with chimneys and associated piping. An enclosed space, separate from the storage area, will be used as a carpentry/woodworking shop that will include a thermostatically controlled HVAC system. The unheated space will include two vehicle openings and two access/egress doors located at each end of the building.

3.1.3 Reservoir Upgrades

The two phases of the Reservoir Upgrades Improvement Project include the construction phase and the operation phase. Decommissioning is not contemplated for the foreseeable future, and thus environmental effects from decommissioning of the new water reservoir are not considered in this report. Decommissioning of the existing water reservoir is considered in the construction phase of the Reservoir Upgrades project.

Additionally, a water licence is currently in place and an amendment is currently being processed that will include the changes resulting from these projects and the additional water needed for the additional staff onsite.

Project components will generally entail the following activities:

- extraction and crushing of aggregate;
- earthworks (excavating, tamping, grading);
- material handling (loading and dumping);
- vehicle travel; and
- refueling of vehicles.

Table 3.3 below outlines the core project components and associated ancillary works for the Reservoir Upgrades Improvement Project in further detail, while each component is described in greater detail following Table 3.3.

Table 3.3. Reservoir Upgrades Project Components

Project Phase	Project Components	
	Core Components	**Ancillary Works**
Construction	• Site preparation, including access road construction and soil excavation • Aggregate extraction and crushing • Construction of new reservoir • Upgrades to existing water treatment plant • Installation of new emergency water supply system • Decommissioning of existing water reservoir and associated obsolete infrastructure • Construction of new small pump house and ancillary piping/pumps • Installation of cut-off trench and berm • Remediation of PHC-contaminated soil in the footprint of the new water reservoir (within north west area of AEC B-2; see Figure 1.2 and 1.3)	
Operation	• Regular use and maintenance of reservoir and ancillary buildings (i.e., pump house)	None
Decommissioning	Not contemplated at this time nor in the foreseeable future	Not contemplated at this time nor in the foreseeable future

Site preparation, including access road construction and soil excavation.

Site preparation activities include constructing a temporary access road to the new reservoir site and the excavation of the reservoir footprint. As discussed in further detail in Section 4, there is widespread PHC contamination in soils in AEC-B2 and AEC-D (see Figure 1.2), including areas within the footprint of the new reservoir. As such, any soil that is removed from this area as part of this Improvement Project will require disposal in an approved waste management site.

Aggregate extraction and crushing.

Granular material required will be extracted from and crushed at the Black Top Creek borrow pit located east of the Eureka runway, concurrent with extraction and crushing of aggregate for the Eureka runway recap. It will be stored in the vicinity of the sewage lagoon prior to use.

Construction of new reservoir.

The new reservoir will be constructed north of the existing reservoir located between Station Creek and the water treatment facility, therefore minimizing pumping and piping requirements for water handling (refer to Figure 2.3). It will have 4 m of active storage depth, which will maximize the ratio of active storage to ice allowance. Berm construction for the reservoir will be completed using imported, manufactured granular material (fill) and construction of the reservoir will involve a cut of 1,300 m^3 and a fill of 35,000 m^3 (including for the berm construction). The cut material will be wasted and manufactured granular material will be imported for construction of the berms at a 3H:1V slope.[6]

A membrane liner will be installed to prevent seepage losses and instability of the outside slopes. The liner will be low permeability, chemically resistant to petroleum, and suitable for the Arctic climate. It will be protected on both sides with sand or geotextile to prevent damage during construction or during ice movement[7].

A perforated sub-drainage system will also be installed below the membrane liner to prevent uplift. The purpose of this system is to collect and treat the groundwater prior to discharging into Station Creek (downstream side of raw water intake system[8]).

The new reservoir will be constructed while maintaining operations in the existing reservoir.

Upgrades to existing water treatment plant.

The current technologies used are able to adequately treat the water from Station Creek for the separated uses system. Thus, the same technologies that currently exist, with a few upgrades to reduce the formation of trihalomethanes, and with continuous Total Dissolve Solids (TDS) monitoring, is sufficient to treat the source water.

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[6] WorleyParsons, 2010.

[7] Ibid.

[8] WorleyParsons, 2010.

Decommissioning of existing water reservoir and associated obsolete infrastructure.

The existing water reservoir will be decommissioned along with obsolete related infrastructure after the new reservoir is in operation. As discussed in more detail in Section 4, contaminated soils and sediments are present in the drainage pond and surrounding area. Thus, if the drainage pond is to be decommissioned as well, sediment from the pond will require disposal in an approved waste management site.

Construction of new small pump house and ancillary piping/pumps.

The new pipeline required to convey water from Station Creek to the reservoir will be 100 mm in diameter and 125 m long. Three pumps (two operational and one standby) will be required to fill the reservoir. The new Pump House and conveyance system between the reservoir and treatment system will be installed with a diameter of 150 mm and a length of approximately 100 m. This pipeline will be heat traced, insulated, and self-draining. Water is to be pumped into the reservoir from Station Creek during the summer (July and August) (WorleyParsons, 2010).

Installation of Cut-Off Trench and Berm.

It is not financially feasible to remove all contaminated soil adjacent to the new reservoir within AEC B-2. Thus, a cut-off trench and berm will be installed along the western extent of AECs B-2 and D-1 to prevent soil migration and surface water runoff from entering the reservoir (WorleyParsons 2010).

3.1.4 Sewage and Wastewater System Upgrades

The two phases of the Sewage and Wastewater System Upgrades Improvement Project include the construction phase and the operation phase. Decommissioning is not contemplated for the foreseeable future, and thus environmental effects from decommissioning of the sewage and wastewater system are not considered in this report.

Additionally, a licence is currently in place and an amendment is currently being processed that will include the changes resulting from these projects and the additional effluent produced by the workers onsite.

Project components discussed above will generally entail the following activities:

- extraction and crushing of aggregate;
- earthworks (excavating, tamping, grading);
- material handling (loading and dumping);

- vehicle travel; and
- refueling of vehicles.

Table 3.4 below outlines the core project components and associated ancillary works for the Sewage and Wastewater Improvement Project in further detail, while each component is described in greater detail following Table 3.4.

Table 3.4. Sewage and Wastewater Project Components

Project Phase	Project Components	
	Core Components	**Ancillary Works**
Construction	• Construction of new chemical/physical treatment system, including construction of wastewater force main or gravity pipes, and pumps and pump house • Upgrading of the existing sewage lagoon, • Stockpiling of crushed aggregate • Decommissioning and disposal of obsolete infrastructure	Inlet piping: Re-piping to the new holding tank container system Construction of new utilidors, as required
Operation	• Regular use and maintenance of sewage treatment plant and lagoon facilities	Regular use and maintenance
Decommissioning	Not contemplated at this time nor in the foreseeable future	Not contemplated at this time nor in the foreseeable future

Construction of new chemical/physical treatment system.

A new sequencing batch reactor (SBR) and upgrades to the sewage lagoon will entail construction of wastewater force main or gravity pipes, and pumps and pump house. SBR technology has previously been used in remote locations. A separate building will not be required and the SBR will be containerized as a portable system with limited structural requirements on site. A concrete pad or support (600 mm x 600 mm) will be required to support the SBR.

The anaerobic tank allows for additional treatment of primary and secondary sludge, while providing storage capacity. The updated tank will accommodate aeration and/or mixing, and will be designed to minimize debris accumulation. The updated system will enhance biological treatment and provide increased storage capacity within the holding tank. Increased capacity will serve to buffer peak flows. During average flow scenarios, such as in the winter months, the larger holding tank will reduce the required frequency of wastewater discharge to the lagoon.

Effluent will be discharged to the existing lagoon, which functions as a retention/holding pond, prior to its release into the fjord. Effluent is released twice annually in the month of August, into the fjord.

Upgrading the sewage lagoon.

Upgrades to the lagoon include a thorough cleaning, sludge removal, slope repairs, and the addition of a new lining. Gravel from the runway recap project and stockpiled near the lagoon site will be used in this project.

Stockpiling of crushed aggregate.

As discussed previously, aggregate for use in the Eureka runway recap and water reservoir upgrades will be extracted from and crushed at the Black Top Creek borrow pit. Prior to its use, it will be stockpiled in the vicinity of the sewage lagoon.

Decommissioning and disposal of obsolete infrastructure.

All obsolete infrastructure will be decommissioned and disposed of in accordance with the HAWS waste management plan, after the new sewage treatment system is in operation.

4 DESCRIPTION OF ENVIRONMENT AND VALUED ECOSYSTEM COMPONENTS

The existing environment serves as the baseline condition against which incremental changes and possible environmental effects associated with the Improvement Projects are evaluated. The existing natural environment is presented in terms of the atmospheric environment, surface and bedrock geology, hydrology and surface water resources, terrestrial and aquatic environment, and physical and cultural resources. A description of the human environment is also provided, which includes a description of Aboriginal communities and the Eureka weather station community. The environment component headings used to characterize the existing environment follow those required under the NIRB screening process.

Valued ecosystem components (VECs) are representative species and/or environmental components that have social, ecological and/or cultural significance. Table 4.1 lists a proposed set of VECs known to be in the vicinity of the HAWS and Eureka runway. They represent most major ecological niches in the terrestrial and marine systems at Eureka and hence could be susceptible to possible environmental effects associated with the Improvement Projects. Several species which have been observed and are known to be present at the HAWS and runway are also designated for special status under Species-At-Risk (SARA) legislation. Relevant VECs listed by environmental component are shown in Table 4.1.

Table 4.1. Environmental Components and VECs

Environmental Components	Relevant VECs
Atmospheric Environment	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to Terrestrial Environment
Surface and Bedrock Geology	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to VEC in other environmental components
Hydrology and Surface Water	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to VEC in other environmental components
Terrestrial & Aquatic Environment	Representative species with social, ecological and/or cultural significance
Physical and cultural Resources	Aboriginal archaeological resources
Human Environment	Aboriginal communities' well-being HAWS residents' well being

4.1 General Description of the Physical Environment

Eureka is located on Ellesmere Island, Nunavut, which is the northernmost island in the Canadian Arctic Archipelago. The Arctic Ocean surrounds the Archipelago to the north and west, with Greenland to the east and the Canadian mainland to the south. Eureka itself is on the western side of Fosheim Peninsula in northern Ellesmere Island. Eureka is located on the north side of Slidre Fjord and surrounded to the northeast and northwest by ridges that rise about 600 m above mean sea level.

While Eureka has no permanent residents, a number of research and operational staff rotate through the HAWS facility. The closest Inuit community is the hamlet of Grise Fjord, located 400 km south of Eureka at the southern end of Ellesmere Island.

Eureka's climate is typical for the Canadian Arctic Archipelago. Eureka experiences a long, dark winter and a short, intense summer with continuous daylight. The winter conditions promote a strong surface-based temperature inversion. The transition to summer occurs with a rapid warming and the breakdown of the Arctic winter vortex.

4.2 Atmospheric Environment

In an effort to characterize the existing air quality and noise environment within the Project area, a monitoring program was completed in August 2015. Details and results of the monitoring program as well as a description of climate and meteorology in the Project area are provided in the following sections.

4.2.1 Climate and Meteorology

The weather station at Eureka (WMO ID no. 71917; latitude 79.98°N, longitude 85.93°W) has been operated by the Metrological Service of Canada since 1947. The hourly surface observation record begins on 1 January 1953 at 01:00 LST (06:00 UTC) and observations are recorded at an altitude of 10.4 m above mean sea level. Upper-air observation data from radiosondes are available starting in 1961.

Lesins *et al.* (2010) provide a comprehensive summary of weather observations made at Eureka from 1953 to 2007, which is briefly discussed in the following sections. A tabular summary of 1981 to 2010 Eureka climate normals is provided in Table 4.2.

Table 4.2. Eureka Climate Normals (1981 to 2010)

Temperature													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Daily Average (°C)	-36.5	-37.4	-36.8	-26.5	-10.2	3	6.1	3.2	-6.4	-20.7	-29.4	-33.3	-18.8
Standard Deviation	3.4	3.2	2.6	3.4	2.3	1.4	1.1	1.4	2.3	3.2	3.8	3.4	1.5
Daily Maximum (°C)	-32.9	-33.7	-33.3	-22.5	-6.9	5.7	9.3	5.4	-3.8	-17.1	-25.9	-29.7	-15.5
Daily Minimum (°C)	-40.1	-41.1	-40.3	-30.5	-13.3	0.4	2.9	0.9	-9	-24.3	-33	-36.8	-22
Precipitation													
Rainfall (mm)	0	0	0	0	0	5.3	14.5	11.7	1	0	0	0	32.5
Snowfall (cm)	3.1	3.9	2.8	4.6	4.2	3	0.7	4.8	11.3	10.9	5.7	5.4	60.3
Precipitation (mm)	2.6	3.1	2.2	3.7	3.1	8.2	15.3	16.1	9.5	7.6	4.1	3.6	79.1
Average Snow Depth (cm)	13	14	15	16	13	2	0	0	3	7	10	12	9
Median Snow Depth (cm)	13	14	15	15	13	1	0	0	3	7	10	12	9
Snow Depth at Month-end (cm)	13	14	15	16	8	0	0	0	4	9	11	13	9
Wind													
Speed (km/h)	8.6	7.8	7.2	8.4	13	17.2	17.6	15.7	12.3	8.4	7.8	7.8	11
Most Frequent Direction	SE	E	SE	SE	W	W	W	W	SE	E	SE	E	SE
Maximum Hourly Speed (km/h)	113	102	113	85	81	78	77	78	89	100	89	103	113
Direction of Maximum Hourly Speed	S	NE	SE	S	SE	S	S	NW	NW	NW	S	SE	SE

4.2.1.1 Temperature

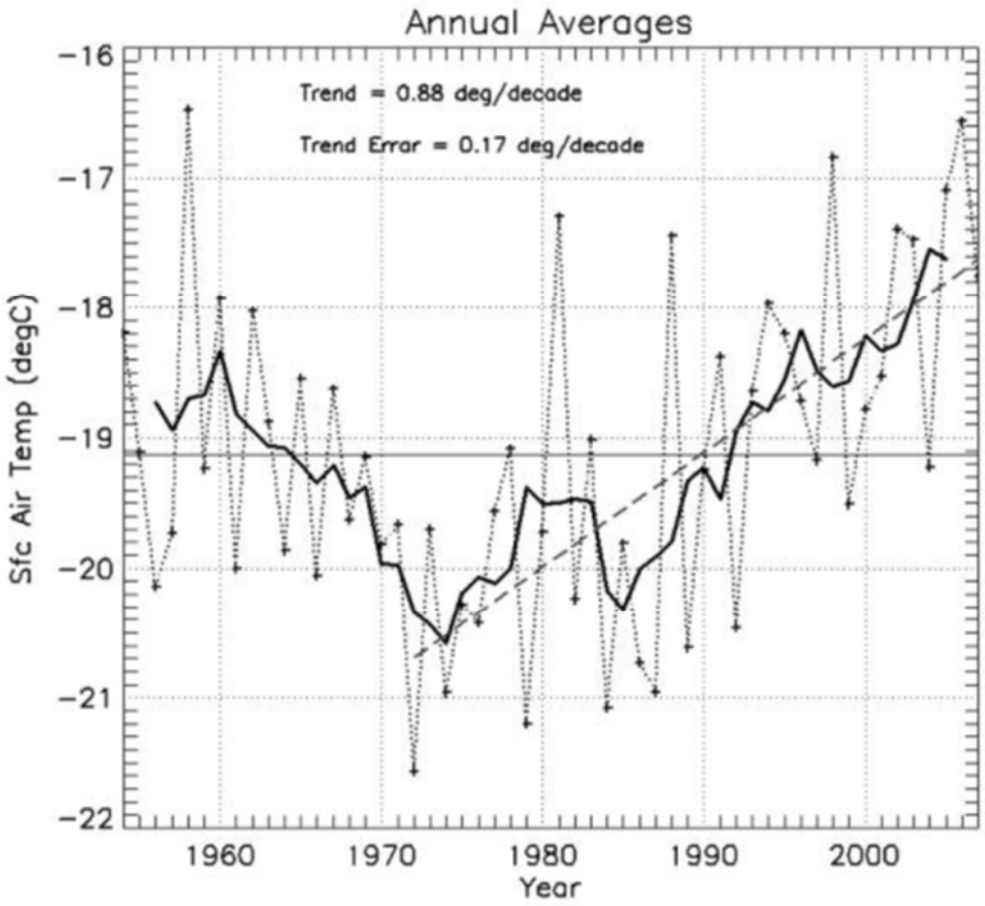
Lesins *et al*. (2010) define the winter months as the three coldest months of the year (January, February, and March) and summer as the three warmest months (June, July, and August). Somewhat unconventionally, autumn is defined to comprise the period of September to December, which is based on the fact that the stable winter boundary layer is not fully formed until January. Spring comprises the rapidly warming months of April and May.

Over the 54 year record, the average temperature at Eureka is -19.1°C, with the highest and lowest observed temperatures of 20.0°C and -54.6°C recorded 22 July 2007 and 15 February 1979, respectively. Trends in temperature across the entire observing record can be summarized as follows:

- A cooling trend from the early 1950s to early 1970s;
- A warming period from the early 1970s to early 1980s;
- A brief cooling period in the mid-1980s; and
- A warming trend up to the present day.

Figure 4.2 shows a time series of the annual average surface air temperature measured at Eureka from 1954 to 2007.

Figure 4.1. Time Series of the Annual Average Surface Air Temperature at Eureka from 1954 to 2007



Note: Reproduced from Lesins et al. 2010. The dark solid line is the 5-year running average and the dashed line shows the linear regressed trend from 1972 to 2007

4.2.1.2 Precipitation

Eureka is typified by a polar desert climate. Annual precipitation averages only 79.1 mm per year, with the majority (60.3 mm on average) falling as snow in the autumn and winter months. Rain is typically confined to the months of July and August, where rainfall events can be intense. The maximum recorded daily precipitation events observed at Eureka in July and August were 20.8 mm (27 July 1997) and 41.7 mm (17 August 1953), respectively.

4.2.1.3 Wind Speed and Wind Direction

Surface wind speeds at Eureka are greatest in the summer months, averaging about 17 km/h across the period from 1954 to 2007. Wind speeds in autumn, winter and spring are reduced, ranging between approximately 8 and 11 km/h over the same period. Lesins *et al*. (2010), however, note that the observations show a weakening trend of approximately -0.6 km/h per decade over the period from 1954 to 2007, which persists despite the slight weakening of the surface-based temperature inversion over the same period. Surface winds are primarily out of the west in the late spring and summer (May to August), switching to the east and southeast for the remainder of the year.

Although variable, Lesins *et al.* (2010) note that there has been no significant change in upper air wind speeds at the 500 mb level.

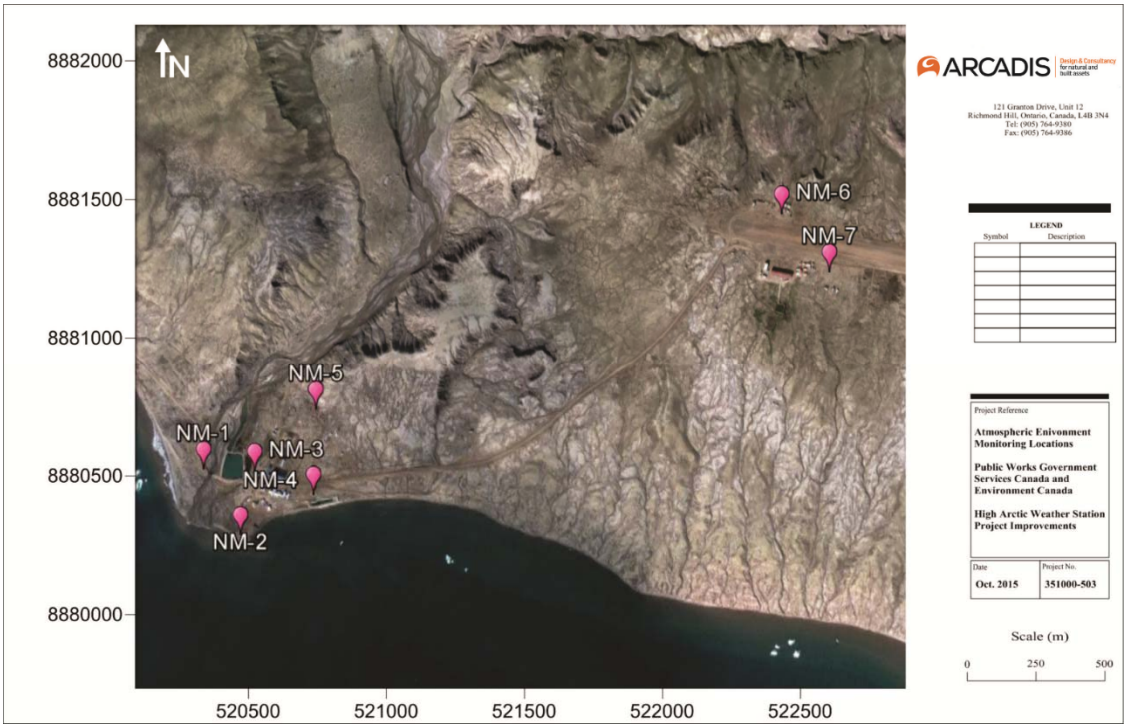
4.2.2 Air Quality

4.2.2.1 Dust Monitoring

Spot measurements of ambient dust were made at seven pre-defined monitoring locations under existing conditions. The seven monitoring locations, shown on Figure 4.2, are summarized below:

- NM-1 – West of the main station
- NM-2 – South end of the main station at the sealift unloading location
- NM-3 – Northwest of the powerhouse within the main station
- NM-4 – North of the existing sewage lagoon within the main station
- NM-5 – North end of the main station at the dead line
- NM-6 – North of the west end of the runway at the DND facilities
- NM7 – South of the west end of the runway at Fort Eureka

Figure 4.2. Atmospheric Environment Monitoring Locations



Ambient particulate matter (PM) data was collected using a DustTrak dust monitor (model DRX 8533) in August 2015. Calibration of the dust monitor was completed in the field at test conditions before and after each measurement campaign with a zero filter. Calibration was valid during the period of monitoring.

Spot measurements of ambient dust (i.e., particulate) levels were completed through multiple 1-minute DustTrak logs at each monitoring location at various observation periods. Levels of total PM, as well as PM less than 10 and 2.5 microns (µm) in diameter (PM_{10} and $PM_{2.5}$) were measured. The dust monitoring data are summarized in Table 4.3 for total PM, PM_{10} and $PM_{2.5}$.

At the time of monitoring, construction of the new multipurpose building project was underway. The ongoing activity included clearing and excavation of the footprint for the building foundation. For the purposes of establishing ambient particulate levels in the project area, the minimum recorded particulate levels are considered to represent the true ambient dust levels and the maximum recorded particulate levels are considered to represent the ambient dust levels as influenced by the ongoing project work and other operations within the Project area.

Based on the monitoring results, NM-5 would be most reflective of true background and indicative of a remote wilderness environment where particulate levels are low and influenced by wind induced dust.

The monitoring data shows that levels of $PM_{2.5}$ are high in comparison to total PM, which suggests that the PM is primarily influenced by the exhaust of passing vehicles. The fact that the lowest monitored levels of PM were observed at the monitoring location farthest from an adjacent roadway (i.e., NM-5) supports this conclusion.

A comparison of the maximum monitored levels in close proximity to the ongoing activity at NM-3 to the maximum monitored levels at NM-5 shows that the effects of ongoing activity are limited to within 300 metres. If activity level is similar for future project work, local effects are expected to be kept within 300 to 500 metres.

Table 4.3. High Arctic Weather Area Dust Monitoring Data

Location	Dust Concentration (µg/m³)					
	Total PM		PM_{10}		$PM_{2.5}$	
	Average Minimum	Instantaneous Peak	Average Minimum	Instantaneous Peak	Average Minimum	Instantaneous Peak
NM-1 – West of the main station	0	32	0	19	0	14
NM-2 – South end of the main station at the sealift unloading location	ND	74	ND	75	ND	73
NM-3 – Northwest of the powerhouse within the main station	ND	35	ND	35	ND	35
NM-4 – North of the existing sewage lagoon within the main station	ND	147	ND	147	ND	147
NM-5 – North end of the main station at the dead line	0	3	0	3	0	3
NM-6 – North of the west end of the runway at the DND facilities	ND	60	ND	52	ND	50
NM-7 – South of the west end of the runway at Fort Eureka	ND	80	ND	80	ND	80

Notes: PM = particulate matter

ND = non-detect

4.2.2.2 Literature Review

A review of an air quality effects assessment submitted to the NIRB for a nearby project (Mary River Project, Baffin Island) was completed to characterize ambient air quality in a similar environment. The Mary River Project is located approximately 1,000 km south of the HAWS in a comparable setting.

The assessment of background air quality for the Mary River Project described in *Air Quality Baseline Study, Baffin Iron Mines Corporation, Mary River Project* (RWDI Air Inc., December 2008) measured total PM concentrations of 3.0 to 7.0 µg/m^3 which "represent low, pristine levels that can be viewed as typical of remote Arctic areas". Similarly, PM_{10} concentrations of 1.5 to 3.8 µg/m^3 were measured. $PM_{2.5}$ measurements were not performed for the *Air Quality Baseline Study, Baffin Iron Mines Corporation, Mary River Project* (RWDI Air Inc., December 2008) because "based on experience in such pristine environments, where particulate matter levels are very low – short-term monitoring would yield results below the levels of detection."

4.2.2.3 Existing Air Quality

In summary, the ambient particulate levels observed at NM-5 are comparable to the particulate levels identified during the literature search, which are pristine and typical of remote Arctic areas. Increased levels were observed in close proximity to the ongoing project work (i.e., construction of the new multipurpose building foundation) and other operations within the project area.

4.2.3 Noise

4.2.3.1 Noise Monitoring

Sound level data was collected using a Quest SoundPro DL-2-1/1 sound level meter in August 2015. Calibration of the sound level meter was completed in the field at test conditions before and after each measurement campaign with the QC-10 acoustic calibrator. Calibration was valid during the period of monitoring.

Spot measurements of ambient sound levels were completed by observing and recording the minimum and maximum slow response A-weighted sound levels within 5-minute observation periods. For the purposes of establishing ambient noise levels in the project area, the minimum recorded sound levels are considered to represent the true ambient sound levels and the maximum recorded sound level are considered to represent the ambient sound levels as influenced by the ongoing project work and other operations within the project area.

The noise monitoring data are summarized in Table 4.4. The true ambient data are indicative of a remote wilderness environment where noise levels are relatively low and are strongly influenced by sounds of nature and wind induced noise effects.

Table 4.4. High Arctic Weather Area Noise Monitoring Data

Location	Observed Sound Level (dBA)				Detailed Observations
	True Ambient		Increased Ambient		
	Overall Minimum	Average Minimum	Overall Maximum	Average Maximum	
NM-1 – West of the main station	38.0	40.2	56.9	50.2	True ambient dominated by sounds of nature (wind, waves, birds) and continuous operation of distant powerhouse; increased ambient influenced by traffic on adjacent road; noise of ongoing construction activities not audible
NM-2 – South end of the main station at the sealift unloading location	34.3	40.8	60.1	50.1	True ambient dominated by sounds of nature (wind, waves); increased ambient influenced by traffic on adjacent road; noise of ongoing construction activities not audible
NM-3 – Northwest of the powerhouse within the main station	49.7	52.7	69.4	62.2	True ambient dominated by continuous operation of adjacent powerhouse; increased ambient influenced by nearby construction of new multi-purpose building (i.e., ongoing project work)
NM-4 – North of the existing sewage lagoon within the main station	42.5	45.7	69.7	60.5	True ambient dominated by sounds of nature (wind and waves) and continuous operation of distant powerhouse; increased ambient influenced by truck movements associated with nearby construction of new multi-purpose building (i.e., ongoing project work) as well as plane fly overs and release into adjacent sewage lagoon
NM-5 – North end of the main station at the dead line	32.3	33.7	57.5	52.1	True ambient dominated by sounds of nature (wind, waves, birds); increased ambient influenced by equipment associated with nearby construction of new multi-purpose building (i.e., ongoing project work)

Table 4.4. High Arctic Weather Area Noise Monitoring Data (Cont'd)

Location	Observed Sound Level (dBA)				Detailed Observations
	True Ambient		Increased Ambient		
	Overall Minimum	Average Minimum	Overall Maximum	Average Maximum	
NM-6 – North of the west end of the runway at the DND facilities	35.3	40.4	84.3	58.3	True ambient dominated by sounds of nature (birds); increased ambient influenced by plane landings (single and twin engine) at adjacent Eureka runway and truck movements associated with distant construction of new multi-purpose building (i.e., ongoing project work)
NM-7 – South of the west end of the runway at Fort Eureka	35.3	35.3	56.9	48.7	True ambient dominated by sounds of nature (light wind, birds); increased ambient influenced by traffic (dump trucks and pick-up trucks) on nearby road

4.2.3.2 Literature Review

A review of a noise effects assessment submitted to the NIRB for the Mary River Project was completed to identify noise levels in a similar environment. The assessment of ambient noise for the Mary River Project described in *Noise Baseline Study, Baffin Iron Mines Corporation, Mary River Project* (RWDI Air Inc., November 2008) concluded that "average 24-hour sound exposures ranged from 25 to 30 dBA, depending on location". The baseline monitoring locations most comparable to the HAWS environment (i.e., in close proximity to Arctic Ocean waterway inlets) had baseline monitoring results of 29 and 30 dBA.

4.2.3.3 Existing Noise Environment

In summary, the minimum uninfluenced ambient sound levels observed in the HAWS area (i.e., natural sounds of nature at NM-2, NM-5, NM-6 and NM-7) are comparable to the sound levels identified during the literature search. With consideration of the above information, a conservative approach to establishing background sound levels was applied. An existing noise level of 35 dBA was selected for 24-hour sound levels and applied as the background value for assessing the relevance of potential changes in sound levels as a result of Project Improvement activities at the HAWS.

4.3 Geological Environment

4.3.1 Geology

The HAWS is situated in the Eureka Hills Ecoregion, within the Northern Arctic Ecozone. The topography in the area is rolling and ridged, and reaches altitudes of no greater than 1000 m above sea level. Underlying strata include Mesozoic and Tertiary sandstone and shale, which have large trenches cut out of them. The trenches form the sinuous, curving drainage that is apparent in the area (Phase I ESA - PWGSC, 2007). The geology of the HAWS site was observed by Columbia/Franz (2010) to be composed of silty clay, with some gravel and cobble.

4.3.2 Hydrogeology

Hydrogeologic information was obtained from Columbia/Franz (2010). Regionally, sinuous drainage formed by carving of the underlying sandstone is apparent, as well as within the study area. Water has formed gullies and seasonal creeks that drain into the Slidre Fjord of the Fosheim Peninsula, and subsequently into the Eureka Sound and Arctic Ocean. The main natural source of surface fresh water at the HAWS is Station Creek, which is seasonally flowing. It flows in early June on the west side of the main facilities at the HAWS, from north to south. Flow from the creek discharges into the salt water of Slidre Fjord and ultimately into Eureka Sound and the Arctic Ocean. The HAWS is in an area of continuous permafrost. In high, dry locations the active layer is at approximately 0.60 metres below surface and in wet, low areas permafrost is located at

approximately 0.80 metres below surface. On south facing slopes, the active layer can reach a depth of approximately 1.2 metres. The water reservoir is the source of domestic water, which is also located on the west side of the main facilities. The reservoir is replenished yearly by the seasonal pumping of Station Creek. A sewage lagoon is located at the south end of the site's facilities on the shore of Slidre Fjord (Columbia/Franz, 2010).

4.3.3 Soil Quality

Negligible chemical weathering and plant action in the arctic environment contribute to poor soil profile development. Thus, soils at the HAWS are composed mostly of sand/gravel fill, underlain by silty, sandy clays – mainly sands, silts, and clays. Specifically, these soils are composed of lithosols and regosols of the Rawmark Great Soil Group, and are typically 18% sands, 47% silts, and 35% clays. Soils include Regosolic Static Crysosols and Orthic Turbic Cryosols over top of colluvial, alluvial and marine deposits (Phase I ESA - PWGSC, 2007).

Several investigations have been carried out at the HAWS and nearby Eureka runway to evaluate the potential risks associated with the various A(P)ECs, including a Detailed Quantitative Risk Assessment (DQRA) carried out in 2010 (Franz/SENES, 2011). This DQRA also derived site-specific target levels (SSTLs) for soil, sediment and surface water, which were subsequently updated in 2013 (Franz/SENES, 2013c). Only the contamination within A(P)ECs of relevance to the Project Improvements are discussed here.

Background soil sampling programs have been ongoing annually since 2009 at a variety of locations throughout the EC reserve lands in areas of historic land use and facility operations, the most recent of which (Franz/SENES, 2013b) indicated that arsenic is naturally elevated in the area. Nonetheless, soils contaminated with both arsenic and PHCs have been documented in the area.

Soils contaminated with PHC are present in the vicinity of the Eureka runway. Of particular interest are the results associated with the former First Air lease which is in proximity to the proposed location for the worker camp (see Figure 2.1). As part of the 2009 Phase III ESA (Franz, 2009), hydrocarbon staining was observed on soil adjacent to the east and west walls of the easternmost building, the white fuel tank at the middle building and the red fuel tank at the western building. Consequently, the Phase III ESA collected and analyzed soil samples for PHCs, benzene, toluene, ethylbenzene and xylenes (BTEX), metals, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). Two samples were found to have PHC and/or BTEX concentrations exceeding the applicable standards, and two other samples had nickel concentrations exceeding the applicable standard. The estimated 100 m^3 of PHC-impacted soil was found to be the result of historic fuel handling and storage. Given the silty clay substrate, migration of contamination was not anticipated. No recommendations were made regarding further investigations or remedial work, provided the land use remains unchanged and the buildings unoccupied (Franz, 2009; Columbia/Franz, 2010).

An estimated total of 12,600 m^3 of PHC-contaminated soils exists throughout the main HAWS site as a result of historical spill events, including a 40,000 L diesel spill in 1973/74 and a 37,000 to

40,000 L diesel spill in 1990, both at the old tank farm where an in-situ landfarm currently exists (AEC B-2; Figure 1.2 and Figure 1.3). Additional sources of contamination across the HAWS may be associated with localized vehicle and equipment spills and fuel handling. At AEC D (Figures 1.2 and 1.3), a spill was reported to have occurred in 1996/97 at the former day tank immediately north of the powerhouse (at what is now the location of the new garage), and oil was observed dripping from a valve at the Powerhouse into an open drum in 2008 and 2009. Numerous soil samples in this area have concentrations of BTEX, PHCs, metals and PAHs above applicable guidelines, at levels indicative of free product (Franz, 2009).

4.4 Aquatic Environment

4.4.1 Hydrology

A hydrology assessment was conducted by WorleyParsons (2010), which established an estimate of the quantity of water that could be withdrawn from Station Creek, the water source for the current and future reservoirs, without adverse environmental effects. Figure 4.3 shows the area of the existing water reservoir and Station Creek.

The results of a hydrology assessment conducted in August 2010 indicate that the drainage area of Station Creek, at the HAWS, is approximately 109.6 km^2 and is shown on Figure 4.4. Based on two methods, it was found that the mean seasonal flow in Station Creek could range from 0.9 m^3/s to 5.1 m^3/s, and was also estimated to be 3.0 m^3/s. The estimated volume passing the HAWS over a period of 30 days would therefore range between 2.4 and 13.3 million m^3. The estimated annual water demand for a station population of 60 is 8,500 m^3. This demand represents a withdrawal of 0.4% of the lowest estimated annual volume. Thus, it is estimated that Station Creek has adequate volume to supply the HAWS with water (WorleyParsons, 2010).

A water licence is already approved and an amendment is underway which will include the proposed projects. The amendment was to include the increased water usage for the runway and building projects, and increase of workers.

Figure 4.3. HAWS Water Supply Study Site Overview

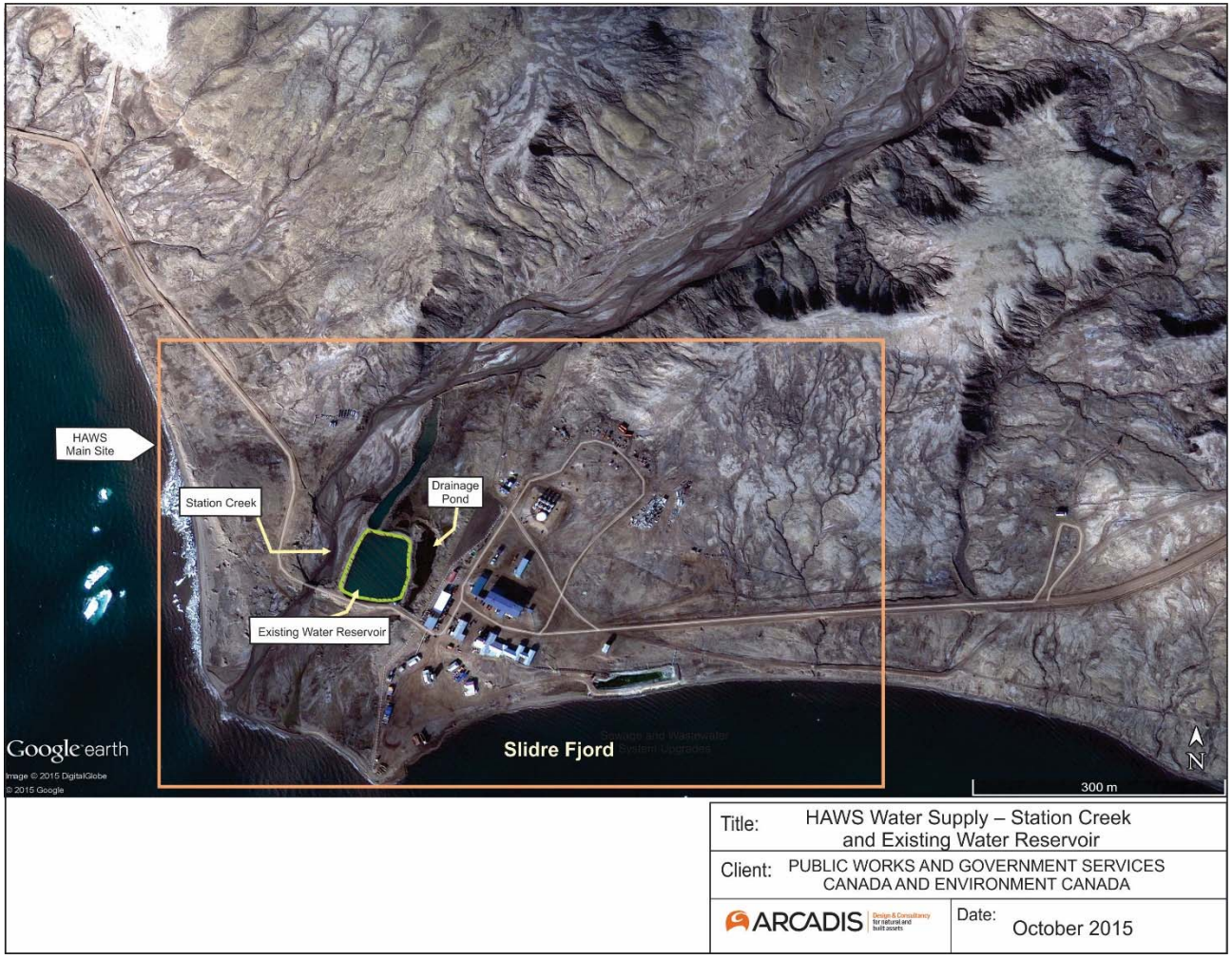
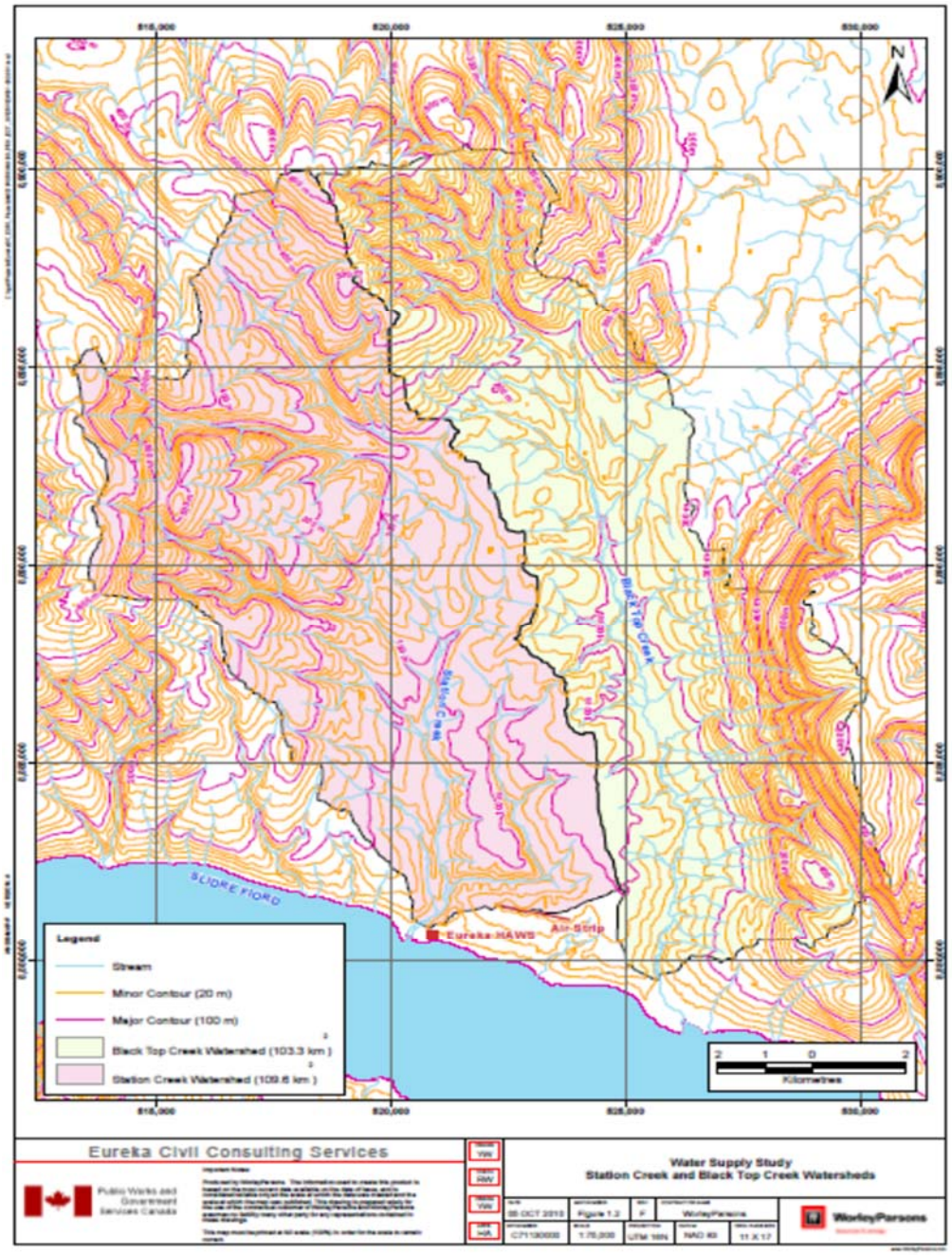


Figure 4.4. HAWS Watershed Description Map



4.4.2 Water and Sediment Quality

Background sampling of surface water and sediment was conducted as part of the 2012 Supplemental Investigation (Franz/SENES, 2013b). Chemical analysis of background surface water samples indicated naturally elevated concentrations of aluminum, cadmium, copper, lead, iron, manganese, and zinc in surface water. The background sediment sampling program found arsenic and copper concentrations above environmental quality guidelines.

Existing baseline water quality data was obtained from testing conducted by WorleyParsons (2010). The overall water quality for Station Creek was assessed by collecting and analysing water samples from the reservoir. At the time of sampling (August 2010), the water reservoir had a temperature of 5.9ºC, an electrical conductivity of 797 µS/cm and a pH of 7.49. Water quality parameters of Station Creek were generally below the Canadian Drinking Water Quality Guidelines (CDWQG) with the exception of the following:

- Turbidity exceeded the Aesthetic Objective (AO) of 0.1 Nephelometric Turbidity Units (NTU) with a value of 3.27 NTU;
- Total Dissolved Solids (TDS) was measured at a concentration of 544 mg/L, exceeding the AO of 500 mg/L in August 2010;
- Historically, dissolved sodium has been almost double the AO, ranging from 333 to 507 mg/L; and
- Aluminum exceeded the AO for the first time since sampling began with a concentration of 0.215 mg/L.

It is recommended that turbidity be controlled as there may be a potential for suspended matter to contain heavy metals, biocides, and potentially protecting microorganisms from disinfection (Health Canada, 2003). Health Canada (2008) guidelines suggest an AO of less than or equal to 500 mg/L for TDS to minimize hardness, unpalatability, mineral deposition and corrosion, and some individual components of TDS can affect human health (Health Canada, 1978a and Health Canada, 1978b; as updated 1991). Components of TDS which are known to affect human health have been provided in individual guidelines by Health Canada (2008).

Health Canada (2008) guidelines suggest an AO of less than or equal to 200 mg/L for sodium. Sodium is not acutely toxic in the normal range of environmental or dietary concentrations, since the body naturally possesses very effective mechanisms to control sodium levels (Health Canada 1979).

There are no known adverse health effects to ingesting aluminum and no known effects on water distribution systems (Health Canada 1998). However, Health Canada (2008) guidelines suggest an AO of 0.1 mg/L, as a preventative measure.

In addition to soil contamination throughout AEC D, the Phase III ESA (Franz, 2009) found sediments in the drainage pond area immediately downgradient of the Powerhouse with elevated PHC, BTEX, metal and PAH concentrations. Surface water samples collected concurrently did not

have elevated concentrations, and sheen on the water was not observed until the sediments were disturbed.

4.5 Terrestrial and Marine Environments

The following subsections address the current terrestrial and marine environments at the Eureka site. Vegetation communities and species are discussed in Section 4.5.1 and wildlife communities and species are described in Section 4.5.2.

4.5.1 Vegetation Communities and Species

Surveys of the plant community and the dominant plant species and distribution around the HAWS site are not available. The site is in ecodistrict 21, situated within the Eureka Hills ecoregion of the Northern Arctic ecozone. The ecoregion includes Axel Heiberg and Ellesmere Islands. General descriptions of plant communities include low-growing herbs and shrubs such as purple saxifrage, *Dryas spp*., arctic willow, sedge and arctic poppy.

The extreme environmental conditions have a significant impact on the ecological recovery of vegetation at disturbed sites at Eureka. Low light levels, extremely low ambient temperatures and lack of moisture and nutrients limit plant productivity. While a precipitation value of 50-150 mm per year has been used for HAWS assessments (PWGSC 2007), the climate conditions listed by Agriculture Canada for the ecodistrict indicates average precipitation at the lower end of this range. Average total precipitation for the ecodistrict is 68 mm/year, 53 mm of which is snow. Due to evaporation of moisture during summer months, the area experiences a deficit of 361 mm of moisture annually. There are only 16 effective growing days annually (days above 5°C adjusted for day length) in the area around Eureka. The area has >90% continuous permafrost, with <20% ground ice.

Changes to vegetation are expected in the High Arctic terrestrial ecosystem as a result of warming ambient temperatures. Long-term monitoring programs were established in Quttinirpaaq National Park in 1990 using several measures of environmental change (Broll *et al.* 2003). Changes recorded between 1990 and 2002 include warming soil temperatures, with an increase in the depth of the active layer. Changes in permafrost caused changes in the hydrological conditions and soil moisture. A review of climate changes in the Canadian Arctic indicate that the ambient temperature has increased 1.5 to 3°C between 1953 and 2007, while precipitation has increased by roughly 10% (Stein *et al.* 2013). If these trends continue, the plant community will undergo changes in species and numbers in response to the changing environment.

4.5.2 Wildlife Communities and Species

The HAWS has been in place since 1947; however, there are no rigorous surveys of the animal community in the area, the species abundance, or other measures of species presence. While

some ecological information is available for many species based on studies conducted in the Arctic, further south of Eureka, important site specific data, such as the numbers of nesting sites for breeding birds, or the density of small mammal species, are not available. For example, the number of ground nesting breeding birds during the summers would allow some estimation of the impacts of disturbed ground from borrow sites or new construction. The Arctic Biodiversity Assessment (CAFF, 2013) estimated that the High Arctic portion of the Canadian Archipelago has a very low biodiversity, with roughly 10 resident mammalian species.

Wildlife sightings are recorded weekly at the HAWS and provide some site specific information on wildlife species in the area and potential interactions with workers on site. The most common sightings are for muskox, arctic hare and wolves, with many sightings within the boundary of the site. Waterfowl, including red-necked loons, have been observed on the Fjord but their nesting sites relative to the station are unknown. Polar bears have been observed in the area but at some distance from the HAWS (refer to Appendix C for more detail on recorded sightings at the HAWS and in the vicinity of the station).

Some data are available from breeding bird surveys at other sites in the High Arctic. Pattie (1977) reported the numbers of regular and occasional breeding birds on Devon Island, a High Arctic ecosystem roughly 500 km to the south of Eureka. Most of the bird species were shorebirds, seabirds and colonial waterfowl. The dominant terrestrial birds that were present every year of the survey were the rock ptarmigan, the Lapland longspur and the snow bunting, with the raven and snowy owl less common. Pattie reported a density of 40 birds per km^2 in July 1972 at Sildre Fjord, with 12 species of birds, equivalent to other high Arctic sites. These results corresponded with a survey reported by Nettleship and Maher (1973) at Hazen Lake, roughly 300 km to the northeast of Eureka. Trefry *et al*. (2010) reported several years of breeding bird survey results from the east coast of Ellesmere Island. Snow buntings, Lapland longspur and Baird's sandpiper were the most abundant species. The density of snow buntings was 1.0 to 1.5 pairs per km^2, while the Lapland longspur reached 1.5 to 2.0 pairs per km^2. These results were used to include the snow bunting as a representative songbird in the selection of Valued Ecosystem Components in the current assessment.

Parks Canada has conducted periodic surveys of wildlife on north Ellesmere Island to establish wildlife presence and numbers before the establishment of Quttinirpaaq National Park. Data for 1989 to 1997 (summarised in 1 file), 2002 and 2008 were obtained in spreadsheet form from J. Chisholm, Nunavut Field Unit, Parks Canada, Iqaluit. No detailed methods were included in the data, although most transects were flown with two observers in small aircraft in early to mid-June. The 1989 to 1997 data set included a number of marine species, including ringed seal, bearded seal and walrus, however the marine transects extended far north of Ellesmere Island and are not relevant for Eureka. The surveys indicated that the dominant terrestrial mammal is the muskox, with several dozen in the area at any time (Table 4.5). Peary caribou are also present although their numbers were consistently low. The number of arctic hare is variable with only 10 reported annually for the 10 year span from 1989 to 1997, yet over 3500 in 2008. The arctic hare was often observed in groups of 20-30 animals. Dominant birds include the gyrfalcon and the snowy owl. Snow geese (not shown in Table 4.4) are also reported in fairly large numbers. Table 4.6 provides

a summary of species reported to be present in the area, as well as the associated Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or SARA status.

Table 4.5. Wildlife Species Reported on North Ellesmere Island from Surveys Conducted for Quttinirpaaq National Park

Common Name	Scientific Name	1988 to 1997	2002	2008
Peary Caribou	*Rangifer tarandus pearyi*	415	8	33
Muskox	*Ovibus moschatus*	2,861	126	436
Polar bear	*Ursus maritimus*	13	-	-
Arctic wolf	*Canus lupus*	55	-	-
Arctic fox	*Alopex lagopus*	13	-	2
Arctic hare	*Lepus arcticus*	97	-	3574
Short-tailed weasel	*Mustela erminea*	2	-	-
Nearctic collared lemming	*Dicrostonyx groenlandicus*	10	-	-
Gyrfalcon	*Falco rusticolus*	29	-	3
Snowy owl	*Nyctea scandiaca*	24	-	4
Rock ptarmigan	*Lagopus mutus*	28	-	-

Source: J Chisholm, Parks Canada (personal communication) 2015.

Table 4.6. Wildlife Species Summary and COSEWIC/SARA Status

Species	Scientific Name	Niche	COSEWIC/SARA STATUS
Terrestrial System			
Plants and lichen	-	Producer	-
Rock ptarmigan	*Lagopus mutus*	Widely distributed land bird feeding on seeds	No assessment
Snowy owl	*Bubo scandiacus*	Predatory bird, nesting in far North in summer	COSEWIC: Not at Risk
Nearctic collared lemming (or Peary Land Collared Lemming)	*Dicrostonyx groenlandicus*	Widely distributed small mammal; food source for upper trophic levels	No assessment
Snow bunting	*Plectrophenax nivalis*	Seed eating songbird that nests up to Ellesmere Island in the summer.	No assessment
Arctic fox	*Vulpes lagopus*	Predator feeds/ scavenges in terrestrial and marine systems.	Not at Risk
Peary Caribou	*Rangifer tarandus pearyi*	Large herbivore, subsistence hunting, traditional diet	SARA: High Arctic population: Schedule 1, Endangered
Muskox	*Ovibos moschatus*	Large herbivore, subsistence hunting, traditional diet	Not at Risk
Marine System			
Benthic Invertebrates	-	Could be highly exposed to run-off in nearshore environment or affected by physical disturbance	-
Arctic sculpin	*Myoxocephalus scorpiodes*	Benthic species; habitat is littoral zone	No assessment
Arctic cod	*Boreogadus saida*	Pelagic species; widely distributed food source for upper trophic levels	No assessment
Ivory gull	*Pagophila eburnea*	Endangered species that feeds in the nearshore marine environment	SARA: Schedule 1, Endangered
Ringed seal	*Phoca hispida*	Widely distributed; food source for polar bear	Not at Risk
Polar bear	*Ursus maritimus*	Top marine predator	SARA: Schedule 1, Special Concern

Sources:

The Birds of North America (online). Cornell Lab of Ornithology.

Environment and Natural Resources. NWT Species at Risk Database.

Species at Risk Public Registry.

4.6 Physical and Cultural Resources

4.6.1 Archaeology

4.6.1.1 Pre-Contact History

There are hundreds of archaeological sites located on Ellesmere Island, the majority of which are concentrated in Quttinirpaaq National Park, located approximately 225 km to the north east of Eureka. About 285 archaeological sites have been documented in the national park (Parks Canada, 2009b). Archaeological evidence unearthed in Quttinirpaaq National Park has revealed that the park and the surrounding region have been occupied by humans for centuries. People have resided on Ellesmere Island for thousands of years, beginning with the arrival of the Paleo-Eskimos of the Independence I culture (approximately 2000 – 4000 B.C.). They were named after the Independence Fjord in northern Greenland, where the first evidence of these people was identified by the Danish archaeologist Count Eigel Knuth. These Paleo-Eskimos arrived after crossing the Bering Strait from Siberia. Artifacts such as tent rings and stone tools were discovered. In addition, remains of their campsites found in the national park, characterized by box-shaped hearths, reveal that they were few in number and that they were present in the area for only about 300 – 400 years. In these hearths, they burned willow, grasses, driftwood, and muskox bones. They were resilient people who hunted muskox and caribou, using whatever material they could find to produce heat during the long, dark arctic winters. They lived in above ground tents year-round, which were most likely covered in muskox hide (Parks Canada, 2009a; Rast, 2015).

For many centuries after the existence of the Paleo-Eskimos, no evidence has been found in the national park to suggest human occupation. Approximately 3000 years ago, a second wave of Paleo-Eskimo people of the Independence II culture migrated across the arctic islands and reached Quttinirpaaq (1000 – 500 B.C.). The Dorset people later arrived and remained on the island until approximately 1000 years ago (A.D. 800 – 1000). The Thule people followed (A.D. 1600 – 1850) and became skillful hunters of whales and other marine mammals. The Thule culture survived elsewhere in the arctic. However, Ellesmere Island and Quttinirpaaq was abandoned by the Thule as the climate became colder and harsher, leading up to the Little Ice Age. The Thule are the ancestors of the modern Inuit (Parks Canada, 2009a). In addition to these relics, those of historic Inuit/Inughuit cultures and of exploratory, scientific, and government activities of the nineteenth and twentieth centuries have also been unearthed (Parks Canada, 2009b). It has been mentioned that a Thule tent ring had been sighted in an area located approximately 10 km from the EC reserve at Eureka, during discussions with the HAWS station manager during the site visit which took place in August 2015.

4.6.1.2 Post-Contact History

Northern Ellesmere Island was first visited by Europeans in 1875, when the British Arctic Expedition sailed through the Nares Strait and established wintering quarters for the HMS Discovery off Lady Franklin Bay, in the sheltered harbour. The HMS Alert, the sister ship to Discovery, wintered 160 km to the north on the shore of the Arctic Ocean. The harbour is now

known as Discovery Harbour. Sledging parties departed from the ships in the spring of 1876 to explore the northern terrain. The expedition was forced to return to England later in 1876 due to the explorers' becoming ill with scurvy (Parks Canada, 2009b).

The United States Army's Lady Franklin Bay Expedition arrived at the same site in 1881, under the leadership of Lieutenant Adolphus Greely, for one of two expeditions staged by the United States in contribution to the International Polar Year (an undertaking by twelve countries in an effort to establish scientific stations in regions bordering the North Pole). The US expedition established a station that they named Fort Conger. When supply ships failed to reach the group in 1882 and 1883, they retreated and became stranded on Pim Island, located on Ellesmere Island's eastern coast. Only seven out of the 26 men survived.

In 1899, Robert Peary, and American explorer, arrived at the abandoned Fort Conger, in hopes of using the Fort as a base station to reach the North Pole. This expedition was accompanied by Inughuit guides from northwestern Greenland. Aboriginal traditional knowledge including the use of fur and local food, allowed the expedition to better cope with the harsh conditions. Combining the traditional knowledge and European technology, the base camp structures at Fort Conger were modified so as to function well in the cold arctic climate. Peary operated expeditions in 1900-01, 1905-06, and 1908-09 from the refurbished Fort Conger. The fort later provided shelter to American, Norwegian, Danish, and British/Canadian expeditions in 1915, 1920, 1921, and 1935. The Fort Conger is presently a significant archaeological resource, and it has been designated as Classified Federal Heritage Buildings protected by Quttinirpaaq National Park as important cultural resources (Parks Canada, 2009a).

4.7 Socio-Economic

4.7.1 Aboriginal Communities

The two established communities that are nearest to Eureka are Grise Fjord (Ausuittuq) and Resolute Bay (Qausuittuq). Both of these communities are Inuit communities.

The closest community is the hamlet of Grise Fjord, which has a population of approximately 130 (as of the 2011 census), and it is located approximately 400 km south of Eureka, at the southern tip of Ellesmere Island. This Inuit community is the northernmost community in Canada (Parks Canada, 2009b; Statistics Canada, 2012a).

Resolute Bay is a hamlet located approximately 625 km south of Eureka and 900 km south of Quttinirpaaq National Park, on Cornwallis Island. It is the location of the closest major airport to Eureka and to the national park. Resolute Bay has a population of approximately 214 (as of the 2011 census) (Parks Canada, 2009b; Statistics Canada, 2012b).

Refer to Figure 4.5 for a map illustrating the locations of the closest community to Eureka and the National Park.

Other communities on Ellesmere Island consist of transient communities conducting scientific research, including universities and government agencies, which is a major activity in the national park region, and in Eureka. The Polar Continental Shelf Project (PCSP) (Natural Resources Canada (NRCan)), based in Resolute Bay, provides logistical support for these activities (Parks Canada, 2009b).

The residents of Ellesmere Island include the year-round permanent residents of Grise Fjord, the military and civilian personnel associated with Canadian Forces Station, Alert (located approximately 480 km northeast of Eureka and 45 km northeast of the national park), the summer base of operations for the Canadian Department of National Defence at Eureka, the personnel working at the weather station at Eureka, and the Parks Canada staff working in Quttinirpaaq from May through August each year (Parks Canada, 2009b).

Figure 4.5. Location of Eureka in Proximity to Closest Community

4.7.2 HAWS and Research Station

The HAWS is home to 8 full-time staff year round. A 3-month rotation for staff is the normal length of each tour. The site sees a number of transients that include contractors, researchers, maintenance workers and occasionally tourists or expedition teams. The numbers of transients vary each year but predominately come to the station from May through October.

The main complex provides beds for 50, including the full time staff. In addition to the weather station offices, other features include full industrial kitchen and dining room, laundry facilities, recreation room, library/office, and TV room.

The volume of traffic movements at the runway vary each year as shown in Table 4.7 below. The number of traffic movements do not reflect helicopter traffic associated with NDN or the Polar Shelf research. These aircraft use the runway apron located south of the runway near Fort Eureka. The HAWS is serviced with a regular charter every six weeks which brings fresh produce, mail, and staff. Helicopters are also known to occasionally use the Eureka airport.

Table 4.7. Number of Aircraft Flights, Eureka Runway

Year	June	July	August	September
2012	119	233	34	8
2013	95	130	22	26
2014	74	80	44	29
2015	88	64	Not available	Not available

5 ASSESSMENT OF ENVIRONMENTAL EFFECTS AND MITIGATION

The assessment of the potential effects of the project on the environment was carried out in four stages:

i. identification of project-environment interactions with potential adverse environmental effects;
ii. consideration of mitigation measures for potential adverse effects;
iii. identification of residual effects that may remain following mitigation; and
iv. evaluation of the significance of any residual effects.

5.1 Identification of Project-Environment Interactions

It is assumed that the operation phase for each Improvement Project will commence immediately following construction. The operation phase for the Improvement Projects has not been evaluated independently as no measureable changes from existing conditions are anticipated as a result of these Improvement Projects.

Decommissioning activities of each of the four Improvement Projects are also not evaluated as decommissioning is not contemplated at this time nor in the foreseeable future. However, decommissioning of the existing water reservoir is a component of the Reservoir Upgrades Improvement Project, and decommissioning of the new reservoir to be built as part of the Improvement Project is not contemplated.

The Improvement Projects were broken out into components (see Section 3) and screened to identify those with the potential for project-environment interaction. All project components were described and analyzed individually to determine if there was a plausible mechanism for an effect on each environmental component. The analyses were based on professional judgement and experience with regard for the physical and operational features of each Improvement Project and their potential interactions with the environment. The results are summarized in Table 5.1.

5.2 Consideration of Mitigation Measures for Potential Adverse Effects

For each potential adverse effect resulting from a measurable change in the environment, possible means of mitigation to eliminate, reduce or control the effect were identified. As an existing facility with many years of operating experience, the HAWS has numerous features and operational practices already in place to mitigate environmental effects. In addition, the HAWS is subject to mitigation measures regulated by the NIRB. Appendix D provides the NIRB Decision of Screening for the Eureka runway Improvement Project, which identifies a number of mitigation measures to be implemented.

5.3 Identification of Residual Effects that May Remain Following Mitigation

Following identification of feasible mitigation measures, each likely adverse effect was re-evaluated to identify any residual adverse effects. A residual effect is one which remains after mitigation has been put into place and would be measurable or observable on the selected VEC. The criteria used in the assessment were based on regulatory standards and guidelines, the scientific literature and existing conditions.

5.4 Evaluation of the Significance of any Residual Effects

Most of the likely adverse effects resulting from a measurable change in the environment were found to have no residual adverse effects and were not assessed further. For those where a residual effect was identified, the effect was evaluated for significance using the measurement parameters defined in Table 5.2.

The effects levels within each parameter were ranked low, medium or high. A residual effect was deemed significant if a medium or high rating was attained for all of the attributes involving magnitude, geographic extent, duration, frequency, and reversibility, and a medium or high rating was attained for ecological value or sustainability. Conversely, if a low rating was achieved for any of the attributes involving magnitude, geographic extent, duration, frequency, or reversibility, or, if a low rating was achieved for ecological value or sustainability, then the effect was considered to be not significant.

In the case of accidents and malfunctions (i.e., unlikely events), frequency was not used as a criterion in the significance determination since this would be redundant (i.e., an unlikely event would, by its very nature, have a low frequency of occurrence). The likelihood of an effect occurring was determined for any residual effect that was deemed significant, consistent with the Canadian Environmental Assessment Agency (CEAA, 1994).

Table 5.1. Project Environment Interactions Matrix

Improvement Project	Project Phase	Project Components	Physical Environment										Biological					Socio-Economic			
			Designated Environmental Areas (i.e., Parks, Wildlife Protected areas)	Ground Stability	Permafrost	Hydrology/ Limnology	Water Quality	Climate Conditions	Surface and Bedrock Geology	Sediment and Soil Quality	Air Quality and Climate Change	Noise	Vegetation	Wildlife	Birds	Aquatic Species	Wildlife Protected Areas	Employment	Community Wellness	Community Infrastructure	Human Health
Eureka Runway Recap	**Construction** Work to begin in summer 2015 with the runway project starting in summer 2017.	Aggregate extraction and crushing			●	●	●		●		●	●	●	●	●						
		Construction of gravel access roads to borrow pit			●		●		●	●	●	●	●	●	●						
		Construction of temporary camp			●	●	●		●	●	●	●	●	●	●						●
		Membrane installation for fuel storage areas			●				●	●	●	●	●	●	●						
		Runway resurfacing					●		●	●	●	●	●	●	●						
	Operation	Regular use and maintenance of runway				●	●				●	●	●		●						
		Refueling aircraft				●	●			●			●	●	●						
	Decommissioning	Not contemplated at this time nor in the foreseeable future	Not evaluated as part of this EIA																		
New Multipurpose Building	**Construction** Summer 2015	Clearing and excavating footprint	Not evaluated as part of this EIA (work already completed)																		
		Aggregate extraction and crushing																			
	Construction Summer 2016	Construction of thermosyphons and concrete foundation			●				●	●	●	●	●	●	●						
		Construction of new pre-engineered Behlen steel building									●	●	●	●	●						
	Operation	Regular use and maintenance of storage space and carpentry shop									●	●	●	●	●						
	Decommissioning	Not contemplated at this time nor in the foreseeable future	Not evaluated as part of this EIA																		
Reservoir Upgrades	**Construction** Material to be shipped to the site in summer 2016, with work occurring the summer of 2017 and 2018.	Site preparation, including access road construction and soil excavation																			●
		Aggregate extraction and crushing																			
		Construction of new water reservoir			●	●	●		●	●	●	●	●	●	●	●					
		Upgrades to the existing water treatment plant									●	●	●	●	●						
		Installation of new emergency water supply system									●	●	●	●	●						
		Decommissioning of the existing water reservoir and associated obsolete infrastructure				●	●		●	●	●	●	●	●	●	●					
		Construction of new small pump house and ancillary piping/pumps			●						●	●	●	●	●						
		Construction of access roads as required to construct and service the reservoir			●	●	●		●	●	●	●	●	●	●						
		Installation of cut-off trench and berm		●	●	●	●		●	●	●	●	●	●	●						
	Operation	Regular use and maintenance of reservoir and ancillary buildings (i.e., pump house)				●	●				●	●	●	●	●						
	Decommissioning	Not contemplated at this time nor in the foreseeable future	Not evaluated as part of this EIA																		

Table 5.1. Project Environment Interactions Matrix (Cont'd)

Improvement Project	Project Phase	Project Components	Physical Environment										Biological					Socio-Economic			
			Designated Environmental Areas (i.e., Parks, Wildlife Protected areas)	Ground Stability	Permafrost	Hydrology/ Limnology	Water Quality	Climate Conditions	Surface and Bedrock Geology	Sediment and Soil Quality	Air Quality and Climate Change	Noise	Vegetation	Wildlife	Birds	Aquatic Species	Wildlife Protected Areas	Employment	Community Wellness	Community Infrastructure	Human Health
Sewage and Wastewater System Upgrades	**Construction** Material to be shipped to the site in summer 2016, with work occurring the summer of 2017 and 2018.	Construction of new chemical/physical treatment system			●				●	●	●	●	●	●	●						
		Upgrading of existing sewage lagoon			●	●	●		●	●	●	●	●	●	●						
		New utililidors as required to move wastewater from the main building to the treatment plant and from the treatment plant to the lagoon						●			●	●	●	●	●						
		Stockpiling of crushed aggregate						●	●		●	●	●	●	●						
		Decommissioning and disposal of obsolete infrastructure						●	●	●	●	●	●	●	●						
	Operation	Regular use and maintenance of sewage treatment plant and lagoon facilities				●	●	●					●	●	●						
	Decommissioning	Not contemplated at this time nor in the foreseeable future	Not evaluated as part of this EIA																		

6 EFFECTS OF IMPROVEMENT PROJECTS ON THE ENVIRONMENT

6.1 Atmospheric Environment

6.1.1 Air Quality

6.1.1.1 Project-Environment Interactions

Activities will occur during each Project Improvement component which have the potential to increase ambient air concentrations of dust (i.e., particulate) and greenhouse gas emissions as identified in Table 5.1. The identified Project activities will use typical construction methods. Project activities which may affect air quality and climate include the following:

- aggregate extraction (excavating and earth moving);
- material handling (loading and dumping);
- vehicle travel (transport of aggregate and building materials); and
- fuel combustion.

6.1.1.2 Evaluation of Effects

Air quality and emissions of greenhouse gases could potentially be affected at all phases of construction. During construction, there will be an increase in local airborne particulate (dust) and tailpipe (fuel combustion) emissions from heavy-duty construction equipment operation and construction activities. The tailpipe emissions will include greenhouse gas emissions and therefore have the potential to contribute to climate change. These effects are typical of a construction site, localized, and of a temporary nature.

Ambient dust monitoring was completed at various monitoring locations in the vicinity of the Improvement Projects components as described in Section 4.2.2.1 and summarized in Table 4.3. As noted, the ambient particulate levels observed in the Project area at NM-5 are comparable to the particulate levels identified during the literature search, with increased levels observed in close proximity to the ongoing project work (i.e., construction of the new multipurpose building foundation) and other operations within the project area.

A comparison of the maximum monitored levels at the various monitoring locations shows that the effects are localized to the area of construction and increased traffic activity. A comparison of the maximum monitored levels in close proximity to the ongoing activity at NM-3 to the maximum monitored levels at NM-5 shows that the effects of ongoing activity are limited to within 300 metres. If activity level is similar for future project work, local effects are expected to be kept within 300 to 500 metres.

6.1.1.3 Mitigation Measures for Air Quality and Climate Change

In general, the Project will employ standard operating procedures for equipment/machinery and ensure that regular maintenance is performed in accordance with good engineering practices or as recommended by suppliers such that the equipment is kept in good operating condition. As well, the Project proponent will adhere to conditions outlined in all permits, authorizations and/or approvals.

Other activity-specific mitigation measures will include the use of appropriate exhaust emissions controls such as catalytic converters and diesel particulate filters to mitigate fuel combustion emissions from heavy equipment and vehicles. Additionally, the number of equipment/vehicle movements and travel distances will be optimized to reduce fuel consumption and minimize dust and greenhouse gas emissions. Lowering vehicle speeds on unpaved road surfaces, applying water as well as implementing good road maintenance practices will minimize the potential for road dust emissions.

6.1.1.4 Residual Effects

A residual environmental effect caused by the Improvement Projects is considered significant if it adversely affects the long-term viability of the VEC. A residual effect is considered to be not significant if the effect causes a change in the VEC that is within the range of natural variability, or does not affect the integrity of the VEC in a measurable or meaningful way.

Because of the possible linkage between increased emissions of greenhouse gases and global warming, there is a potential for the Project to contribute to changes in climate in the long term, although, the nature and magnitude of these changes is highly speculative. In particular, the Canadian Environmental Assessment Agency's guide to Incorporating Climate Change Considerations in Environmental Assessment (CEA Agency 2003) notes that climate change is a complex, global phenomenon and unlike most project-related environmental effects, the contribution of an individual project to climate change cannot be measured.

As the Improvement Projects and therefore the above Improvement Projects activities would be of limited frequency and duration, they are not expected to generate substantive air quality and climate change effects. With the implementation of the atmospheric environment mitigation measures (section 6.1.1.3), no residual adverse effects on air quality and climate change are anticipated.

6.1.1.5 Significance of Effect

Not significant.

6.1.2 Noise

6.1.2.1 Project-Environment Interactions

Activities will occur during each Improvement Project which have the potential to increase ambient noise as identified in Table 4.4. The identified Improvement Project activities will use typical construction methods. Project activities which may increase ambient sound levels include the following:

- aggregate extraction (excavating and earth moving);
- material handling (loading and dumping); and
- vehicle travel (transport of aggregate and building materials).

6.1.2.2 Evaluation of Effects

Ambient sound levels in the vicinity of the Improvement Projects could potentially be affected during all construction activities. During construction, there will be an increase in noise emissions from heavy-duty construction equipment operation and construction activities. These effects are typical of a construction site, localized, and of a temporary nature.

Ambient noise monitoring was completed at various monitoring locations in the vicinity of the Project components as described in Section 4.2.3.1 and summarized in Table 4.4. As noted, the minimum recorded sound levels are considered to represent the true ambient sound levels and the maximum recorded sound levels are considered to represent the ambient sound levels as influenced by the ongoing project work and other operations within the project area.

Construction of the new multipurpose building inclusive of heavy equipment operation and elevated vehicle traffic on local roads was ongoing at the time of the monitoring campaign, therefore increased sound levels are potentially attributed to this activity. As was the case for air quality (i.e., dust or particulate), although increased sound levels are observed from baseline ambient levels, a comparison of the “overall maximum” to the “average maximum” (see Table 4.4) shows that the increased sound levels are relatively short in duration and the maximum monitored levels at the various monitoring locations shows that the effects are localized to the area of construction and increased traffic activity.

The physiological and ecological impacts of noise on wildlife have been reviewed in a number of contexts. Birds and mammals rely on sound for communication for reproductive and territorial purposes, communication with young, navigation, avoiding danger and finding food (US Dept of Transportation[9] 2011). Increased noise from motorized recreational vehicles, construction equipment, aircraft and military exercises can result in a stress response in the wildlife that interferes with routine behavior and may affect breeding success. Very high levels of noise, such

[9] (https://www.fhwa.dot.gov/environment/noise/noise_effect_on_wildlife/effects/wild04.cfm; accessed Oct 2015).

as that near jet engines at airports, can cause acute hearing loss in wildlife. The US Dept. of Transport reports that mammals can hear in the range of <10 Hz to 150 kHz, with a sensitivity of 20 dB, while birds show greater uniformity, hearing a range of 100 Hz to 8-10 kHz, with a sensitivity of 10 dB.

The potential impacts of noise on mammals and birds at HAWS is difficult to evaluate without knowing the distribution of species present and the noise generated by the construction activity. The number of flights by aircraft at the airport (and not including helicopter flights) range from a maximum of 233 flights in July of 2012 to 8 in September of the same year. Considerably fewer flights occurred in 2014, ranging from roughly 1 to >2 per day in July and September, respectively. Depending on the types of aircraft (i.e. if sound levels exceed 100 dB). Helicopters are also known to occasionally use the Eureka airport. However, there are no anticipated increases in helicopter traffic as a result of Improvement Project activities. Aircraft flights could cause avoidance of the area by breeding wildlife or disruption of normal feeding and reproductive activity if nests and dens were established before flights began.

The behavior of large mammals, such as caribou, as a result of construction activity has been reviewed by several agencies and ranges from avoidance and displacement to neutral behaviour. Examples of large scale development, such as oil and gas installations in Alaska, have shown examples of avoidance by some age classes (usually females with young) while other age groups such as bulls, show little effect and are more likely than females to be attracted to airstrips, roads and other open areas to avoid insect harassment (AMAP 2010). Studies on Peary caribou and muskox responses to helicopter overflights (Miller and Gunn 1979) reported that a large proportion of both species showed extreme response to helicopter overflights. Several factors affected the response, including the group size and number of young. The long-term impacts to the Peary caribou and muskox from low level flights were unclear.

The nature of the noise (e.g., duration, energy levels, attenuation) and the potential impact from the construction projects is difficult to assess, particularly in light of the amount of flight activity at the airport. It is unlikely that muskox and caribou would be significantly affected by the activity because the area affected is small and it will not impact calving grounds or known breeding sites for large mammals. Noise from the construction of the airstrip will attenuate quickly and is unlikely to affect birds or small mammals in the area, although sustained noise and activity may significantly disrupt routine feeding and breeding activity. Populations of small mammals and birds may benefit if predators avoid the area because of increased human activity and noise.

6.1.2.3 Mitigation Measures for Noise

As stated above, in general, the Project will employ standard operating procedures for equipment/machinery and ensure that regular maintenance is performed in accordance with good engineering practices or as recommended by suppliers such that the equipment is kept in good operating condition. As well, the Project proponent will adhere to conditions outlined in all permits, authorizations and/or approvals.

The number of equipment/vehicle movements and travel distances will be optimized to reduce fuel consumption and minimize noise emissions. Lowering vehicle speeds on unpaved roads as well as implementing good road maintenance practices will minimize the potential for noise emissions. Steps will be taken to ensure that all heavy construction equipment are equipped with proper mufflers to reduce noise levels.

6.1.2.4 Residual Effects

A residual environmental effect caused by the Improvement Projects is considered significant if it adversely affects the long-term viability of the VEC. A residual effect is considered to be not significant if the effect causes a change in the VEC that is within the range of natural variability, or does not affect the integrity of the VEC in a measurable or meaningful way.

As the Project and therefore the above Project activities would be of limited frequency and duration, they are not expected to generate substantive air quality and climate change effects. With the implementation of the mitigation measures for noise (section 6.1.2.3), no residual adverse effects due to noise are anticipated.

6.1.2.5 Significance of Effect

Not significant.

6.2 Geological Environment

6.2.1 Hydrogeology

6.2.1.1 Project-Environment Interactions

Activities will occur during each Improvement Project component which have the potential to affect the surface and bedrock geology as identified in the interaction matrix, Table 5.1. The identified Project activities will use typical construction methods for Arctic environments. A quarry permit for aggregate extraction was completed for this Improvement Project. Project activities which may result in effects to surface and bedrock geology include the following:

- aggregate extraction (excavating and earth moving); and
- construction of roads to service Project Improvement areas.

6.2.1.2 Evaluation of Effects

The four Improvement Projects are located in areas of continuous permafrost with a varying active layer dependent of location (e.g. high vs low areas. south facing etc.). Extraction of granular material from the Black Top Creek borrow area and the extraction of soil from the new reservoir site can expose the underlying permafrost, resulting in melting, ground instability, and soil erosion. Construction of access roads as required and the realignment and resurfacing of the Eureka runway access road can also result in similar effects.

6.2.1.3 Mitigation Measures

- Minimize the footprint of the area to be excavated or disturbed;
- Manage surface water to control soil erosion through the use of silt fences/curtains;
- Construct required access roads following best practices for protection of permafrost including a raised and compacted road bed;
- Evaluation of the borrow area would be required to determine exact measures to be taken to protect permafrost as a result of the borrow activity;
- Reduction of impacts to permafrost by minimizing the borrow area footprint and maintaining a setback from Black Top Creek and current water bodies where there are expected to be depressed permafrost zones;
- Workers are to remain on pre-established roads and trails where possible, to project against permafrost damage;
- Avoid vehicle rutting during all construction activities by ensuring access roads are built to sustain the weight of all vehicles; and
- The temporary ATCO trailer worker camp will be installed on cribbing, and raised. Therefore, it is anticipated that heat generated in the trailers will dissipate in the air space

underneath the trailer. This will decrease heat exchange and heat loss. Additionally, it is anticipated that the trailers will be installed at a minimum of 1 m above ground level, which is also facilitate heat dissipation. These measures will minimize potential negative effects to permafrost in the worker camp area.

6.2.1.4 Residual Effects

EC has experience with project improvements at the HAWS and has successfully implemented a range of mitigation measures such as those identified above. No residual adverse effects are anticipated to the hydrogeology and specifically to permafrost stability at the HAWS.

6.2.1.5 Significance of Effects

Not significant.

6.2.2 Soil Quality

6.2.2.1 Project-Environment Interactions

Activities will occur during each Project Improvement component which have the potential to affect the soil as identified in Table 5.1. The identified Project activities will use typical construction methods for Arctic environments. Project activities which may result in effects to the soil quality include the following:

- Excavations and earth moving, including removal of contaminated soil from AEC B-2;
- Removal of buildings, infrastructure;
- Construction/installation of buildings and infrastructure;
- Material handling (loading and dumping); and
- Refueling of vehicles/equipment.

6.2.2.2 Evaluation of Effects

Soil quality may be affected during construction at all Project Improvement sites as a result of an increase of project activities, most notably as a result of fuel spills and leaks from equipment.

Areas of existing soil contamination exist across the HAWS, including within the footprint of the new reservoir (northwest area of AEC B-2). This contaminated soil will be excavated during construction of the reservoir, and thus appropriate handling and storage will be required to ensure that further contamination of the surrounding environment does not occur.

6.2.2.3 Mitigation Measures

- Refueling of vehicles and equipment to occur in designated areas following all applicable regulations and guidance to prevent further soil contamination, and basic petroleum spill clean-up equipment is to be kept on-site;
- Consolidation and transfer of contaminated soil from the area of the new reservoir into seaworthy membrane-lined wooden crates (for prevention of seepage) using the on-site backhoe loader, and relocate crates to temporary staging area dockside using the on-site forklift, pending arrival of the seasonal barge. The crates of soil would be transferred to the barge using site equipment and transported for disposal at a licenced and regulated landfill or recycling facility, likely in Southern Canada or northern U.S.A.
- The above mitigation measure for contaminated soil from the new reservoir is based on the premise that in- situ or ex-situ site remediation will not be undertaken. A detailed workplan has not yet been completed at this stage of site development. Should the course of action include in-situ or ex-situ remediation, more detail pertaining to recommended remediation options are available in the *Remedial Action Plan for Eureka High Arctic Weather Station* (Franz/SENES, 2013c).
- Measures should be taken to ensure the temporary worker camp site is restored to its original condition when the camp is dismantled.
- Measures should be taken to ensure that the aggregate storage pile, which will be located in the vicinity of the sewage lagoon, is kept at a low height and gentle grade to reduce the impacts of disturbance/erosion due to wind or precipitation.

6.2.2.4 Residual Effects

With the implementation of the above mitigation measures, no adverse residual effects are anticipated.

6.2.2.5 Significance of Effects

Not significant.

6.3 Aquatic and Terrestrial Environment

6.3.1 Physical Aquatic Environment

6.3.1.1 Project-Environment Interactions

Activities will occur during each Improvement Project which have the potential to affect the hydrology and water and sediment quality as identified in Table 5.1. The identified Project activities will use typical construction methods for Arctic environments. Project activities which may result in effects to the site hydrology and water and sediment quality include the following:

- Excavations and earth moving;
- Removal of buildings, infrastructure;
- Construction/installation of buildings and infrastructure;
- Material handling (loading and dumping); and
- Refueling of vehicles/equipment.

6.3.1.2 Evaluation of Effects

During construction of the reservoir, the fill used to construct the berm could contain materials which can become suspended in surface water. If the berms are not placed and graded properly, the fill can be carried into Station Creek and the Fjord as sediment. In addition, surface drainage from the construction site could result in the deposition of sediments in the aquatic environment.

During all construction activities, surface water contamination could potentially occur due to leaks/spills that may occur during the re-fuelling of vehicles and construction machinery on site.

There is a water licence currently in place. An amended licence will be required for the new reservoir and water treatment facility.

WorleyParsons (2011) has estimated that the amount of water required to service the reservoir is 0.4% of the lowest estimated annual volume. Based on this value, effects to the aquatic system are not expected from water loss. Also, increased waste during construction will be treated in the lagoon system, with the quality and number of the releases to the fjord controlled by regulations defined by Nunavut and Environment Canada.

6.3.1.3 Mitigation Measures

- Suitable erosion and sediment suppression measures will be implemented to prevent sediment from entering Black Top Creek, Station Creek or other water bodies. Erosion control structures (temporary matting, geotextile silt control filter (curtains) fabric, etc.) are to be used, as appropriate for the water reservoir project and the sewage and wastewater improvement project, to prevent erosion and release of sediment and/or sediment laden water during the construction phase, and all berms are to be graded correctly. Weather

conditions must be considered when carrying out the work to ensure that erosion potential associated with wind and rainfall runoff is mitigated. Any work carried out during the frechette would require additional precautions associated with snow melt runoff and flow;

- For the water reservoir upgrades Improvement Project, it is recommended that turbidity be controlled as there may be a potential for suspended matter to contain heavy metals, biocides, and to potentially protect microorganisms from disinfection (Health Canada, 2003). It is recommended that best management practices be implemented for turbidity control;
- Vehicles/machinery are to be checked for leakage of lubricants or fuel and are maintained in good working order;
- Re-fueling should occur in designated areas only;
- Basic petroleum spill clean-up equipment is to be kept on-site;
- Barriers will be required during extraction of contaminated soils to prevent material from entering surface water, Station Creek or the reservoir; and
- Discharge must comply with the water licence, including the amended licence which must also be applied for.

6.3.1.4 Residual Effects

With the implementation of the above mitigation measures, no adverse residual effects on surface water are anticipated.

6.3.1.5 Significance of Effects

Not significant.

6.3.2 Aquatic Community

6.3.2.1 Project-Environment Interactions

Some assessment work has been conducted on the local surface water bodies at the HAWS in order to determine water quality and quantity to improve water supply at the station. However, the evaluation of potential effects from recent construction to the aquatic community requires site specific information on the distribution and numbers of invertebrate species and fish present. Without these data, potential effects to the aquatic community are estimated from observations by site personnel and general descriptions of the water bodies.

WorleyParsons (2011) assessed the water quality and quantity in the major water bodies at the site in order to determine their suitability for supplying water to the station. Four water bodies have been identified in previous site assessments as AECs and have been sampled for chemical contaminations (Franz/SENES 2013). The sewage lagoon and old water reservoir are not considered to be part of the natural hydrology of the site.

Table 6.1. Summary of Major Surface Water Bodies Potentially Impacted by Construction

Water Body	Location	Characteristics
Station Creek	Western margin of station, and major water supply for Eureka HAWS	Intermittent stream running adjacent to station and supplies water to reservoir for use by HAWS personnel. Water quality shows high TDS and turbidity in August 2010. No survey of natural biological community.
Black Top Creek	5 km west of the HAWS; used as background for water chemistry surveys.	Stream draining the area to the east of the runway. Unlikely to be affected by construction activity at the HAWS, including activity in borrow area. No survey of natural biological community.
Drainage Pond	Adjacent to station; and old reservoir	Present for full year; chemical contamination identified in sediments on eastern shore and in adjacent soils; fish observed in stream draining to fjord, but numbers and species not identified
Drainage Area	Area associated with landfill at eastern end of runway	Temporary stream. Situated at base of landfill (APEC A). Some flow during snow melt, but dry for most of the year.

All water bodies on the site are intermittent and do not flow for the majority of the year. Station Creek flows from June to September and any remaining water freezes to the bottom of the stream bed. Similarly, Black Top Creek drains a large area to the east of the runway; however, flow most likely ceases in September and any remaining water freezes. There is no evidence of anadromous fish, such as arctic char, that move into the streams in summer to breed. Based on these observations, it is unlikely that there are fish present in the reaches of the creeks adjacent to HAWS, and any impacts from physical disturbance or increased sediment loads would be on the benthic community and algal periphyton on rocks in the stream bed.

None of the four major Improvement Projects involve direct disturbance of the water bodies, particularly Station Creek, which is the source of water for the new reservoir. All projects are isolated from the water bodies, although movement of heavy equipment may increase sediment transport during the summer construction period. An analysis of water chemistry by WorleyParsons (2011) reported high solids in Station Creek in August 2010 and turbidity exceeded the CCME's Aesthetic Objective. These data indicate that high suspended sediment loads are a natural feature of the drainage basin.

The Drainage Pond may have higher loads of total dissolved solids (TDS) due to construction upstream in the new reservoir which may also mobilise and impact the area downstream from the Pond. Fish are not present in the Drainage Pond but have been observed in the brackish discharge zone. No surveys of the aquatic community or the benthic environment and littoral zone near the discharge of the stream have been conducted to allow predictions of the biotic community that might be impacted by elevated levels of TDS or hydrocarbons released from construction activities.

The impact to the marine system from the construction and operation of the new sewage lagoon is expected to be reduced or no different, from the operation of the old lagoon. The quality of the water releases from the new lagoon to the fjord are defined under the relevant wastewater regulations for the Nunavut Territory and Environment Canada. The effluent quality requirements define the acceptable for a number of parameters including BOD, TSS, coliforms, pH, etc. The new lagoon will improve the performance of wastewater treatment and may reduce the impacts on the nearshore environment. Other regulated activities include reconstruction of the lagoon and associated infrastructure, decommissioning of the old lagoon, sludge management and final effluent disposal. All of these activities will be conducted following regulations from Environment Canada and Nunavut to keep local impacts to a minimum.

Construction of the new reservoir and upgrades to the sewage lagoon may cause an increase in sedimentation to the nearshore marine environment and erosion of the wall of the lagoon adjacent to the shoreline. Fisheries and Oceans Canada recommends the development of an Erosion and Sediment Control Plan to avoid impacts to the nearshore environment and the possible installation of a curtain or boom to contain sedimentation.[10]

6.3.2.2 Mitigation Measures

The separation of construction activities from the surface water bodies and lack of fish species in Station Creek near the HAWS indicate that mitigation may only be required if construction activity is expected to physically disturb the stream bed or margins. Increased movement of borrow materials or fuel from storage sites that involve transport along the stream margins may require relocation of roads or transport in the fall when the area is frozen. If changes in the stream banks and bed are observed, then construction can be delayed until fall or conducted in spring before thaw. Site personnel should be instructed on the importance of not driving heavy equipment along the stream banks or bed.

Additionally, should water pulling from Station Creek be required during the construction period, and when it will be required during operations of the upgraded water reservoir and treatment plant, the most appropriate time of year to do so would be during the frechette period.

Mitigation measures in the marine environment may include the installation of a silt boom or silt curtain if construction takes place along the shoreline at the lagoon. Similarly, high sediment loads that exceed CCME guidelines or hydrocarbon contamination in the stream discharge during the construction of the reservoir may require a boom or curtain to contain contamination and sediment transport. Previous studies by Franz indicates that hydrocarbon contamination is confined to the

[10](http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html (accessed Jan 2016).

upper reaches of the stream (adjacent to the reservoir) however sediment could be transported to the mouth as a result of local construction activity.

6.3.2.3 Residual Effects

No residual effects are expected in the aquatic system from the four construction activities. Construction and increased transport of vehicles may impact Station Creek locally, but no fish are present in the stream near the station.

No residual effects are expected in the nearshore marine environment from the new construction activities. Construction of the new lagoon and decommissioning of the old lagoon will follow relevant regulations to maintain isolation from the marine environment. The transport of existing hydrocarbon contamination to the marine environment is not expected to increase from construction activity.

6.3.2.4 Significance of Effects

Impacts to the aquatic community are expected to be negligible, due to the very low productivity and diversity of the aquatic community. Any potential impacts need to be considered in light of previous modifications that have occurred from previous construction at the site, such as during the construction of the current existing water reservoir. Aerial photos of the site indicate that a roadway running to the west of the main site intersects the stream bed. Impacts from increased suspended solids and physical disturbance are expected to be localized and of short term.

The impacts to the marine system from the construction activities are not expected to be significant. New construction will not physically disturb the nearshore marine environment and will not significantly change the quality of runoff. The transport of suspended solids and hydrocarbons are not expected to significantly increase to the marine system. The operation of and releases from, the sewage lagoon will be regulated as per Nunavut and Environment Canada regulations and will not significantly impact the nearshore environment.

6.3.3 Vegetation Communities and Species

6.3.3.1 Project-Environment Interactions

The major interaction with the plant community will be physical damage to vegetation during construction and changes in the soil surface layer, leading to potential soil and permafrost erosion, changes in surface water hydrology and thermokarst. Fugitive dust may also suppress plant growth within a zone around construction zones.

Most of the Improvement projects activities are located in areas that have already been disturbed by past or existing land uses resulting in a limited presence of vegetation. The location of the worker camp to support the runway improvement project, south of the runway was observed during the August 2015 to host vegetation intermittently throughout this area.

6.3.3.2 Evaluation of Effects

The effects to the plant community are difficult to predict due to the lack of site-specific data on plant species and their density near the Improvement Projects sites. The damage to the vegetation will be equal to the footprint of the construction, storage and borrow sites and the dust footprint.

6.3.3.3 Mitigation Measures

Construction in the North often takes place during winter to avoid the effects of damage to the tundra and soil. Due to the extreme conditions at Eureka, construction will be conducted during the brief summer months when most damage to tundra will occur. Damage can be reduced by covering the ground, possibly using matting, prior to construction to reduce physical disruption of the soil. Fugitive dust can be suppressed at its source (see Section 6.1.1.3 for dust suppression and mitigation details). Additionally, vehicles should remain on pre-established roads/trails. Workers are to be advised of sensitivity of environment and to stay off the soil/vegetation in a start off meeting.

6.3.3.4 Residual Effects

The damage to the plant community caused during construction will endure for a long time. Recovery of the plant community is very slow due to extreme cold and low moisture levels. It is unlikely that revegetation will be successful given the environmental conditions.

6.3.3.5 Significance of Effects

Using the process and criteria described in Section 5 above, the significance of the residual effect on site plant community is as follows:

- Magnitude: Low – Losses of vegetation are low relative to the EC reserve land;
- Geographic extent: Low – Limited to the worker camp site;
- Duration/timing: Low – Will occur during the construction phase;
- Frequency: Low – Will occur during construction phase, a temporary condition;
- Reversibility: Medium – Affected vegetation will be slow to recover due to extreme cold and low moisture levels.

Given that all but one criterion was rated low, advancement to the second step of significance determination was not warranted. Therefore, the conclusion is that the residual adverse environmental effect is minor in nature and not significant.

6.3.4 Wildlife Communities and Species

The analysis of potential impacts to the plants and animals will use data available from site characterization studies (EBA Consultants 2008, Franz/SENES, 2013 a, b, c) and published data from similar High Arctic sites. To date, no systematic, rigorous surveys have been conducted to record the species present, their abundance and distribution or rare/sensitive plants and animal species in the area surrounding the HAWS. Site-specific information on the plant and animal species present during summer when construction activity will take place would significantly reduce the uncertainty in predicting the type of interactions expected, the species and the numbers of individuals involved.

6.3.4.1 Project-Environment Interactions

This analysis will use data from other sites and several assumptions to predict potential impacts on the ecology in and around the HAWS site during the Improvement Projects construction phase. To date, no surveys have been conducted to record the numbers or species of common or rare plants and animal species in the area surrounding the HAWS. Site specific data on the abundance and distribution of species would significantly reduce the uncertainty in predicting the type of interactions expected, the species and the numbers of individuals involved.

Construction will occur during the summer, the time that nesting and denning occur for many bird and mammal species. A summary of the types of interactions that are known to occur at mine sites and camps across northern Canada are listed in Table 6.2. Interactions include the physical destruction of habitat and the loss of vegetation. In the Arctic, the destruction of the upper active soil layer leads to erosion of permafrost, drainage issues and the loss of soil-stabilizing plants. For birds and mammals, the interactions include behavioral changes such as avoidance and/or attraction to the site and changes in the dominant species in areas adjacent to the site.

Table 6.2. Summary of Known Interactions to Remote Mine and Camp Sites in Northern Canada

Type of Interactions	Example
Physical disturbance of habitat	• Destruction of nesting or denning sites during construction; loss of vegetation; disruption of surface layer leading to permafrost thaw and thermokarst.
Avoidance of human activity	• Presence of human activity, such as that resulting in increased noise levels, during sensitive life stages causes abandonment or disruption of daily feeding activity.
Attraction to human activity	• Response of wildlife to attractants (garbage, food) to enter site. Might also include predatory behavior by some species which result in the animals being shot. • Birds will be attracted to open water of new reservoir.

Table 6.2. Summary of Known Interactions to Remote Mine and Camp Sites in Northern Canada (Cont'd)

Type of Interactions	Example
Chemical contamination	• Wildlife exposed to elevated levels of contaminants of concern in surface waters or though the contamination of soil and vegetation. This can occur offsite, as chemicals migrate through air or water, or on-site as wildlife move to contaminated areas.
Biological/ecological changes	• Presence of infrastructure may provide nesting or denning areas for wildlife. • Predatory species (e.g., ravens) are known to be attracted to infrastructure and prey on small mammals and birds.

6.3.4.2 Evaluation of Effects

The estimation of effects to local plant and animal species is conducted with the use of Valued Ecosystem Components (VECs), which are representative species that have social, ecological and/or cultural significance. Candidate species are selected to include representative species from different ecological niches. They may also represent specific niches or trophic status that suggests they will be good indicators of biological effects due to disturbance (e.g., physical disturbance of habitat, noise). Due to the extreme climate and harsh environment, the number of species present in the area is small and have adapted to survival under those conditions, or they migrate to the area for breeding/nesting during the summer. VECs generally include species that are actively harvested by local indigenous people to ensure that these species are given a priority for protection. VECs may also include rare/sensitive species that are also given a priority for protection if surveys have documented their presence in an area of interest.

Table 6.3 lists the set of VECs known to be in the vicinity of the HAWS and Eureka runway that were selected for this analysis. They represent most major ecological niches in the terrestrial and marine systems at Eureka and hence could be affected by physical disturbance and general activity during construction. Rare/sensitive species are those that have been assigned heightened conservation status under SARA legislation.

Table 6.3. Valued Ecosystem Components used to Predict Possiblel Effects from Construction Activities at the Eureka HAWS

Species	Scientific Name	Niche
Terrestrial System		
Plants and lichen	-	Producer
Rock ptarmigan	*Lagopus mutus*	Widely distributed land bird feeding on seeds.
Snowy owl	*Bubo scandiacus*	Predatory bird, nesting in far North in summer.
Nearctic collared lemming (or Peary Land Collared Lemming)	*Dicrostonyx groenlandicus*	Widely distributed small mammal; food source for upper trophic levels.
Snow bunting	*Plectrophenax nivalis*	Seed eating songbird that nests up to Ellesmere Island in the summer.
Arctic fox	*Vulpes lagopus*	Predator feeds/ scavenges in terrestrial and marine systems.
Peary Caribou	*Rangifer tarandus pearyi*	Large herbivore, subsistence hunting, traditional diet.
Muskox	*Ovibos moschatus*	Large herbivore, subsistence hunting, traditional diet.
Marine System		
Benthic Invertebrates	-	Could be highly exposed to run-off in nearshore environment or affected by physical disturbance.
Arctic sculpin	*Myoxocephalus scorpiodes*	Benthic species; habitat is littoral zone.
Arctic cod	*Boreogadus saida*	Pelagic species; widely distributed food source for upper trophic levels.
Ivory gull	*Pagophila eburnea*	Endangered species that feeds in the nearshore marine environment.
Ringed seal	*Phoca hispida*	Widely distributed; food source for polar bear.
Polar bear	*Ursus maritimus*	Top marine predator.

Table 6.4. Summary of VEC Features that may Lead to Interaction with Construction at the Eureka HAWS

Species	General Description	Breeding Behaviour	Conclusions
Terrestrial System			
Plants and lichen	• No rigorous surveys have been conducted but plant species are expected to include arctic willow, Dryas spp. birch, arctic poppy. • No surveys of rare or conservation-sensitive plants have been conducted.		• No rare or sensitive species are known in the HAWS area. • Any local damage to plants and lichen unlikely to affect general population of species. • Very slow recovery of any disturbed of damaged areas due to low moisture and light.
Rock ptarmigan	• Small grouse-like bird widely distributed across Arctic. • Small scale migration during winter to avoid most severe climate. • Feeds on plant material (99% - e.g., birch buds, willow, Dryas) with some invertebrates in summer.	• Nests on dry rocky ground, nest is little more than open scrape on the ground. • 1 brood per year, possibly second clutch if first is lost. • Loss of chicks primarily due to predation and exposure. • Nest densities vary from <1 to up to 10 or more/km^2.	• Numbers are variable but the population in the area around the HAWS has not been surveyed. • Destruction of nests or impacts to breeding adults possible during construction, but unlikely to affect larger population.
Snowy owl	• Predator that nests in High Arctic and overwinters in southern/central Canada. • needs high density of small prey (e.g., lemmings) in order to breed.	• Nests are located on dry areas on tundra, usually on high mounds or hummocks. • Clutches usually from 5-10 eggs. Nests may be 1 or more km apart, with density roughly 1 nest/22 km^2.	• Nests are on raised ground and tend to be visible due to the bright white of the adults. • Destruction of a hidden nest during construction is less likely. • The low density and the low numbers that might be destroyed inadvertently will probably not impact the northern population.

Table 6.4. Summary of VEC Features that may Lead to Interaction with Construction at the Eureka HAWS (Cont'd)

Species	General Description	Breeding Behaviour	Conclusions
Terrestrial System			
Nearctic collared lemming (or Peary Land Collared Lemming)	• Small mammal of roughly 75 g • Density varies significantly from 0.6 to 400 per ha, with peaks every 2 to 5 years. • Feeds on sedges, grasses and berries in summer • Occupy shallow burrows under sod where soil is available.	• Breeding season is from March to September. • Average litter of 4-5. • Reproduce 2 to 3 times a year.	• Construction likely affects individual lemmings and their burrows, the number depends on the phase of the population cycle. • Significant, long-term impacts to the population are unlikely due to their high reproductive rate and wide distribution.
Snow bunting	• Medium sized songbird that nests in High Arctic. • Overwinter in southern Canada and northern US. • Feeds on seed, buds and invertebrates in summer.	• Nest in rocky areas and rock cavities; isolation in rocks reduces predation. • May use barrels, metals cans for nests. • 1 brood /year. nest densities vary but may reach 26 pairs/km^2.	• No data for Eureka on numbers, but summer construction may destroy nests or cause parental abandonment. • Pairs may also nest in litter on the HAWS site. • Impacts unlikely to affect general population.
Arctic fox	• Widely distributed across northern Canada, primarily north of 60, and population is stable. • Feed on small mammals, and scavenges kills from bears or wolves. • May scavenge around human dwellings.	• Female matures at 9 months and bears young once a year. • Litter size of usually 5-8.	• Arctic foxes are ubiquitous on northern Ellesmere, although the numbers around the HAWS are unknown. • Impacts from construction may occur from the destruction of dens. • Impacts are unlikely to have a significant impact of the fox population.
Peary Caribou	Considered under Rare/sensitive species		

Table 6.4. Summary of VEC Features that may Lead to Interaction with Construction at the Eureka HAWS (Cont'd)

Species	General Description	Breeding Behaviour	Conclusions
Terrestrial System			
Muskox	• Restricted to far north in Canada, including north Ellesmere Island. • Ruminants that feed on sedges, grasses and willows. • Population is stable and increasing in some areas. • Threats include long severe winters and deep snow, and parasitic infections.	• Females usually bear a calf every two years. • Single calf after gestation of 8 months. • Young are weaned at 10-12 months.	• Muskox are often observed near the HAWS. • Significant effects from construction activities unlikely due to avoidance by muskox and their ability to move to isolated areas.
Marine System			
Benthic Invertebrates	• Benthic community is sparse due to very low productivity in nearshore environment. • Benthic species provide food to benthic and nearshore fish, such as sculpins.		• Impacts to the benthic environment could occur from changes in water quality and sedimentation during construction; however, the current status of the nearshore environment is unknown and benthic community distribution from past activities at the HAWS is unknown.

Table 6.4. Summary of VEC Features that may Lead to Interaction with Construction at the Eureka HAWS (Cont'd)

Species	General Description	Breeding Behaviour	Conclusions
Marine System			
Arctic sculpin	• Benthic fish found in nearshore environment. • Feeds on benthic invertebrates, including algae and crustaceans.	• Spawn in the fall, with eggs found on or near the bottom. • Larvae are planktonic and usually found offshore	• Adults are unlikely to be affected by station activity • Eggs in the nearshore environment might be impacted by increased sedimentation or changes in water quality from the site, but the area affected is expected to be low. • Residual impacts from past activities at the HAWS are unknown.
Arctic cod	• Pelagic fish found in very large numbers. • Feeds on plankton and small fish and is a major food source for seals and other marine mammals.	• Breeds under ice in the pelagic environment • Eggs distributed in open water and the larvae feed on the epontic community under the ice.	• Pelagic species that can be very numerous but is unlikely to be close to the HAWS shoreline in large numbers • Probability of impacts from proposed construction activity at the station is very low.
Ivory gull	Considered under Rare/sensitive species		

Table 6.4. Summary of VEC Features that may Lead to Interaction with Construction at the Eureka HAWS (Cont'd)

Species	General Description	Breeding Behaviour	Conclusions
Marine System			
Ringed seal	• Solitary seal widely distributed in marine system across the North. • Feeds on crustaceans and small fish, including arctic cod. • Northern population probably approaches 1 million individuals. • Density of 0.2 to 0.9 per km^2.	• Breeding once per year. • Delayed implantation of fetus for up to 3 months. • Pups born in snow dens on landfast ice. • 1 pup born per year.	• Interactions with construction activity at the HAWS is minimal. • Pups born in dens on landfast ice during March/April when there is no construction at site. • Adult seals can avoid activity on shore during open water season.
Polar bear	Considered under Rare/sensitive species		

Sources of Data:

Banfield, A.W.F. 1974. Mammals of Canada. University of Toronto Press.
NWT Species Monitoring InfoBase (http://www.nwtspeciesatrisk.ca/Infobase) (accessed September 2015).
Birds of North America online. Cornell Lab of Ornithology and American Ornithologists (http://bna.birds.cornell.edu.uml.idm.oclc.org/bna/) (accessed September 2015).

6.3.5 Rare and Sensitive Species

Although there is very little site-specific information about the numbers and distribution of species in the environment around Eureka, it is important to recognize that there may be sensitive bird and mammal species in the area and those with heightened conservation status. Because of their protective status, these species will be assessed individually. Photos of each species are provided in Appendix C.

Ivory Gull (Pagophila eburnea)

Protected under the Migratory Birds Convention Act

COSEWIC Designation: Endangered

SARA Designation: Schedule 1, Endangered

The ivory gull is a medium-sized marine gull that has a patchy, circumpolar distribution and breeds in several areas of the Canadian Arctic, and in areas such as northern Greenland. At one time there were 31 colonies recorded in the Canadian Arctic; however, the last survey in 2005 indicates that only 9 colonies remain (COSEWIC 2006). Due to its low numbers and its distribution in the far north, relatively little is known of its biology. Surveys of breeding sites and overwintering areas indicate that the population has declined by 80% in the last 20 years (COSEWIC 2006). The ivory gull is protected under the Migratory Bird Convention Act and COSEWIC (Committee on the Status of Endangered Wildlife in Canada) designates the species as “endangered” (Birds of North America[11], accessed 2105). Known sites of active colonies include areas of eastern Ellesmere Island roughly 300 km from Eureka.

CONCLUSION: Impacts from the Improvement Projects are unlikely due to the nests being on remote cliffs and inaccessible locations. Nesting and fledging occurs from June to August when construction may be occurring. No surveys for nests in the region have been conducted, although nesting sites are present on the east coast of Ellesmere Island.

Red Knot (Calidris canutus islandica)

COSEWIC Designation: Special Concern

SARA Designation: Schedule 1, Special Concern

The red knot is a medium-sized shorebird that breeds in the Arctic. There are three subspecies found in Canada, however, the *islandica* subspecies is the only one that nests in the region of north Ellesmere Island. The *islandica* species nests in the Canadian Arctic but overwinters on shorelines of Europe. It has declined by about 17% since the 1990s and number roughly 200,000. The species builds small cup-like nests on flat land, with a clutch size of 4 eggs, an incubation time of 22 days and a fledging period of 18 days. Nests are roughly 1 km apart, although higher

[11] http://bna.birds.cornell.edu.uml.idm.oclc.org/bna/species/175/articles/introduction

densities have been observed[12]. Hatching usually occurs in the first half of July (Niles *et al.* 2008). Field surveys have shown that the *islandica* subspecies is widely distributed across north Ellesmere Island (Morrison *et al.* 2005). It is protected by the Migratory Bird Convention Act and has been designated as "Special Concern" by COSEWIC (2007).

CONCLUSION: There is little evidence to evaluate whether impacts from activity from the Improvement Projects are likely. The *islandica* subspecies is known to nest on northern Ellesmere Island in nests on the tundra. The red knot has been reported at Eureka, but the location of nesting sites is not known.

Peary Caribou (Rangifer tarandus pearyi)

COSEWIC Designation: Endangered

SARA designation: Schedule 1, Endangered

Peary caribou is a distinct barren-ground caribou subspecies that is distributed across the Canadian Arctic Archipelago. The total population has been estimated at roughly 8,000 animals after undergoing a major decline during the 1990s, possibly as much as 70% in some populations COSEWIC (2004). There are roughly four distinct populations located on the major islands in the Archipelago, and small migrations between the islands have been observed, usually when the environmental conditions are severe. Threats to the population are from overhunting and from weather events, such as major snow or ice storms that cause forage to become unavailable.

CONCLUSION: Effects from the Improvement Projects to Peary caribou population are unlikely due to the wide dispersal of individual caribou, the relatively small footprint of the station and low levels of other development in the region that would add to cumulative impacts. The caribou have the ability to avoid construction activity although they may move to open areas, such as the runway, to reduce insect harassment.

Wolverine (*Gulo gulo*)

COSEWIC Designation: Special Concern

SARA Designation: No schedule, no status

The wolverine has been classified as "Special Concern" by COSEWIC due to its slow reproductive rate and the large undisturbed range required to maintain a stable population. In a 2003 assessment, COSEWIC concluded that the eastern population required heightened protection status but not the western population. The most recent assessment (COSEWIC 2014) combines all wolverines in Canada into a single unit under "Special Status". Food for the species includes small game (such as the arctic hare) and the carcasses of large ungulates, both of which are present around Eureka. The greatest threat to the species is the loss and fragmentation of habitat and disturbance from development.

[12] http://bna.birds.cornell.edu.uml.idm.oclc.org/bna/species/563/articles/behavior.

CONCLUSION: There are no data on the numbers or density of wolverines in the region around the HAWS. There have been no recorded sightings of wolverines by HAWS staff, although the species was not listed in wildlife surveys of the Quttinirpaaq National Park. Wolverines are attracted to human activity and domestic garbage and may need to be destroyed at camps and mines; however, due to the large ranges of individual animals and low density on Ellesmere Island, significant impacts to the population from the loss of a small number of animals are probably low.

Polar Bear (*Ursus maritimus*)

COSEWIC Designation: Special Concern

SARA Designation: Schedule 1, Special Concern

Polar bears are present throughout the Canadian Arctic. Populations are managed individually and it appears that some populations are increasing while others are clearly declining. The polar bear relies on land fast ice to access ringed seals, its major food source. Denning sites are on land near the coast, usually in snowdrifts, while offshore maternal dens are on multi-year ice floes. The reproductive rates differ between subpopulations but are usually low, making this species very sensitive to overhunting. The Baffin Bay population is declining (COSEWIC 2008), but the ecology of bears in the region of Eureka HAWS, and the major threats to the population is unknown.

CONCLUSION: The lack of data on the status of the local bear subpopulation and the number of bears that could potentially be affected by the Improvement Projects make it difficult to predict impacts, but it is unlikely that impacts would be different from typical station operations. The draft Polar Bear Management Plan for Nunavut (2014) indicates that the designation of Special Concern for the polar bear under SARA has no immediate impact on Inuit harvest or management, should management activities be required. It is expected that polar bear activity at the HAWS can be managed through repellents and it is unexpected that they would need to be destroyed. As noted in Appendix C, in May 2014 there was a confirmed sighting of a momma bear and two cubs by HAWS staff at a location approximately 3.5 miles (5.6 km) away from the HAWS.

The effect of the Improvement Projects on the polar bear population will be no different than occurrences taking place prior to the construction of the Improvement Projects.

6.3.5.1 Mitigation Measures

Mitigation is required when it is expected that construction activities will directly impact one of the rare or sensitive species. Construction will occur during summer months when nesting and denning is at a peak. Impacts may occur from the physical disturbance of habitat or from indirect effects such as noise, human activity, dust, increased air and ground traffic. Mitigation should include identifying nesting and denning sites prior to construction and isolating them so that:

- Temporary workers need to be informed of station protocols for the control and disposal of food and refuse to ensure that local wildlife is not attracted to the site.

- Temporary workers involved with construction need to be trained to avoid contact with all wildlife and their nests (particularly with species at risk) and to report sightings to a central authority (i.e., supervisors) immediately. Movements of workers in off-hours should also be restricted to ensure nesting sites and denning areas are not disturbed.
- Site personnel should consider the use of trained wildlife monitors prior to, and during, construction to ensure a coordinated, appropriate response to wildlife sightings and to ensure protection of local species during construction.
- To ensure minimal disturbance to birds and mammals, a qualified person should be present before and during important phases of construction to facilitate protection of wildlife. This person should conduct a survey prior to commencement of construction to identify important areas and sensitive species that might be affected.
- In the event that SARA listed birds or mammals are located in the area, construction crews should be prepared to modify, or delay, activity that might harm the protected species. For example, if nests with eggs are located for the red knot, activity in the area might be delayed until after hatching.

With the application of the above mitigation measures, there will be minimal impacts to SAR or critical habitat. As a result, no SARA Authorizations are required.

6.3.5.2 Residual Effects

No residual effects to most species of wildlife are expected from the construction activities. The numbers of plants and wildlife that are likely to be directly affected by displacement and altered behavior (avoidance, changes in feeding and brooding behavior) is expected to be small and unlikely to affect the larger population. Rare or sensitive species should be protected, if in the area, to ensure minimal residual effects.

6.3.5.3 Significance of Effects

Significant effects are not expected to the larger population of most species because the area affected by the construction is relatively small. Increased human activity might cause changes in the biological community as some species may avoid, while others may be are attracted to the activity. The protection of rare and sensitive plants and animals is key to keeping the effects from increased human activity and construction to a minimum.

6.4 Physical and Cultural Resources

6.4.1.1 Project-Environment Interaction

The extraction of material at the proposed Black Top Creek borrow pit is the only activity associated with the Improvement Projects with the potential to interact with physical and cultural resources.

6.4.1.2 Evaluation of Effects

There is no site specific information available for the Black Top Creek area; however, there is documented evidence that the Thule did occupy Ellesmere Island for a time between A.D. 1600 and 1850). Further, during discussions with the HAWS station manager in August 2015, it was suggested that a Thule tent ring had been sighted 10 km east of the EC reserve.

The site referenced was observed in the region further north up the peninsula, not within the area of the EC reserve lands. As such, the archaeological site is in no way threatened by any of the Improvement Project activities.[13]

6.4.1.3 Mitigation Measures

- Retain a licenced palaeontologist and/or archaeologist to conduct an initial assessment of the borrow pit area, the new water reservoir area, and the location of the runway expansion, as requirements defined in the *Nunavut Archaeological and Palaeontological Sites Regulations*.
- Comply with all relevant measures stipulated in the NIRB Screening Decision dated September 2015.

6.4.1.4 Residual Effects

With the implementation of the above mitigation measures, no adverse residual effects on physical and cultural resources are anticipated.

6.4.1.5 Significance of Effects

Not significant.

[13] P. Ducharme (personal communication August 22, 2015).

6.5 Socio-Economic

6.5.1.1 Project-Environment Interactions

As noted in Table 5.1, there are only two Project Improvement activities that would have the potential to affect components of the human environment, namely the direct contact of workers with contaminated soil during excavation of the new reservoir, and exposure to PHCs in soil in the vicinity of the temporary camp at the Eureka runway.

6.5.1.2 Evaluation of Effects

Areas of existing soil contamination are present across the HAWS, including in the area of the new reservoir (northwest area of AEC B-2). Refer to Figures 1.2 and 1.3 for maps of AEC locations which are relevant to the Improvement Projects, including the construction of the new water reservoir. There is therefore the potential for construction workers to come in contact with contaminated soil during construction of the new reservoir. The maximum PHC concentration (of the F2 fraction, which is the fraction of concern at the HAWS) in the north western area of AEC B-2 is 4,000 mg/kg. For direct contact (ingestion and dermal contact), the Canadian Council of Ministers of the Environment (CCME, 2008) has derived guideline values of 6,800 mg/kg for residential and industrial land use and 10,000 mg/kg for commercial land use. Given that the maximum measured concentration is well below both these guideline values, it is not expected that any worker coming into contact with PHC-contaminated soils during excavation would be at risk. Nonetheless, it is recommended that any worker involved in excavation activities wear clothing that fully covers arms and legs, as well as gloves and boots. Any soil that is excavation must be disposed of at an approved facility following all applicable regulations.

The proposed site for the worker camp associated with the Eureka runway recap project is near buildings associated with the former First Air lease, and past investigations have confirmed that 100 m^3 of PHC-contaminated soil are present adjacent to the easternmost building. No recommendations were made regarding further investigations or remedial work, provided the land use remains unchanged and the buildings unoccupied (Franz, 2009; Columbia/Franz, 2010). Given the proximity of the contamination to the proposed worker camp, further investigation into potential human health effects from the contamination is warranted. There is the possibility that volatile PHC and BTEX vapours may migrate from the soil into indoor air of an overlying trailer, which could subsequently lead to inhalation exposure by workers residing in the trailer. The soil contamination is not underneath the proposed camp area, and thus vapour migration is not a concern for this contaminated area. In the event that any contaminated soil does exist in the area where the camp is to be constructed, vapour migration to indoor air is still expected to be minimal since it is proposed to install an ATCO modular work camp with no underlying basement or crawlspace. As long as there is no skirt below the trailer, rapid air dispersion of any soil vapours would essentially eliminate this exposure pathway. Therefore, no concern is associated with the use of the area near to the former First Air lease area for a work camp, provided the trailer does not sit directly on the ground.

6.5.1.3 Mitigation Measures

Based on the foregoing information, the following mitigation measures are recommended:

- All workers involved in excavation of the new water reservoir (and subsequent disposal of the contaminated soil) must wear clothing that covers arms and legs, as well as gloves and boots;
- The worker camp at the Eureka runway must be constructed such that there is no basement, crawlspace or skirt below the trailer.

6.5.1.4 Residual Effects

With the implementation of the above mitigation measures, no adverse residual effects are anticipated.

6.5.1.5 Significance of Effects

Not significant.

6.6 Summary of Mitigation Measures

Table 6.5 below summarizes the mitigation measures outlined throughout this chapter for addressing potential environmental effects associated with the Improvement Projects.

Table 6.5. Summary of Mitigation Measures

Environmental Component	Mitigation Measures
Atmospheric Environment	
Air Quality	• employ standard operating procedures for heavy equipment/machinery and ensure that regular maintenance is performed in accordance with good engineering practices or as recommended by suppliers such that the equipment is kept in good operating condition; • adhere to conditions outlined in all permits, authorizations and/or approvals; • use appropriate exhaust emissions controls such as catalytic converters and diesel particulate filters to mitigate fuel combustion emissions from heavy equipment and vehicles; • optimize the number of equipment/vehicle movements and travel distances to reduce fuel consumption and minimize dust and greenhouse gas emissions; • reduce vehicle speeds on unpaved road surfaces; and • apply water as well as implement good road maintenance practices to minimize the potential for road dust emissions.
Noise	• employ standard operating procedures for heavy equipment/machinery and ensure that regular maintenance is performed in accordance with good engineering practices or as recommended by suppliers such that the equipment is kept in good operating condition; • adhere to conditions outlined in all permits, authorizations and/or approvals; • optimize the number of equipment/vehicle movements and travel distances to minimize noise emissions; • reduce vehicle speeds on unpaved roads as well as implement good road maintenance practices to minimize the potential for noise emissions; and • ensure that all heavy construction equipment are equipped with proper mufflers to reduce noise levels.

Table 6.5. Summary of Mitigation Measures (Cont'd)

Environmental Component	Mitigation Measures
Geological Environment	
Hydrogeology	• minimize the footprint of the area to be excavated or disturbed; • manage surface water to control soil erosion through the use of silt fences/curtains; • construct required access roads following best practices for protection of permafrost including a raised and compacted road bed; • evaluate the borrow area to determine exact measures to be taken to protect permafrost as a result of the borrow activity; • reduce the impacts to permafrost by minimizing the borrow area footprint and maintaining a setback from Black Top Creek and current water bodies where there are expected to be depressed permafrost zones; • require workers to remain on pre-established roads and trails where possible, to protect against permafrost damage; • avoid vehicle rutting during all construction activities by ensuring access roads are built to sustain the weight of all vehicles; • install cribbing and raise the temporary ATCO trailer worker camp. Therefore, it is anticipated that heat generated in the trailers will dissipate in the air space underneath the trailer. This will decrease heat exchange and heat loss. Additionally, it is anticipated that the trailers will be installed at a minimum of 1 m above ground level, which is also facilitate heat dissipation; and • measures should be taken to ensure the temporary worker camp site is restored to its original condition when the camp is dismantled.

Table 6.5. Summary of Mitigation Measures (Cont'd)

Environmental Component	Mitigation Measures
Geological Environment	
Soil Quality	• refuel vehicles and equipment in designated areas following all applicable regulations and guidance to prevent further soil contamination; • keep basic petroleum spill clean-up equipment on-site; • consolidate and transfer contaminated soil from the area of the new reservoir into seaworthy membrane-lined wooden crates (for prevention of seepage) using the on-site backhoe loader, and relocate crates to temporary staging area dockside using the on-site forklift, pending arrival of the seasonal barge. The crates of soil would be transferred to the barge using site equipment and transported for disposal at a licenced and regulated landfill or recycling facility, likely in Southern Canada or northern U.S.A; • should the course of action include in-situ or ex-situ remediation, more detail pertaining to recommended remediation options are available in the *Remedial Action Plan for Eureka High Arctic* Weather Station (Franz/SENES, 2013c); and • measures should be taken to ensure that the aggregate storage pile, which will be located in the vicinity of the sewage lagoon, is kept at a low height and gentle grade to reduce the impacts of disturbance/erosion due to wind or precipitation.
Aquatic Environment	
	• employ suitable erosion and sediment suppression measures to prevent sediment from entering Black Top Creek, Station Creek or other water bodies. Erosion control structures (temporary matting, geotextile filter fabric) are to be used, as appropriate for the water reservoir project and the sewage and wastewater Improvement Project; • installation of a silt boom or silt curtain if construction takes place along the shoreline at the lagoon; • high sediment loads that exceed CCME guidelines or hydrocarbon contamination in the stream discharge during the construction of the reservoir may require a boom or curtain to contain contamination and sediment transport; • check vehicles/machinery for leakage of lubricants or fuel and are maintained in good working order; • undertake re-fueling in designated areas only;

Table 6.5. Summary of Mitigation Measures (Cont'd)

Environmental Component	Mitigation Measures
Aquatic Environment	
	• keep basic petroleum spill clean-up equipment on-site; • use barriers during extraction of contaminated soils to prevent material from entering surface water, Station Creek or the reservoir; and • ensure that discharge comply with the water licence, including the amended licence which must also be applied for.
Aquatic and Terrestrial Environment	
Aquatic Community	• separate construction activities from the surface water bodies; • increased movement of borrow materials or fuel from storage sites that involve transport along the stream margins may require relocation of roads or transport in the fall when the area is frozen; • delay construction until fall or spring before thaw if changes in the stream banks and bed are observed; and • instruct site personnel on the importance of not driving heavy equipment along the stream banks or bed.
Vegetation Communities and Species	• reduce damage to the tundra by covering the ground, possibly using matting, prior to construction to reduce physical disruption of the soil.
Rate and Sensitive Species	• inform temporary workers of station protocols for the control and disposal of food and refuse to ensure that local wildlife is not attracted to the site; • train temporary workers involved with construction how to avoid contact with all wildlife and to report sightings to a central authority. Movements of workers in off-hours should also be restricted to ensure nesting sites and denning areas are not disturbed; • consider the use of trained wildlife monitors prior to, and during, construction to ensure a coordinated, appropriate response to wildlife sightings and to ensure protection of local species during construction;

Table 6.5. Summary of Mitigation Measures (Cont'd)

Environmental Component	Mitigation Measures
Rate and Sensitive Species	• ensure minimal disturbance to birds and mammals, by requiring a qualified person to be present before and during important phases of construction to facilitate protection of wildlife. This person should conduct a survey prior to commencement of construction to identify important areas and sensitive species that might be affected; and • in the event that SARA listed birds or mammals are located in the area, construction crews should be prepared to modify, or delay, activity that might harm the protected species. For example, if nests with eggs are located for the red knot, activity in the area might be delayed until after hatching.
Physical and Cultural Resources	
	• retain a licenced palaeontologist and/or archaeologist to conduct an initial assessment of the borrow pit area as requirements defined in the *Nunavut Archaeological and Palaeontological Sites Regulations;* and • comply with all relevant measures stipulated in the NIRB Screening Decision dated September 2015.
Socio-Economic	
	• ensure that all workers involved in excavation of the new water reservoir (and subsequent disposal of the contaminated soil) wear clothing that covers arms and legs, as well as gloves and boots; and • the worker camp at the Eureka runway must be constructed such that there is no basement, crawlspace or skirt below the trailer. As long as there is no skirt below the trailer, rapid air dispersion of any soil vapours would essentially eliminate this exposure pathway.

Table 6.5. Summary of Mitigation Measures (Cont'd)

Environmental Component	Mitigation Measures
Accidents and Malfunctions	
Fuel Spill Management	• inspect machinery for leakage of lubricants or fuel and to ensure that they are in good working order; • maintain basic petroleum spill clean-up equipment on-site; • refueling of vehicles and equipment to occur in designated areas following all applicable regulations and guidance to prevent further soil contamination, and basic petroleum spill clean-up equipment is to be kept on-site; • provide permanent fuel storage on-site which will have appropriate secondary containment; • contractors must develop a contingency plan for work in an Arctic environment that includes, but is not limited to: • roles and responsibilities of intervening personnel; • a communication plan for operational personnel and regulatory agencies; • response technique for various types of spills; and • follow-up actions.

7 ACCIDENTS AND MALFUNCTIONS

Consideration of the environmental effects of accidents and malfunctions during construction, operation and decommissioning was assessed as part of this EIA. There are no plans for decommissioning and abandonment of the four Improvement Projects at this time. If and when this does occur, a separate evaluation of decommissioning accidents and malfunctions will be undertaken.

7.1.1 Safety Practices

There is potential for accidents or malfunctions to occur during any construction project. These include events such as, spills of construction-related equipment fuel stored on site, traffic accidents involving construction-related vehicles, structural failure of building components during construction, and personal injury resulting from a construction accident. To reduce the risk of accidents and malfunctions, the requirements of the *Northwest Territories Safety Act,* and associated Occupational Health and Safety Regulations will be adhered to. In addition, sound safety practices will be followed on the construction site. Operational safety measures such as the use of appropriate Personal Protective Equipment (PPE), including, hard hats, safety glasses, safety boots, and work gloves will be used on site. Also, building construction will be compliant with the National Fire Code and National Building Code and will conform to design and construction protocols specifically developed to minimize the potential for structural failure.

7.1.2 Fuel Spill Management

Potential environmental effects associated with construction of the Improvement Projects include the spills/releases of hazardous materials (e.g. fuels and lubricants). Should spills/releases occur during the construction phase, these are most likely to be associated with the use of construction equipment. As described in previous sections, mitigation measures will be implemented to prevent and mitigate the effects of such occurrences. In addition to the mitigation measures stipulated by the NIRB Screening Decision dated 22 September 2015, mitigation measures that may be employed include:

- inspecting machinery for leakage of lubricants or fuel and to ensure that they are in good working order;
- maintain basic petroleum spill clean-up equipment on-site;
- re-fueling in designated areas, and
- providing permanent fuel storage on-site which will have appropriate secondary containment.

Prior to a contract being issued for the construction of the proposed Improvement Projects, Contractors must develop a contingency plan for work in an Arctic environment that includes, but is not limited to:

- roles and responsibilities of intervening personnel;
- a communication plan for operational personnel and regulatory agencies;
- response techniques for various types of spills; and
- follow-up actions.

With the implementation of the applicable mitigation measures, no residual adverse environmental effects are expected to occur.

8 LIKELY EFFECTS OF THE ENVIRONMENT ON THE PROJECT

This section describes potential effects of the environment on the Project, which consist of severe weather and climate change.

8.1.1 Severe Weather

The high Arctic presents challenges given its extreme temperatures, wind speeds and sunlight cycles throughout the year and consequently, all buildings and associated infrastructure are designed to address these severe weather conditions. EC is experienced with constructing, operating and maintaining its weather stations in the Arctic and specifically the HAWS. Severe weather is typically experienced outside the summer construction season when the Improvement Projects will be undertaken; consequently, severe weather is not expected to affect the projects.

8.1.2 Climate Change

The construction of each Project component is scheduled to take place exclusively during the summer months from 2014 to 2018. Since the effects from climate change impacts are evaluated in the longer term (approximately 10-100 years), the Project component construction period is not expected to be affected by the potential impacts of climate change.

9 ASSESSMENT OF CUMULATIVE EFFECTS

Section 16(1) of the *CEAA* requires the consideration of cumulative environmental effects in relation to a project. The Canadian Environmental Assessment Agency's Cumulative Effects Assessment Practitioners Guide (Cumulative Effects Assessment Working Group and AXYS Environmental 1999) and Operational Policy Statement (1999) provides guidance in conducting an assessment of cumulative effects to meet the regulatory requirements. According to the Practitioners Guide, a cumulative effects assessment is:

> *"…an assessment of those incremental effects of an action on the environment when the effects are combined with those from other past, existing and future actions" (pg. A1).*

As noted in the Practitioner's Guide, the identification of residual effects allows for cumulative effects to be assessed since only those project-environment interactions that result in residual effects can lead to a cumulative effect. The Guide suggests that a cumulative effects assessment for a single project under regulatory review should fundamentally accomplish the following:

1. *Determine if the project will have an effect on a Valued Ecosystem Component (VEC);*
2. *If such an effect can be demonstrated, determine if the incremental effect acts cumulatively with effects of other actions, either past, existing or future;*
3. *Determine if the effect of the project, in combination with the other effects, may cause a significant change now or in the future in the characteristics of the VEC after the application of mitigation for that project".*

There are four basic steps in a cumulative effects assessment:

1. Identifying any adverse residual environmental effects of the proposed project (as presented in Section 6).

2. Identifying other projects or activities that could potentially interact with the residual effects of the proposed project.

3. Considering the likelihood for an interaction in terms of:
   - Similar effects from other projects and activities that might contribute to those caused by the proposed project;
   - The time over which these potential interactions coincide; and
   - The geographic area in which the effects occur.

4. For the effects indicated, determining whether there is overlap in time and space, and where that occurs, the resultant overall cumulative effect and its significance.

Based on the assessment of effects in Section 6, and as summarized in Table 9.2, there are no adverse residual project effects to be considered in a cumulative effects assessment. That there are no identified adverse residual project effects is not surprising for a construction project such as this, where the works and activities associated with the four Improvement Projects are very limited in geographic extent and time. For example, the potential loss of vegetation was identified for the footprint of the worker camp associated with the Eureka Runway Recap Improvement Project. Other projects identified (Table 9.1) are located within the existing HAWS site and infrastructure and most likely within the same construction windows as the Runway Recap Improvement Project; however, none will interact with the proposed location of the worker camp.

Therefore, consideration of cumulative environmental effects is not warranted for the High Arctic Weather Station Project Improvements Project.

Table 9.1. Other Projects and Activities

Category	Projects or Activities	Description
Past or Existing Projects or Activities	HAWS Normal Operations	Includes regular operations of the station, regular maintenance activities, research activities and vehicle movements throughout the EC reserve lands.
	Construction of Multipurpose Building	Pre-fabricated steel building for cold and heated storage, and carpentry/woodworking shop located north of the main complex building. Construction work commenced 2015, and will continue in summer 2016.
	Eureka Runway Normal Operations	Includes aircraft movements, refueling and vehicle movements between the runway and main site.
Certain/planned projects or activities	Main complex Building Maintenance and Upgrades	Proposed maintenance and upgrades for systems/equipment within the HAWS main complex include: • Main complex transformer replacement; • Domestic Hot Water Plate Heat Exchanger; • Fresh Air intake Preheater Main Complex. Proposed 2016-2018.
Reasonably Foreseeable Projects or Activities	Hydrogen building	Updates/improvements 2016-2019.
	Main complex	Perimeter regrading 2017. Window replacement 2018-2020.
	Existing old garage recapitalization	Updates/improvements 2016 – 2019.

Source: L. Barz (personal communication) September 10, 2015.

Table 9.2. Project Effects on VEC

Environmental Components	Sub-components	Relevant VECs	Direct Effect on VEC
Atmospheric Environment	Air Quality (dust and climate change)	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to Terrestrial Environment	Minimal localized dust during construction activities. No long-term residual effect anticipated. No long term residual changes in climate as result of project works anticipated.
	Noise	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to Terrestrial Environment	Localized effect of a temporary nature anticipated. No long-term residual effects anticipated.
Surface and Bedrock Geology	Hydrogeology	Pathway to Human Health Permafrost stability	None
	Soil Quality	Pathway to Non-Human Biota Health	None
Hydrology and Surface Water	Hydrology	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to VEC in other environmental components	None
	Water Quality and Sediment	Pathway to Human Health Pathway to Non-Human Biota Health Pathway to VEC in other environmental components	Effects to surface waters expected to be localized and temporary. Small areas of physical disturbance and suspended solids may occur during construction but long-term water quality and effects to the aquatic community are not expected.

10 CONCLUSIONS OF THE ASSESSMENT

As an active and operating site, the HAWS is subject to and compliant with a number of Federal and Territorial regulations. Adherence to regulations, implementation of existing measures existing mitigation obligations, in addition to those proposed within, ensure the Improvement Projects are not likely to cause significant adverse effects on the environment.

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APPENDIX A

Photo Exhibits of HAWS

HAWS Main Site

Photo 1	Photo 2
Description: Hydrogen Building used for daily weather balloon releases. Located east of main complex, adjacent to sewage lagoon.	Description: HAWS main complex.
	
Date: August 20, 2015	Date: August 20, 2015

HAWS Main Site

Photo 3	Photo 4
Description: Garage/Storage building located south of main complex.	Description: Former HAWS main complex, located south of existing main complex
	
Date: August 20, 2015	Date: August 20, 2015

HAWS Main Site

Photo 5	Photo 6
Description: Former bunk house	Description: Carpentry Shop located between main complex and Fjord.
	
Date: August 20, 2015	Date: August 20, 2015

1) HAWS Main Site

Photo 7	Photo 8
Description: Building #17 between the main complex and Fjord.	Description: Storage sheds and greenhouse (right) located south of the main complex
	
Date: August 22, 2015	Date: August 22, 2015

1) HAWS Main Site

Photo 9	Photo 10
Description: Container storage area near sealift docking	Description: Fuel pipe from sealift docking to tank farm.
	
Date: August 20, 2015	Date: August 20, 2015

HAWS Main Site

Photo 11	Photo 12
Description: Building #16 between the main complex and Fjord.	Description: Description: North end of Powerplant and new garage building.
	
Date: August 22, 2015	Date: August 22, 2015

HAWS Main Site

Photo 13	Photo 14
Description: Structures from left to right include tank farm, incinerator and storage shed.	Description: Red Quanset located east side of site.
	
Date: August 22, 2015	Date: August 22, 2015

HAWS Main Site

Photo 15	Photo 16
Description: Fuel Tank Farm located north of main complex.	Description: Fuel Tank Refill Area located adjacent to fuel tank farm.
	
Date: August 20, 2015	Date: August 20, 2015

HAWS Main Site

Photo 17	Photo 18
Description: Water Treatment and storage occurs in the south end of the Powerplant building located east of the reservoir.	Description: Reservoir Pump House and associated piping leading to the treatment system. Reservoir defined by orange fencing in the backgournd.
	
Date: August 22, 2015	Date: August 22, 2015

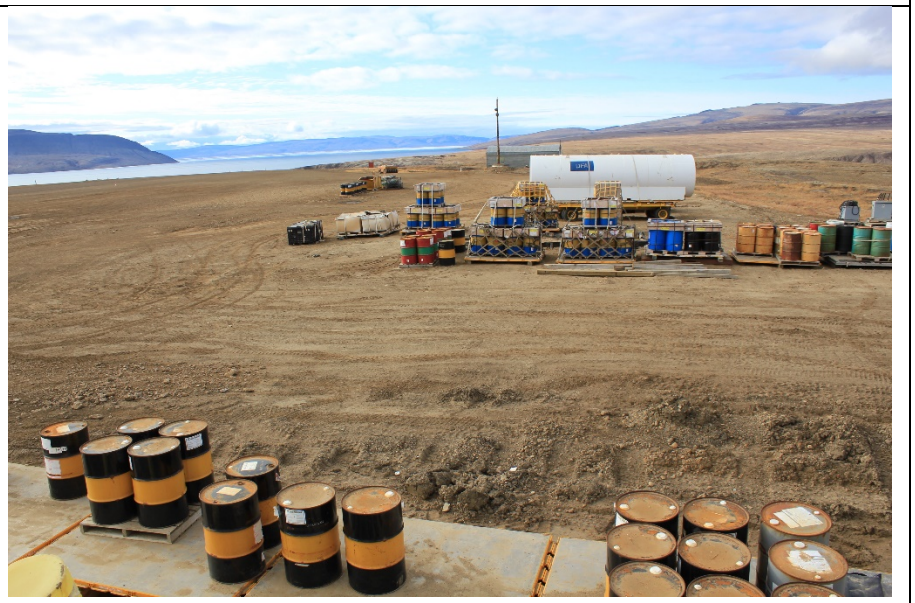
HAWS Main Site

Photo 19	Photo 20
Description: Drinking water reservoir (surrounded by orange fencing) and drainage pond.	Description: Reservoir Pump House located west of Powerhouse/treatment building
	
Date: August 22, 2015	Date: August 22, 2015

HAWS Main Site

Photo 21	Photo 22
Description: Sewage Lagoon, looking westward toward old Station buidling	Description: Sewage lagoon pump house and piping
	
Date: August 22, 2015	Date: August 22, 2015

Runway Area

Photo 23	Photo 24
Description: Eureka Terminal Building located on the north side of the runway.	Description: Runway apron, north side. Fuel stoage/refueling area.
	
Date: August 22, 2015	Date: August 22, 2015

Runway Area

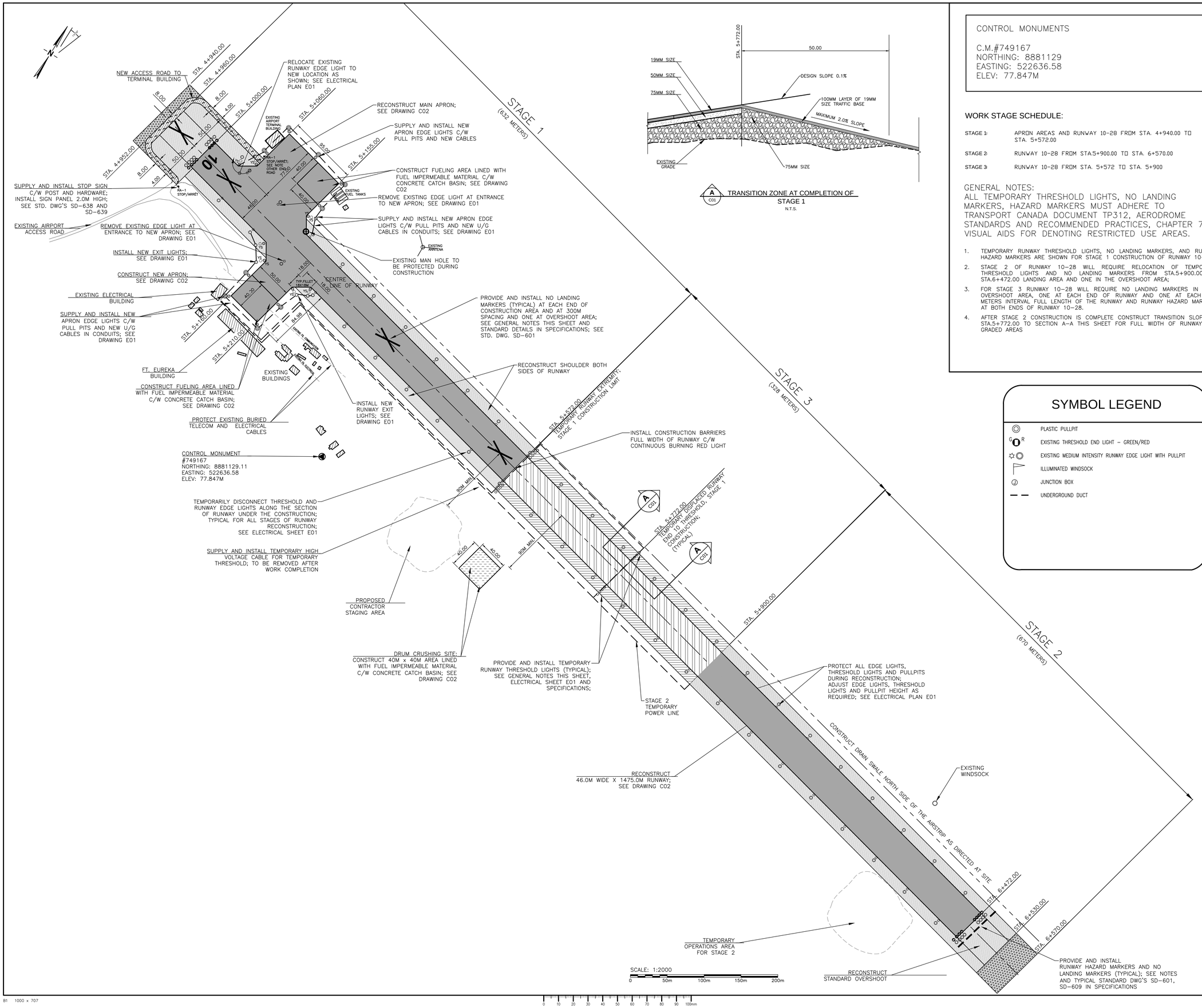
Photo 25	Photo 26
Description: Department of National Defense – Fort Eureka located on the south side of the runway.	Description: Eureka Landfil located south east of runway.
	
Date: August 22, 2015	Date: August 22, 2015

Borrow Pit and Area

Photo 27	Photo 28
Description: Black Top Creek Borrow Pit Area in Foreground	Description: Borrow Pit
	
Date: August 22, 2015	Date: August 22, 2015

APPENDIX B

Technical Drawings



A C01 TRANSITION ZONE AT COMPLETION OF STAGE 1
N.T.S.

CONTROL MONUMENTS

C.M.#749167
NORTHING: 8881129
EASTING: 522636.58
ELEV: 77.847M

WORK STAGE SCHEDULE:

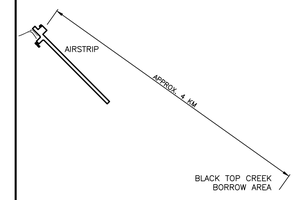
STAGE 1:	APRON AREAS AND RUNWAY 10-28 FROM STA. 4+940.00 TO STA. 5+572.00
STAGE 2	RUNWAY 10-28 FROM STA.5+900.00 TO STA. 6+570.00
STAGE 3	RUNWAY 10-28 FROM STA. 5+572 TO STA. 5+900

GENERAL NOTES:
ALL TEMPORARY THRESHOLD LIGHTS, NO LANDING MARKERS, HAZARD MARKERS MUST ADHERE TO TRANSPORT CANADA DOCUMENT TP312, AERODROME STANDARDS AND RECOMMENDED PRACTICES, CHAPTER 7, VISUAL AIDS FOR DENOTING RESTRICTED USE AREAS.

1. TEMPORARY RUNWAY THRESHOLD LIGHTS, NO LANDING MARKERS, AND RUNWAY HAZARD MARKERS ARE SHOWN FOR STAGE 1 CONSTRUCTION OF RUNWAY 10-28;
2. STAGE 2 OF RUNWAY 10-28 WILL REQUIRE RELOCATION OF TEMPORARY THRESHOLD LIGHTS AND NO LANDING MARKERS FROM STA.5+900.00 TO STA.6+472.00 LANDING AREA AND ONE IN THE OVERSHOOT AREA;
3. FOR STAGE 3 RUNWAY 10-28 WILL REQUIRE NO LANDING MARKERS IN EACH OVERSHOOT AREA, ONE AT EACH END OF RUNWAY AND ONE AT EACH 300 METERS INTERVAL FULL LENGTH OF THE RUNWAY AND RUNWAY HAZARD MARKERS AT BOTH ENDS OF RUNWAY 10-28.
4. AFTER STAGE 2 CONSTRUCTION IS COMPLETE CONSTRUCT TRANSITION SLOPE AT STA.5+772.00 TO SECTION A-A THIS SHEET FOR FULL WIDTH OF RUNWAY AND GRADED AREAS

SYMBOL LEGEND

- PLASTIC PULLPIT
- G O R — EXISTING THRESHOLD END LIGHT – GREEN/RED
- EXISTING MEDIUM INTENSITY RUNWAY EDGE LIGHT WITH PULLPIT
- ILLUMINATED WINDSOCK
- J — JUNCTION BOX
- UNDERGROUND DUCT



KEY PLAN
N.T.S.

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Western Region

DO NOT SCALE DRAWINGS

revisions	description	date
5		
4		
3	ISSUED FOR TENDER	2014/09/12
2	90% SUBMISSION	2013/01/15
1	66% SUBMISSION	2012/10/30
0	Design Completion	

Client

project title
EUREKA, NUNAVUT

RUNWAY 10-28, APRONS AND ROAD REHABILITATION

approved by

designed by
SURINDER J.S. BRAR, P. Eng.

drawn by
MISHA GOGELA / OCTOBER 2012

PWGSC Project Manager

PWGSC, Architectural and Engineering Resources Manager
Surinder J. S. BRAR, P. Eng.

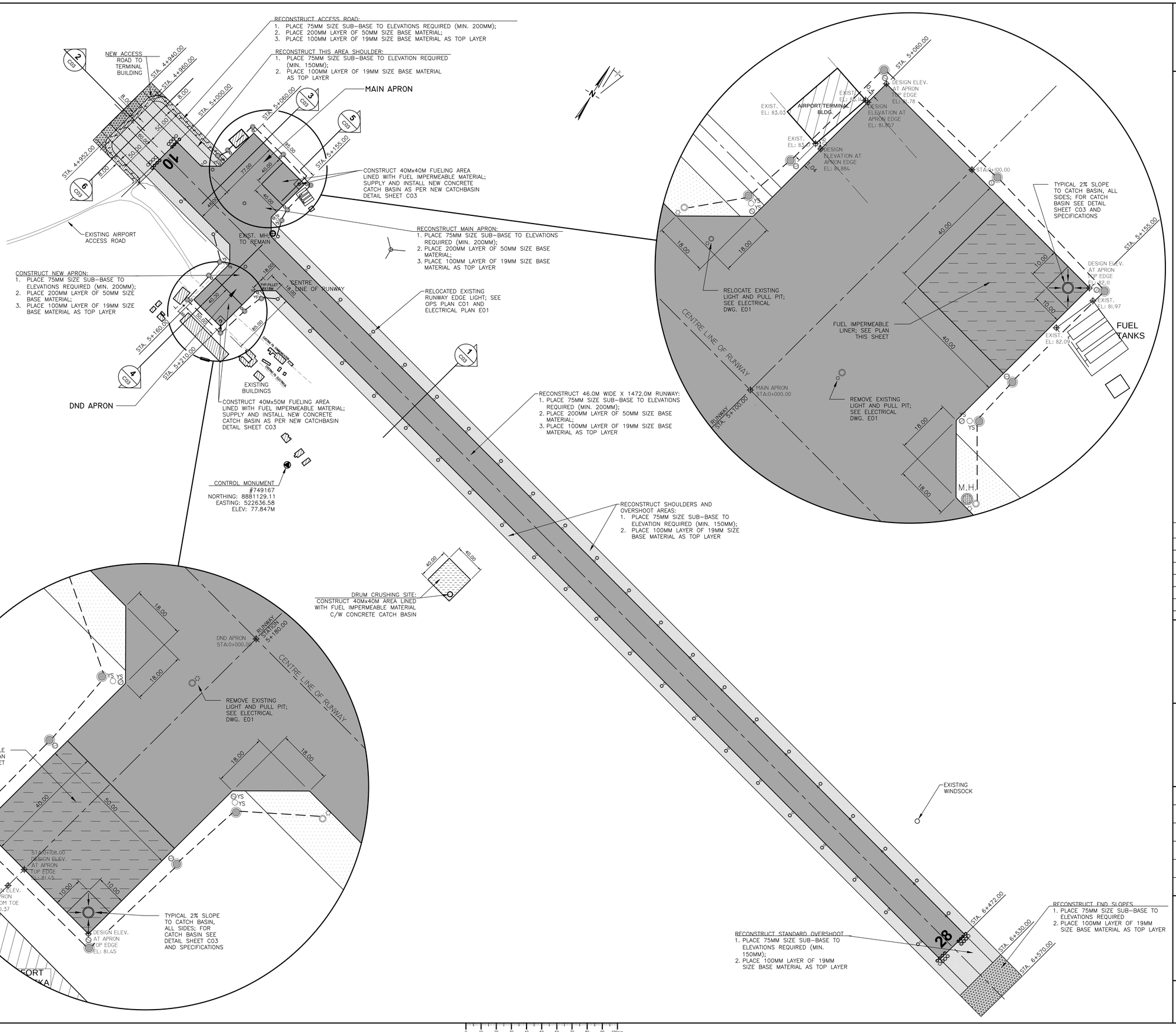
Client

drawing title
OPS PLAN

project no.	sheet	revision no.
R.053906.001	C01 OF 19	0

B1 1000 x 707

A000



Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Western Region

DO NOT SCALE DRAWINGS

revisions	description	date
5		
4		
3	ISSUED FOR TENDER	2014/09/12
2	90% SUBMISSION	2013/01/15
1	66% SUBMISSION	2012/10/30
0	Design Completion	

Client

project title

EUREKA, NUNAVUT

RUNWAY 10-28, APRONS AND ROAD REHABILITATION

approved by

designed by
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drawn by
MISHA GOGELA / OCTOBER 2012

PWGSC Project Manager

PWGSC, Architectural and Engineering Resources Manager
Surinder J. S. BRAR, P. Eng.

Client

drawing title

SCOPE OF WORK

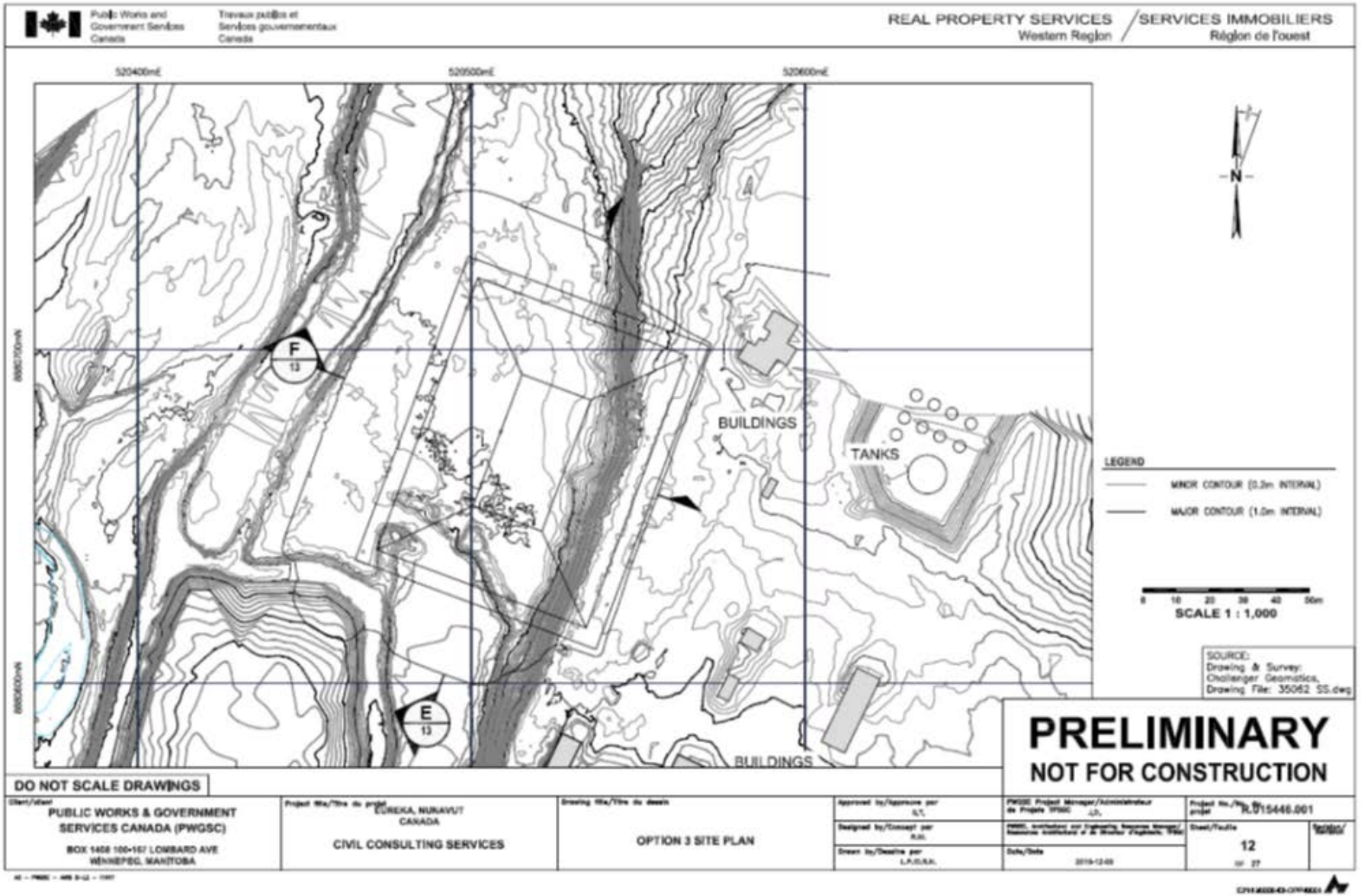
project no.	sheet	revision no.
R.053906.001	**C02** OF **19**	**0**

B1 1000 x 707

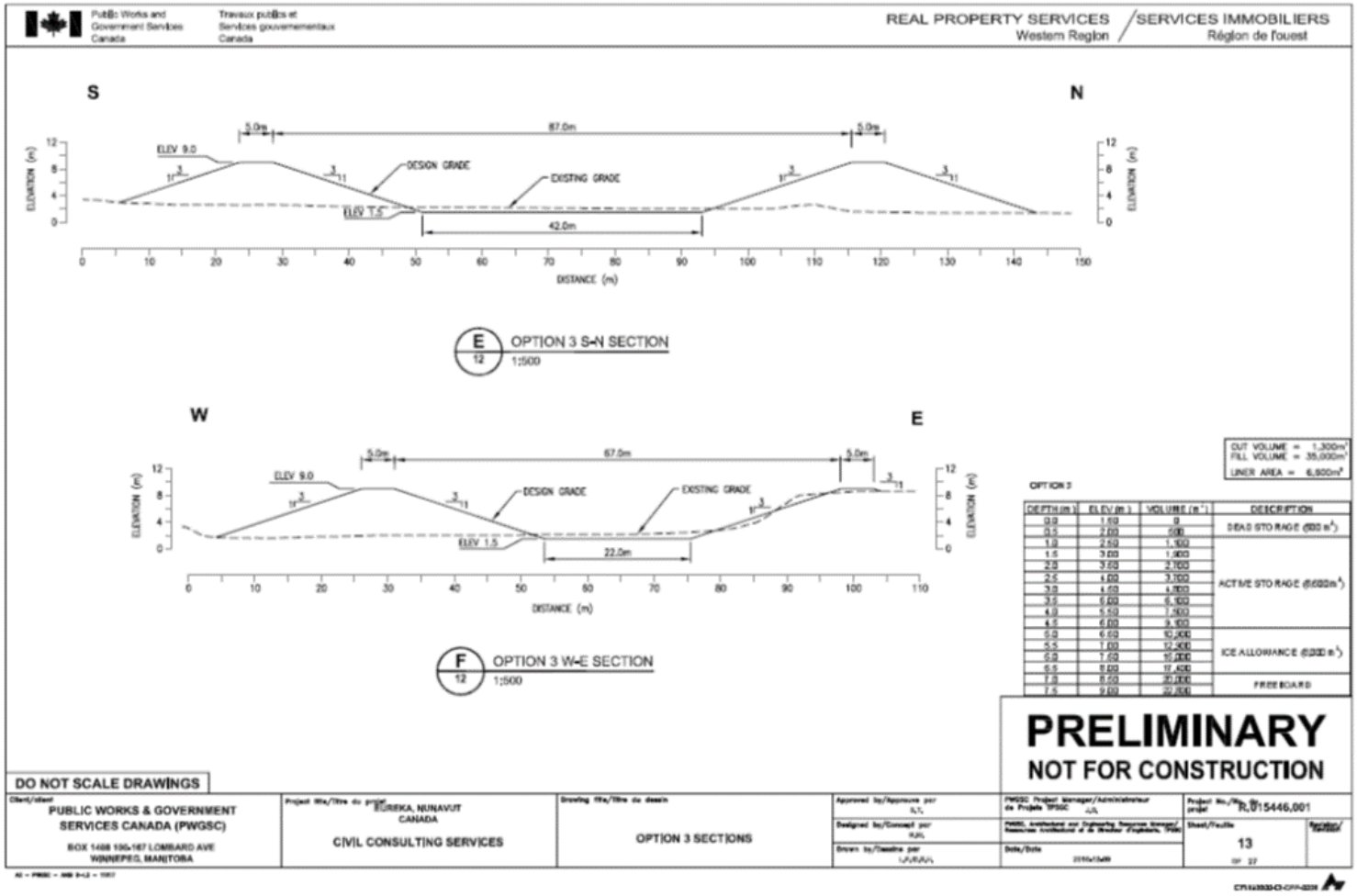
0 10 20 30 40 50 60 70 80 90 100mm

A000

New Reservoir Drawing



New Reservoir Cross Section Drawing



APPENDIX C

Site Visit Wildlife Field Observations and Photos of Rare and Sensitive Species

Field Observations by Arcadis Crew at Eureka HAWS in August 2015

Field observations
Date: *August 20* Tour of east boundary of EC site Black Top Creek at base of Black Top range.
Vegetation – willow, ground cover. Arctic cotton, tuffs of grass upwards of 12" high
Wildlife observed – muskox, individuals, one crossed road to creek on ridge. Family of muskox north of land fill in valley. 2nd family east of airport
White arctic hare either individually or in in groups upwards of 10.
Date: *August 21st (morning)*
Seabird (Arctic tern) in and around shore at sealift docking site. 2 white and black shorebirds. One gull (also sited at the Landfill previous evening).
One small brown coloured bird on shed in 'dead line equipment area' north of fuel tanks.
Arctic hares everywhere, in and around buildings or on the road, out on the terrain – sometimes in small groups of 6-10, but mostly individuals. – *This is applicable for all days but not repeated.*
Date: *August 21 (Afternoon)*
Wolf prints near reservoir
Small birds – brown head and shoulders, white and black back and wings, 2 pairs near reservoir bridge/road. Birds are snow buntings, confirmed by Jane, Environment Canada personnel
Wolf prints on shore of Fjord near sealift area
Seal spotted on ice flow on fjord east of HAWS
Date: *August 22, 2015* – from station manager John McIver
Arctic hares everywhere, in and around buildings, out on the terrain – sometimes in small groups of 6-10, but mostly individuals. – *This is applicable for all days but not repeated.*
Terns nest along shore in vicinity of station creek. Experience in past during construction projects, is that wildlife move off, but return once disturbance over.
John witnessed muskox and wolves 'socializing' young to the HAWS, bring them in closer to the facility during the summer. Wildlife seem to be very curious, especially the wolves.
Date: *August 22, 2015 (afternoon)*
2 arctic wolves beyond the EC property in the vicinity of the NU borrow pit located east of the EC property. Station manager speculates they are siblings.
Collared wolf research ongoing in the vicinity. Posters 2009/2010 show movements in the region. Known den site over 10km from the EC property to the north and west.
Arctic hares observed throughout the site. Watched a small group of 5 from window at east end of complex. One hare jumped and twisted, flipped, performance lasted several minutes – crazy funny to watch.

Field Observations by Arcadis Crew at Eureka HAWS in August 2015

Date: *August 23, 2015*
Wolf prints and scat observed by construction contractors at multipurpose building worksite.
Ryan and Aleshia observed wolf prints south of the reservoir, south of road.
Station manager reported that a family of muskox were grazing at the west end of the runway. Unit consist of one small juvenile and 6 adults.
Date: *August 24, 2015*
At the DND fuel tanks on north side of runway, saw numerous small song birds +12. Confirmed by Jane Fonger, EC birder at station that, based on my photographs, the birds were Lapland longspurs and Juvenile winter snow buntings. NOTE: Jane submits birding observations to NWTchecklist@ec.gc.ca.
Also seen earlier in summer, was a pair of red-throated loons at the west end of the fjord. – observed by Don and Jane from the station and reported in the Station's weekly report.
Evening – family of muskox adjacent to runway, north side near the east end of the runway. Same family unit observed previously.
Also observed 2 males (according to SM) on south side of runway, east of barrel crushing area.

Summary of wildlife observations reported by Eureka HAWS Station Manager in weekly logs. August 2015.

Date: August 3, 2015 – birds and geese around,
Lots of wildlife in area, birds starting to flocking together
Aug 10 – numerous hares, foxes daily, muskox seen daily, 12 muskox family unit, 2 wolves passing through camp
Aug 17 numerous hares, foxes daily, muskox seen daily, 12 units family unit, males boxing heads. wolves in area
3 or 4 muskox family groups slowly approach from east,
4 pairs loon observed in fjord, wolves west of station 2, may be siblings or young couple.
May 13 – wolf pack in area, muskox, hare, few seals, lots of birds starting to appear.
May 11 –pack of 15 wolves observed at runway, appear healthy
2014 –June – found a wolf den on the northeast side of Canon Fiord just off Greely fiord.
June 2, 2014 – station creek was running, started late afternoon. Nesting birds back along the beach. Hares spotted, muskox south of Fort Eureka,
May 19th – momma polar bear and 2 cubs spotted approx. 3.5 miles away, south down Eureka Sound. Observation occurred 7 miles from station.

Photos of Rare and Sensitive Species Present on Ellesmere Island

Sources: http://bna.birds.cornell.edu/bna/
http://www.sararegistry.gc.ca

Figure 1: Ivory Gull (*Pagophila eburnea*)

Figure 2: Red Knot (*Calidris canutus islandica*)

Figure 3: Peary Caribou (*Rangifer tarandus pearyi*)

Figure 4: Wolverine (*Gulo gulo*)

Figure 5: Polar Bear (*Ursus maritimus*)

APPENDIX D

Nunavut Impact Review Board Decision of Screening

NOTICE OF INDICATION
NIRB FILE NO.: 12XN020

AANDC File No.: N2012N0012
NWB File No.: 3BC-EUR1116

September 22, 2015

Tracey McCaie
Manger, Land Administration
Aboriginal Affairs and Northern Development Canada
PO Box 100
Iqaluit, NU X0A 0H0

Sent via email: tracey.mccaie@aandc.gc.ca

Re: Notice of Indication for Environment Canada's "Eureka Weather Station Facility" Project Proposal, North Baffin Region, NIRB File No. 12XN020

Dear Tracey McCaie:

Enclosed is the Nunavut Impact Review Board (NIRB) Screening Decision Report to the Honourable Bernard Valcourt, Minister of Aboriginal Affairs and Northern Development for Environment Canada's "Eureka Weather Station Facility" in the Qikiqtani Region.

The NIRB has assessed this project proposal for ecosystemic and socio-economic impacts taking into consideration the comments from relevant authorities and communities. Based on this assessment NIRB's indication to the Minister is in accordance with **12.4.4 (a)** which states the following:

> "The proposal may be processed without a review under Part 5 or 6; NIRB may recommend specific terms and conditions to be attached to any approval, reflecting the primary objectives set out in Section 12.2.5."

The enclosed NIRB Screening Decision for NIRB File No. 12XN020, signed on September 22, 2015 by Elizabeth Copland at Churchill, Manitoba has been issued to Aboriginal Affairs and Northern Development Canada (AANDC) and is subject to the terms and conditions contained herein being imposed upon the Proponent.

The NIRB is aware of the AANDC's authority to regulate the terms and conditions attached to the enclosed Screening Decision Report, and requests that the AANDC send a hardcopy of the

authorization with NIRB's file number referenced on the document to the NIRB office to complete our files. In addition, the NIRB requests that copies of any subsequent inspection reports related to the subject project proposal be sent to the NIRB office.

Please contact Erika Zell, NIRB assistant technical advisor, at (867) 983-4622 or info@nirb.ca if you have any questions or require additional clarification.

Sincerely,

Erika Zell
Assistant Technical Advisor

cc: Marc Ste-Marie, Environment Canada
Phyllis Beaulieu, Nunavut Water Board
Joel Fortier, Qikiqtani Inuit Association

Enclosure: NIRB Screening Decision Report (NIRB File No.: 12XN020)

SCREENING DECISION REPORT
NIRB FILE NO.: 12XN020

AANDC File No.: N2012N0012
NWB File No.: 3BC-EUR1116

September 22, 2015

To: The Honourable Bernard Valcourt
Minister of Aboriginal Affairs and Northern Development
Government of Canada
10 Rue Wellington
Gatineau, QC K1A 0H3

Sent via email: minister@aandc.gc.ca, bernard.valcourt@parl.gc.ca

Re: Screening Decision for Environment Canada's Amendment request with Aboriginal Affairs and Northern Development Canada for its "Eureka Weather Station Facility" Project, Qikiqtani Region, Additional Application Terms and Conditions, 12XN020

Dear Mr. Bernard Valcourt:

The primary objectives of the Nunavut Impact Review Board (NIRB) are set out in section 12.2.5 of the Nunavut Land Claims Agreement (NLCA) as follows:

> "*In carrying out its functions, the primary objectives of NIRB shall be at all times to protect and promote the existing and future well-being of the residents and communities of the Nunavut Settlement Area, and to protect the ecosystemic integrity of the Nunavut Settlement Area. NIRB shall take into account the well-being of the residents of Canada outside the Nunavut Settlement Area.*"

Section 12.4.3 of the NLCA states that:

> "*Any application for a component or activity of a project proposal that has been permitted to proceed in accordance with these provisions shall be exempt from the requirement for screening by NIRB unless:*
>
> *(a) such component or activity was not part of the original project proposal; or*
>
> *(b) its inclusion would significantly modify the project.*"

NIRB ASSESSMENT AND DECISION

The NIRB has completed a review of Environment Canada's request to Aboriginal Affairs and Northern Development Canada (AANDC) for an amendment to their Land Use Permit and application for a Quarry Permit for their "Eureka Weather Station Facility" project.

After a thorough assessment of the project proposal, the amendment application information and the comments received (please see *Procedural History* and *Project Activities* in **Appendix A)**, in accordance with Section 12.4.3 of the NLCA, the Board has determined that this request will result in a change to the original scope of the project. Therefore, the NIRB is re-issuing the recommended project-specific terms and conditions contained in the May 30, 2012 Screening Decision, NIRB file No.: 12XN020 in addition to new terms and conditions which are designed to mitigate any potential impacts to the environment as per Section 12.4.4(a) of the NLCA.

PREVIOUSLY APPROVED PROJECT-SPECIFIC TERMS AND CONDITIONS

The following terms and conditions were previously approved by the NIRB for file **12XN020** in a Screening Decision Report dated May 30, 2012 and is available from NIRB's online registry using the following link:
http://ftp.nirb.ca/01-SCREENINGS/COMPLETED%20SCREENINGS/

General

1. Environment Canada (the Proponent) shall maintain a copy of the Project Terms and Conditions at the site of operation at all times.
2. The Proponent shall forward copies of all permits obtained and required for this project to the Nunavut Impact Review Board (NIRB) prior to the commencement of the project.
3. The Proponent shall operate in accordance with all commitments stated in correspondence and materials provided as a part of the current application package:
    a. NIRB Part 1 Form, April 5, 2012;
    b. NPC Application for Conformity, April 16, 2012;
    c. AANDC Land Use Permit Application, April 4, 2012;
    d. Operations and Maintenance for Drinking Water, Sewage, Solid waste Disposal and Waste Treatment Facilities, January 2011; and
    e. Operating procedures for Eureka Land Reserve, March 1, 2011.
4. The Proponent shall operate the site in accordance with all applicable Acts, Regulations and Guidelines.

Water Use

5. The Proponent shall not extract water from any fish-bearing waterbody unless the water intake hose is equipped with a screen of appropriate mesh size to ensure that there is no entrapment of fish. Small lakes or streams should not be used for water withdrawal unless approved by the Nunavut Water Board.

6. The Proponent shall not use water, including constructing or disturbing any stream, lakebed or the banks of any definable water course unless approved by the Nunavut Water Board.

Waste Disposal/Incineration

7. The Proponent shall incinerate all combustible wastes daily, and remove the ash from incineration activities and non-combustible wastes from the project site to an approved facility for disposal.
8. The Proponent shall keep all garbage and debris in bags placed in a covered metal container or equivalent until disposed of at an approved facility. All such wastes shall be kept inaccessible to wildlife at all times.
9. The Proponent shall ensure that the incineration of combustible camp wastes comply with the *Canadian Wide Standards for Dioxins and Furans*, and the *Canadian Wide Standards for Mercury*.
10. The Proponent shall ensure that no waste oil/grease is incinerated on site.
11. The Proponent shall remove and treat hydrocarbon contaminated soils/snow on site or transport them to an approved disposal site for treatment.

Fuel and Chemical Storage

12. The Proponent shall ensure that storage of fuel and hazardous materials and re-fuelling of project equipment is conducted at a minimum of thirty-one (31) metres away from the high water mark of any water body and in such a manner as to prevent their release into the environment.
13. The Proponent shall store all fuel and chemicals in such a manner that they are inaccessible to wildlife.
14. The Proponent shall use adequate secondary containment or a surface liner (e.g. self-supporting insta-berms and fold-a-tanks) when storing barrelled fuel and chemicals at all locations. Appropriate spill response equipment and clean-up materials (e.g., shovels, pumps, barrels, drip pans, and absorbents) must be readily available during any transfer of fuel or hazardous substances, as well as at fuel caches, vehicle-maintenance areas and drill sites. Spill kits and secondary containment structures should accommodate 110% of the capacity of the largest fuel storage container within the cache.
15. The Proponent shall inspect and document the condition of all large fuel tanks on a weekly basis. All fuel and chemical storage containers must be clearly marked with the Proponent's name and examined for leaks immediately upon delivery.
16. The Proponent shall flag all fuel caches on site so they remain visible in the winter months.
17. The Proponent shall use drip pans or other equivalent device when refueling equipment on-site. The Proponent shall ensure that appropriate spill kit (e.g., shovels, absorbents, etc.) must be readily available during any transfer of fuel.
18. The Proponent shall ensure that all personnel are properly trained in fuel and hazardous waste handling procedures, as well as spill response procedures. All spills of fuel or other deleterious materials of any amount must be reported immediately to the 24 hour Spill Line at (867) 920-8130.

Wildlife - General

19. The Proponent shall ensure that there is no damage to wildlife habitat in conducting this operation.
20. The Proponent shall not harass wildlife. This includes persistently worrying or chasing animals, or disturbing large groups of animals. The Proponent shall not hunt or fish, unless proper Nunavut authorizations have been acquired.
21. The Proponent shall ensure that all project personnel are made aware of the measures to protect wildlife and are provided with training and/or advice on how to implement these measures.

Migratory Birds and Raptors Disturbance

22. The Proponent shall not disturb or destroy the nests or eggs of any birds. If nests are encountered and/or identified, the Proponent shall take precaution to avoid further interaction and or disturbance (e.g., a 100 metre buffer around the nests). If active nests of any birds are discovered (i.e. with eggs or young), the Proponent shall avoid these areas until nesting is complete and the young have left the nest.

Aircraft Flight Restrictions

23. The Proponent shall restrict aircraft/helicopter activity related to the project to a minimum altitude of 610 metres above ground level unless there is a specific requirement for low-level flying, which does not disturb wildlife and migratory birds.
24. The Proponent shall ensure that aircraft maintain a vertical distance of 1000 metres and a horizontal distance of 1500 metres from any observed groups (colonies) of migratory birds. Aircraft should avoid critical and sensitive wildlife areas at all times by choosing alternate flight corridors.
25. The Proponent shall ensure that aircraft/helicopter do not, unless for emergency, touch-down in areas where wildlife are present.
26. The Proponent shall advise all pilots of relevant flight restrictions and enforce their application over the project area, including flight paths to/from the project area.

Landfarms

27. The Proponent shall only treat petroleum and hydrocarbon contaminated soils using the landfarm facility. Materials contaminated with other substances such as glycol and heavy metals are not to be stored at the landfarm and shall only be disposed of at an authorized facility.
28. The Proponent shall ensure required standards, set out in the Nunavut Water Board's Water Licence for this project are met prior to any discharge of collected water in the retention cell.
29. The Proponent shall ensure that the equipment used in the landfarm operation for aeration, have been cleaned off within the landfarm facilities prior to exiting to prevent contaminated soil transfer.
30. The Proponent shall take appropriate dust suppression measures when conducting soil turning and removal.

31. All operation personnel shall be adequately trained prior to commencement of any operation in the landfarm facility. Operational personnel should also be trained in the operational guidelines and commitments made by the Proponent for this project.

32. The Proponent shall ensure that all on site personnel are properly trained in fuel and hazardous waste handling procedures as well as spill response procedures. All spills of fuel or other deleterious materials of any amount must be reported immediately to the 24 hour Spill Line at (867) 920-8130.

Access Road

33. The Proponent shall not move any equipment or vehicles unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging. Overland travel of equipment or vehicles must be suspended if rutting occurs.

34. The Proponent shall implement suitable erosion and sediment suppression measures on disturbed areas in order to prevent sediment from entering any water body.

35. All road vehicles must be fitted with standard and well-maintained noise suppression devices and engine idling is to be minimized.

36. The Proponent shall use water or other non-toxic and biodegradable additives for dust suppression as necessary to maintain ambient air quality without causing water to pool or runoff.

Temporary Camps

37. The Proponent shall ensure that all camps are located on gravel, sand or other durable land.

38. The Proponent shall not erect camps or store material on the surface ice of lakes or streams.

Restoration of Disturbed Areas

39. The Proponent shall remove all garbage, fuel and equipment upon abandonment.

Other

40. The Proponent should, to the extent possible, hire local people and consult with local residents regarding their activities in the region.

NEW RECOMMENDED PROJECT-SPECIFIC TERMS AND CONDITIONS (pursuant to Section 12.4.4(a) of the NLCA)

The Board is recommending that the following or similar ***additional*** project-specific terms and conditions be imposed upon the Proponent through all relevant legislation:

Aggregate Removal and Operations within Existing Quarries

41. The Proponent shall not remove any material from below the ordinary high water mark of any lake or stream.

42. The Proponent shall not deposit or permit the deposit of sediment into any water body.

43. The Proponent shall ensure there is no obstruction of natural drainage, flooding or channel diversion from quarry/pit access, stockpiles, or other structures or facilities.

44. The Proponent shall ensure that silt fences/curtains are installed down gradient of any quarry activities.
45. The Proponent shall maintain an undisturbed buffer zone between the periphery of quarry sites and the high water mark of any water body that is of an adequate distance to ensure erosion control.
46. The Proponent shall locate screening and crushing equipment on stable ground, at a location with ready access to stockpiles.
47. The Proponent shall use water or other non-toxic and biodegradable additives for dust suppression as necessary to maintain ambient air quality without causing water to pool or runoff.

MONITORING AND REPORTING REQUIREMENTS

The Board has previously recommended the following:

Fuel and Chemical Storage

1. The Proponent shall implement the recommendations found in the 2003 CCME Guidance Document PN 1326 entitled "Environmental Code of Practice for Above Ground and Underground Storage Tank Systems containing Petroleum Product and Allied Petroleum Products".

Transport of Waste/Dangerous Goods

2. The Proponent shall ensure that a waste manifest accompanies the shipment of all waste oil/grease and is registered with the Government of Nunavut Department of Environment (GN-DoE). Contact the Manager of Pollution Control and Air Quality at (867) 975-7748 to obtain a manifest if hazardous waste will be generated during project activities.
3. The Proponent shall ensure that an export manifest or the appropriate transportation of dangerous goods (TDG) documentation accompany all potential hazardous samples and/or materials that are transported off site.

In addition, the Board is recommending the following:

Annual Report

4. The Proponent shall submit an annual report with copies provided to the Nunavut Impact Review Board by November 1 of each year between 2015 and 2017. The annual report must contain the following information:
    a. A summary of activities undertaken for the year, including a list of activities and when they were undertaken, as well as the approximate quantities of aggregate extracted each year.

OTHER NIRB CONCERNS AND RECOMMENDATIONS

In addition to the project-specific terms and conditions, the Board has previously recommended the following:

Bear and Carnivore Safety

1. The Proponent review the bear/carnivore detection and deterrent techniques outlined in "Safety in Grizzly and Black Bear Country" which can be down-loaded from this link: http://www.enr.gov.nt.ca/_live/documents/content/Bear_Safety.pdf. Note that some recommendations in this manual are also relevant to polar bears. There is a DVD about polar bears and safety available from Nunavut Parks at the following link http://www.nunavutparks.com/english/visitor-information/suggested-resources.html and a "Safety in Polar Bear Country" pamphlet from Parks Canada at the following link http://www.pc.gc.ca/eng/pn-np/nu/auyuittuq/visit/visit6/d/i.aspx.

2. Any problem wildlife or any interaction with carnivores should be reported immediately to the local Government of Nunavut, Department of Environment Conservation Office (North Baffin Regional Manager, Alex Millar, phone: (867) 899-8034, email: amillar@gov.nu.ca).

Incineration of Wastes

3. The Proponent review Environment Canada's "Technical Document for Batch Waste Incineration", available at the following link: http://www.ec.gc.ca/gdd-mw/default.asp?lang=En&n=F53EDE13-1. The technical document provides information on appropriate incineration technologies, best management and operational practices, monitoring and reporting.

Species at Risk

4. The Proponent review Environment Canada's "Environment Assessment Best Practice Guide for Wildlife at Risk in Canada", available at the following link: http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=5407909E-10F6-4AFE-ACDF-75B9E820B4A1. The guide provides information to the Proponent on what is required when Wildlife at Risk, including *Species at Risk*, are encountered or affected by the project.

Change in Project Scope

5. All Authorizing Agencies shall notify the NIRB of any changes in operating plans or conditions associated with this project prior to any such change.

The Board is currently also recommending the following:

Aboriginal Affairs and Northern Development Canada

6. Aboriginal Affairs and Northern Development Canada (AANDC) impose mitigation measures, conditions and monitoring requirements pursuant to the Federal Land Use Permit, which require the Proponent to respect the sensitivities and importance of the area. These mitigation measures, conditions and monitoring requirements should be in regard to the location and area; type, location, capacity and operation of facilities; use, storage, handling and disposal of chemical or toxic material; wildlife and fisheries habitat; and petroleum fuel storage.

7. AANDC consider the importance of conducting regular Land Use Inspections, pursuant to the authority of the Federal Land Use Permit, while the project is in operation. The Land Use Inspections should be focused on ensuring the Proponent is in compliance with the conditions imposed through the Federal Land Use Permit.

REGULATORY REQUIREMENTS

The Proponent has been previously advised that the following legislation may apply to the project:

1. The *Fisheries Act* (http://laws-lois.justice.gc.ca/eng/acts/F-14/index.html).

2. The *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (http://www.canlii.org/ca/sta/n-28.8/whole.html).

3. The *Migratory Birds Convention Act* and *Migratory Birds Regulations* (http://laws-lois.justice.gc.ca/eng/acts/M-7.01/).

4. The *Species at Risk Act* (http://laws-lois.justice.gc.ca/eng/acts/S-15.3/index.html). Attached in **Appendix B** is a list of Species at Risk in Nunavut.

5. The *Wildlife Act* (http://www.canlii.org/en/nu/laws/stat/snu-2003-c-26/latest/snu-2003-c-26.html) which contains provisions to protect and conserve wildlife and wildlife habitat, including specific protection measures for wildlife habitat and species at risk.

6. The *Nunavut Act* (http://laws-lois.justice.gc.ca/eng/acts/N-28.6/). The Proponent must comply with the proposed terms and conditions listed in the attached **Appendix C**.

7. The *Transportation of Dangerous Goods Regulations*, *Transportation of Dangerous Goods Act* (http://www.tc.gc.ca/eng/tdg/safety-menu.htm), and the *Canadian Environmental Protection Act* (http://laws-lois.justice.gc.ca/eng/acts/C-15.31/). The Proponent must ensure that proper shipping documents accompany all movements of dangerous goods. The Proponent must register with the GN-DOE Manager of Pollution Control and Air Quality at 867-975-7748.

8. The *Aeronautics Act* (http://laws-lois.justice.gc.ca/eng/acts/A-2/ /).

Other Applicable Guidelines

9. The *Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils,* Science Applications International Corporation (SAIC Canada), March, 2006. Information in this document addresses design, operation, monitoring, sampling, analytical methods, decommissioning and closure, record keeping and reporting requirements for landfarming projects. It is recommended that the consultant refer to this document as it relates to the future operations of the landfarming project

In addition, the Proponent is also advised that the following legislation may apply to the project:

10. The Proponent shall undertake quarrying in accordance with the *Nunavut Mining Safety Ordinance* and the *Territorial Quarrying Regulations* (http://www.canlii.org/en/ca/laws/regu/crc-c-1527/latest/crc-c-1527.html) or equivalent.

Other Applicable Guidelines

11. The Proponent shall practice progressive reclamation in accordance with the restoration guidelines outlined in Aboriginal Affairs and Northern Development Canada's *Northern Land Use Guidelines Pits and Quarries* (http://www.aadnc-aandc.gc.ca/eng/1100100023585).

Validity of Land Claims Agreement

Section 2.12.2
Where there is any inconsistency or conflict between any federal, territorial and local government laws, and the Agreement, the Agreement shall prevail to the extent of the inconsistency or conflict.

Dated _____September 22, 2015__at Churchill, MB.

_____
Elizabeth Copland, Chairperson

Attachments: Appendix A: Procedural History and Project Activities
Appendix B: Species at Risk in Nunavut
Appendix C: Archaeological and Palaeontological Resources Terms and Conditions for Land Use Permit Holders.

Appendix A
Procedural History and Project Activities

Procedural History

On June 30, 2015 the Nunavut Impact Review Board (NIRB or Board) received an amendment application for Land Use Permit N2012N0012 from Aboriginal Affairs and Northern Development Canada (AANDC) as well as a new Quarry Permit application associated with Environment Canada's "Eureka Weather Station Facility" project. Previously on June 29, 2015 the NIRB received notice from the Nunavut Planning Commission (NPC) that the original April 19, 2012 positive conformity determination (North Baffin Regional Land Use Plan) and associated terms and conditions still applied.

Past File History

The original application for the project (NIRB File No.: 12XN020) was received by the NIRB from AANDC on April 19, 2012. The project proposal was screened in accordance with Part 4, Article 12 of the Nunavut Land Claims Agreement (NLCA) and on May 30, 2012 the NIRB issued a 12.4.4 (a) screening decision to the Minister of Aboriginal Affairs and Northern Development recommending that the proposed activities be allowed to proceed subject to the NIRB's recommended project-specific terms and conditions.

On December 18, 2014 the NIRB received an application from AANDC for an extension to AANDC Land Use Permit (LUP) N2012N0012 for the above mentioned project. After a thorough assessment of the extension application request, the NIRB determined that the application was exempt from the requirement for further screening pursuant to Section 12.4.3 of the NLCA, and reissued the enclosed screening decision report on February 3, 2015.

Current File History

The current project proposal by Environment Canada is for an amendment to existing AANDC LUP N2012N0012 in addition to a new Quarry Permit.

The NIRB determined that this request may result in a change to the original scope of the project and on September 2, 2015 distributed the project proposal to community organizations in Resolute and Grise Fiord, as well as to relevant federal and territorial government agencies, and Inuit organizations. The NIRB requested that interested parties review the proposal and the NIRB's previously recommended terms and conditions and provide the Board with any comments or concerns by September 14, 2015 regarding:

- Whether the inclusion of the additionally proposed components and/or activities would significantly modify the project;
- Any additional mitigation measures that are appropriate; and
- Any other matter of importance to the Party related to the project proposal.

On or before September 14, 2015 the NIRB received comments from the following interested parties:

- **Aboriginal Affairs and Northern Development Canada**

All comments provided to NIRB regarding this project proposal can be viewed on NIRB's online public registry at the following location:
http://ftp.nirb.ca/01-SCREENINGS/COMPLETED%20SCREENINGS/

Project Activities

As previously screened by the NIRB (File No. 12XN020) the "Eureka Weather Station Facility" project proposal was located within the Qikiqtani Region, approximately 407 kilometres (km) northwest of Grise Fiord. The Proponent indicated that it intended to continued operations of the existing Eureka Weather Station which was originally established in 1983, and has been in operation since 1947. The facility would operate year round with the purpose of collecting meteorological information and providing logistical support for research, exploration, military operations, and tour groups.

The original application, that was screened in accordance with Part 4, Article 12 of the NLCA, included the following project components/activities:

- Operations and maintenance of all of the existing Eureka infrastructure, specifically:
  - Airstrip and all access roads,
  - Tankfarm and fuel supply system,
  - Water and sewage lagoons,
  - Heating and electricity,
  - Biotreatment cell (landfarm),
  - Disposal/burning of non-hazardous landfill,
  - Hazardous materials collected and barged off site to be disposed of appropriately, and
  - Accommodations, laboratories, and general storage and warehousing
- Ongoing use of the Eureka facilities as a base camp and logistical support/staging area for other entities/organizations such as the Department of National Defence and Natural Resources Canada's Polar Continental Shelf Program

The components and activities associated with the June 30, 2015 Land Use Permit (AANDC No. N2012N0012) amendment and Quarry Permit applications were for upgrades to infrastructure at the Eureka Weather Station site between August 2015 and September 2017, including:

- Construction of a new airside apron and rehabilitation of existing airstrip, airside apron and access road at the Eureka Weather Station Facility; and
- Removal of up to 160,900 cubic metres of aggregate from the existing Black Top Creek Quarry.

Appendix B
Species at Risk in Nunavut

This list includes species listed on one of the Schedules of SARA (*Species at Risk Act*) and under consideration for listing on Schedule 1 of SARA. These species have been designated as at risk by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). This list may not include all species identified as at risk by the Territorial Government.

- Schedule 1 is the official legal list of Species at Risk for SARA. SARA applies to all species on Schedule 1. The term "listed" species refers to species on Schedule 1.
- Schedule 2 and 3 of SARA identify species that were designated at risk by the COSEWIC prior to October 1999 and must be reassessed using revised criteria before they can be considered for addition to Schedule 1.
- Some species identified at risk by COSEWIC are "pending" addition to Schedule 1 of SARA. These species are under consideration for addition to Schedule 1, subject to further consultation or assessment.

Schedules of SARA are amended on a regular basis so it is important to check the SARA registry (www.sararegistry.gc.ca) to get the current status of a species.

Updated: June 2015

Terrestrial Species at Risk [1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility [2]
Migratory Birds			
Eskimo Curlew	Endangered	Schedule 1	EC
Buff-breasted Sandpiper	Special concern	Pending	EC
Ivory Gull	Endangered	Schedule 1	EC
Ross's Gull	Threatened	Schedule 1	EC
Harlequin Duck (Eastern population)	Special Concern	Schedule 1	EC
Rusty Blackbird	Special Concern	Schedule 1	Government of Nunavut
Peregrine Falcon	Special Concern (*anatum-tundrius* complex[3])	Schedule 1 - Threatened (*anatum*) Schedule 3 – Special Concern (*tundrius)*	Government of Nunavut
Short-eared Owl	Special Concern	Schedule 1	Government of Nunavut
Red Knot (*rufa* subspecies)	Endangered	Schedule 1	EC
Red Knot (*islandica* subspecies)	Special Concern	Schedule 1	EC
Horned Grebe (Western population)	Special Concern	Pending	EC
Red-necked Phalarope	Special concern	Pending	EC
Vegetation			
Felt-leaf Willow	Special Concern	Schedule 1	Government of Nunavut
Porsild's Bryum (Moss)	Threatened	Schedule 1	Government of Nunavut

Terrestrial Species at Risk [1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility [2]
Terrestrial Wildlife			
Peary Caribou	Endangered	Schedule 1	Government of Nunavut
Peary Caribou (High Arctic Population)	Endangered	Schedule 2	Government of Nunavut
Peary Caribou (Low Arctic Population)	Threatened	Schedule 2	Government of Nunavut
Dolphin and Union Caribou	Special Concern	Schedule 1	Government of Nunavut
Grizzly Bear (Western Population)	Special Concern	Pending	Government of Nunavut
Wolverine	Special Concern	Pending	Government of Nunavut
Marine Wildlife			
Polar Bear	Special Concern	Schedule 1	Government of Nunavut/DFO
Atlantic Walrus	Special Concern	Pending	DFO
Beluga Whale (Cumberland Sound population)	Endangered	Schedule 2	DFO
Beluga Whale (Eastern Hudson Bay population)	Endangered	Pending	DFO
Beluga Whale (Western Hudson Bay population)	Special Concern	Pending	DFO
Beluga Whale (Eastern High Arctic – Baffin Bay population)	Special Concern	Pending	DFO
Bowhead Whale (Eastern Canada – West Greenland population)	Special Concern	Pending	DFO
Bowhead Whale (Eastern Arctic population	Endangered	Schedule 2	DFO
Killer Whale (Northwest Atlantic / Eastern Arctic populations)	Special Concern	Pending	DFO
Narwhal	Special Concern	Pending	DFO
Fish			
Northern Wolffish	Threatened	Schedule 1	DFO
Atlantic Wolffish	Special Concern	Schedule 1	DFO
Bering Wolffish	Special Concern	Schedule 3	DFO
Roundnose Grenadier	Endangered	Pending	DFO
Spotted Whitefish	Threatened	Schedule 1	DFO
Thorny Skate	Special Concern	Pending	DFO
Atlantic Cod, Arctic Lakes	Special Concern	Pending	DFO
Blackline Prickleback	Special Concern	Schedule 3	DFO

[1] The Department of Fisheries and Oceans has responsibility for aquatic species.
[2] Environment Canada (EC) has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the Migratory Birds Convention Act (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Populations that exist in National Parks are also managed under the authority of the Parks Canada Agency.
[3] The *anatum* and *tundrius* subspecies of Peregrine Falcon were reassessed by COSEWIC in 2007 and combined into one subpopulation complex. This subpopulation complex was assessed by COSEWIC as Special Concern, and was added to Schedule 1 of SARA in July 2012.

Appendix C
Archaeological and Palaeontological Resources Terms and Conditions for Land Use Permit Holders

INTRODUCTION

The Department of Culture and Heritage (CH) routinely reviews land use applications sent to the Nunavut Water Board, Nunavut Impact Review Board and the Aboriginal Affairs and Northern Development Canada. These terms and conditions provide general direction to the permittee/proponent regarding the appropriate actions to be taken to ensure the permittee/proponent carries out its role in the protection of Nunavut's archaeological and palaeontological resources.

TERMS AND CONDITIONS

1) The permittee/proponent shall have a professional archaeologist and/or palaeontologist perform the following **Functions** associated with the **Types of Development** listed below or similar development activities:

	Types of Development (See Guidelines below)	**Function** (See Guidelines below)
a)	Large scale prospecting	Archaeological/Palaeontological Overview Assessment
b)	Diamond drilling for exploration or geotechnical purpose or planning of linear disturbances	Archaeological/ Palaeontological Inventory
c)	Construction of linear disturbances, Extractive disturbances, Impounding disturbances and other land disturbance activities	Archaeological/ Palaeontological Inventory or Assessment or Mitigation

Note that the above-mentioned functions require either a Nunavut Archaeologist Permit or a Nunavut Palaeontologist Permit. CH is authorized by way of the *Nunavut and Archaeological and Palaeontological Site Regulations*[1] to issue such permits.

[1] P.C. 2001-1111 14 June, 2001

2) The permittee/proponent shall not operate any vehicle over a known or suspected archaeological or palaeontological site.

3) The permittee/proponent shall not remove, disturb, or displace any archaeological artifact or site, or any fossil or palaeontological site.

4) The permittee/proponent shall immediately contact CH at (867) 934-2046 or (867) 975-5500 should an archaeological site or specimen, or a palaeontological site or fossil, be encountered or disturbed by any land use activity.

5) The permittee/proponent shall immediately cease any activity that disturbs an archaeological or palaeontological site encountered during the course of a land use operation until permitted to proceed with the authorization of CH.

6) The permittee/proponent shall follow the direction of CH in restoring disturbed archaeological or palaeontological sites to an acceptable condition. If these conditions are attached to either a Class A or B Permit under the Territorial Lands Act Aboriginal Affairs and Northern Development Canada directions will also be followed.

7) The permittee/proponent shall provide all information requested by CH concerning all archaeological sites or artifacts and all palaeontological sites and fossils encountered in the course of any land use activity.

8) The permittee/proponent shall make best efforts to ensure that all persons working under its authority are aware of these conditions concerning archaeological sites and artifacts and palaeontological sites and fossils.

9) If a list of recorded archaeological and/or palaeontological sites is provided to the permittee/proponent by CH as part of the review of the land use application the permittee/proponent shall avoid the archaeological and/or palaeontological sites listed.

10) Should a list of recorded sites be provided to the permittee/proponent, the information is provided solely for the purpose of the proponent's land use activities as described in the land use application, and must otherwise be treated confidentially by the proponent.

Legal Framework

As stated in Article 33 of the *Nunavut Land Claims Agreement*:

Where an application is made for a land use permit in the Nunavut Settlement Area, and there are reasonable grounds to believe that there could be sites of archaeological importance on the lands affected, no land use permit shall be issued without written consent of the Designated Agency. Such consent shall not be unreasonably withheld. [33.5.12]

Each land use permit referred to in Section 33.5.12 shall specify the plans and methods of archeological site protection and restoration to be followed by the permit holder, and any other conditions the Designated Agency may deem fit. [33.5.13]

Palaeontology and Archaeology

Under the *Nunavut Act*[2], the federal government can make regulations for the protection, care and preservation of palaeontological and archaeological sites and specimens in Nunavut. Under the *Nunavut Archaeological and Palaeontological Sites Regulations*[3], it is illegal to alter or disturb any palaeontological or archaeological site in Nunavut unless permission is first granted through the permitting process.

Definitions

As defined in the *Nunavut Archaeological and Palaeontological Sites Regulations*, the following definitions apply:

> *"archaeological site" means a place where an archaeological artifact is found.*
>
> *"archaeological artifact" means any tangible evidence of human activity that is more than 50 years old and in respect of which an unbroken chain of possession or regular pattern of usage cannot be demonstrated, and includes a Denesuline archaeological specimen referred to in section 40.4.9 of the Nunavut Land Claims Agreement.*
>
> *"palaeontological site" means a site where a fossil is found.*
>
> *"fossil" includes:*
> *Fossil means the hardened or preserved remains or impression of previously living organisms or vegetation and includes:*
> *(a) natural casts;*
> *(b) preserved tracks, coprolites and plant remains; and*
> *(c) the preserved shells and exoskeletons of invertebrates and the preserved eggs, teeth and bones of vertebrates.*

[2] s. 51(1)
[3] P.C. 2001-1111 14 June, 2001

(**Note:** Partial document only, complete document at: www.ch.gov.nu.ca/en/Archaeology.aspx)

Introduction

The following guidelines have been formulated to ensure that the impacts of proposed developments upon heritage resources are assessed and mitigated before ground surface altering activities occur. Heritage resources are defined as, but not limited to, archaeological and historical sites, burial grounds, palaeontological sites, historic buildings and cairns Effective collaboration between the developer, the Department of Culture, Language, Elders and Youth (CH), and the contract archaeologist(s) will ensure proper preservation of heritage resources in the Nunavut Territory. The roles of each are briefly described.

CH is the Nunavut Government agency which oversees the protection and management of heritage resources in Nunavut, in partnership with land claim authorities, regulatory agencies, and the federal government. Its role in mitigating impacts of developments on heritage resources is as follows: to identify the need for an impact assessment and make recommendations to the appropriate regulatory agency; set the terms of reference for the study depending upon the scope of the development; suggest the names of qualified individuals prepared to undertake the study to the developer; issue an archaeologist or palaeontologist permit authorizing field work; assess the completeness of the study and its recommendations; and ensure that the developer complies with the recommendations.

The primary regulatory agencies that CH provides information and assistance to are the Nunavut Impact Review Board, for development activities proposed for Inuit Owned Lands (as defined in Section 1.1.1 of the Nunavut Land Claims Agreement), and the Aboriginal Affairs and Northern Development Canada, for development activities proposed for federal Crown Lands.

A developer is the initiator of a land use activity. It is the obligation of the developer to ensure that a qualified archaeologist or palaeontologist is hired to perform the required study and that provisions of the contract with the archaeologist or palaeontologist allow permit requirements to be met; i.e. fieldwork, collections management, artifact and specimen conservation, and report preparation. On the recommendation of the contract archaeologist or palaeontologist in the field and the Government of Nunavut, the developer shall implement avoidance or mitigative measures to protect heritage resources or to salvage the information they contain through excavation, analysis, and report writing. The developer assumes all costs associated with the study in its entirety.

Through his or her active participation and supervision of the study, the contract archaeologist or palaeontologist is accountable for the quality of work undertaken and the quality of the report produced. Facilities to conduct fieldwork, analysis, and report preparation should be available to this individual through institutional, agency, or company affiliations. Responsibility for the curation of objects recovered during field work while under study and for documents generated in the course of the study as well as remittance of artifacts, specimens and documents to the repository specified on the permit accrue to the contract archaeologist or palaeontologist. This individual is also bound by the legal requirements of the *Nunavut Archaeological and*

Palaeontological Sites Regulations.

Types of Development

In general, those developments that cause concern for the safety of heritage resources will include one or more of the following kinds of surface disturbances. These categories, in combination, are comprehensive of the major kinds of developments commonly proposed in Nunavut. For any single development proposal, several kinds of these disturbances may be involved

- *Linear disturbances: including the construction of highways, roads, winter roads, transmission lines, and pipelines;*
- *Extractive disturbances: including mining, gravel removal, quarrying, and land filling;*
- *Impoundment disturbances: including dams, reservoirs, and tailings ponds;*
- *Intensive land use disturbances: including industrial, residential, commercial, recreational, and land reclamation work, and use of heritage resources as tourist developments.*
- *Mineral, oil and gas exploration: establishment of camps, temporary airstrips, access routes, well sites, or quarries all have potential for impacting heritage resources*.

Types of Studies Undertaken to Preserve Heritage Resources

Overview: An overview study of heritage resources should be conducted at the same time as the development project is being designed or its feasibility addressed. They usually lack specificity with regard to the exact location(s) and form(s) of impact and involve limited, if any, field surveys. Their main aim is to accumulate, evaluate, and synthesize the existing knowledge of the heritage of the known area of impact. The overview study provides managers with baseline data from which recommendations for future research and forecasts of potential impacts can be made. A Class I Permit is required for this type of study if field surveys are undertaken.

Reconnaissance: This is done to provide a judgmental appraisal of a region sufficient to provide the developer, the consultant, and government managers with recommendations for further development planning. This study may be implemented as a preliminary step to inventory and assessment investigations except in cases where a reconnaissance may indicate a very low or negligible heritage resource potential. Alternately, in the case of small-scale or linear developments, an inventory study may be recommended and obviate the need for a reconnaissance.

The main goal of a reconnaissance study is to provide baseline data for the verification of the presence of potential heritage resources, the determination of impacts to these resources, the generation of terms of reference for further studies and, if required, the advancement of preliminary mitigative and compensatory plans. The results of reconnaissance studies are primarily useful for the selection of alternatives and secondarily as a means of identifying impacts that must be mitigated after the final siting and design of the development project.

Depending on the scope of the study, a Class 1 or Class 2 Permit is required for this type of investigation.

Inventory: A resource inventory is generally conducted at that stage in a project's development at which the geographical area(s) likely to sustain direct, indirect, and perceived impacts can be well defined. This requires systematic and intensive fieldwork to ascertain the effects of all possible and alternate construction components on heritage resources. All heritage sites must be recorded on Government of Nunavut Site Survey forms. Sufficient information must be amassed from field, library and archival components of the study to generate a predictive model of the heritage resource base that will:

- allow the identification of research and conservation opportunities;
- enable the developer to make planning decisions and recognize their likely effects on the known or predicted resources; and
- make the developer aware of the expenditures, which may be required for subsequent studies and mitigation. A Class 1 or 2 permit is required.

Assessment: At this stage, sufficient information concerning the numbers and locations of heritage resources will be available, as well as data to predict the forms and magnitude of impacts. Assessments provide information on the size, volume, complexity and content of a heritage resource, which is used to rank the values of different sites or site types given current archaeological knowledge. As this information will shape subsequent mitigation program(s), great care is necessary during this phase.

Mitigation: This refers to the amelioration of adverse impacts to heritage resources and involves the avoidance of impact through the redesign or relocation of a development or its components; the protection of the resource by constructing physical facilities; or, the scientific investigation and recovery of information from the resource by excavation or other method. The type(s) of appropriate mitigative measures are dictated by their viability in the context of the development project. Mitigation strategies must be developed in consultation with, and approved by, the Department of Culture and Heritage. It is important to note that mitigation activities should be initiated as far in advance of the construction of the development as possible.

Surveillance and monitoring: These may be required as part of the mitigation program.

Surveillance may be conducted during the construction phase of a project to ensure that the developer has complied with the recommendations.

Monitoring involves identification and inspection of residual and long-term impacts of a development (i.e. shoreline stability of a reservoir); or the use of impacts to disclose the presence of heritage resources, for example, the uncovering of buried sites during the construction of a pipeline.

APPENDIX E

Nunavut Impact Review Board – Form 1 & 2

PART 1 FORM
PROJECT PROPOSAL INFORMATION REQUIREMENTS

To access NIRB documents, project screenings, and project reviews please visit the Nunavut Impact Review Board's ftp site http://ftp.nirb.ca/. The NIRB's website (www.nirb.ca) is currently under construction. Please contact info@nirb.ca should you have any questions or require further information.

IMPORTANT!
Please be advised that your application will not be processed until the Sections 1 - 9 are completed in their entirety, in both English and Inuktitut (+ Inuinnaqtun, if in the Kitikmeot).

SECTION 1: APPLICANT INFORMATION

1. Project Name **Eureka High Arctic Weather Station (HAWS) Improvements**

2. Applicant's full name and mailing address:
Environment Canada

Phone:
Fax:
Email:

3. Primary contact's full name and mailing address:

Phone:
Fax:
Email:

SECTION 2: AUTHORIZATION NEEDED

1. Indicate <u>all</u> authorizations associated with the project proposal:

- [ ] Regional Inuit Association (RIA)
- [x] Nunavut Water Board (NWB)
- [x] Nunavut Planning Commission (NPC)
- [x] Government of Nunavut (GN)
- [ ] Community Government & Services (CG&S)
- [ ] Culture and Heritage (CH)
- [ ] Nunavut Research Institute (NRI)
- [x] Aboriginal Affairs and Northern Development Canada (AANDC)
- [ ] Canadian Launch Safety (CLS)
- [ ] Canadian Wildlife Service (CWS)
- [ ] Department of National Defense (DND)
- [x] Environment Canada (EC)
- [ ] Fisheries and Oceans Canada (DFO)
- [ ] Parks Canada (PC)
- [ ] Hamlet
- [ ] Other (please specify):

2. List the <u>active</u> permits, licenses, or other authorizations related to the project proposal, and their expiry date(s):

Nunavut Water Board Water Licence

3. **List the <u>pending</u>* permits, licenses, or other authorizations related to the project proposal:**

*Please provide a copy of all applications to the NIRB.

4. **Has this project or <u>any components of this project</u> been previously screened or reviewed by NIRB?**

☑ **YES** **NO**

If YES, indicate the previous project name and NIRB File No.

NIRB File No.12XN020 Eureka Weather Station Facility Project

SECTION 3: PROJECT PROPOSAL DESCRIPTION

1. **Indicate the type of project proposal (check all that apply)[1,2]: (See Appendix A for Project Type Definitions)**

1	All-Weather Road/Access Trail	☑	**9**	Site Cleanup/Remediation	☐
2	Winter Road/ Winter Trail	☐	**10**	Oil and Natural Gas Exploration/Activities	☐
3	Mineral Exploration	☐	**11**	Marine Based Activities	☐
4	Advanced Mineral Exploration	☐	**12**	Scientific/International Polar Year Research*	☑
5	Mine Development /Bulk Sampling	☐	**13**	Harvesting Activities*	☐
6	Pits and quarries	☑	**14**	Tourism Activities*	☐
7	Offshore Infrastructure (port, break water, dock)	☐	**15**	Other[2]: Facility infrastructure upgrades	☑
8	Seismic Survey	☐			☐

<u>Please note:</u>

1. All project types listed above, except those marked with an asterisk (*), will also require the Proponent to submit a **Part 2 Project Specific Information Requirement (PSIR) Form**. The NIRB application process will not be considered complete without the Part 2 PSIR Form.
2. Please be advised that in order to complete the NIRB process, the NIRB may request additional information at any time during the process.
3. If "Other" is selected, contact NIRB for direction on whether a Part 2 PSIR Form is required.

2. If Project Type 3, 4 or 5 was selected in previous question, please indicate the mineral of interest that is being extracted. Include a brief description.

- [ ] Base Metals (zinc, copper, gold, silver, etc)_____
- [ ] Diamonds
- [ ] Uranium
- [ ] Other: _____

3a. If Project Type 12, 13 or 14 was selected above, complete the table and questions below.

Transportation Type	Quantity	Proposed Use	Length of Use
E.g. Helicopter	*1*	*Site to site pick ups and drop offs*	*6 days*
Charter aircraft (e.g. Twin otter, single prop)	Varies	Transportation of supplies and workers to HAWS	Annualy
Sealift	1/yr	Transportation of goods and materials to site	Annually

3b. Describe any docks, piers, air strips or related structures that are to be used in conjunction with the proposed project activities. **Please note**: *the building of new structures may require a Part 2 Form.*

The main Eureka HAWS site (79°59'41''N and 85°56'W) consists of a number of buildings and associated infrastructure including: the operations/ residence and transient complex, garages, a water treatment plant and powerhouse, incinerator, assorted warehouses, hydrogen/balloon release building, carpentry shop, greenhouse, sealift landing area, an active landfill; closed landfills; roads; water reservoir; sewage lagoon; tank farm and fuel pipeline. In addition to the above, outdoor storage of old equipment, referred to as the “dead line” is located north of the tank farm and operations complex. The Eureka HAWS also includes an existing airstrip that is located 1.5 km northeast of the HAWS main site (coordinates at the centre of the airstrip are 79°59'40''N and 85°48'42''W).

3c. If a temporary camp site is to be established, describe the proposed structures in detail and indicate the type and source of power for the camp site if applicable.

A temporary camp for 50 workers will be required for the duration of the project. The modular style (e.g. ATCO trailers) camp will provide accommodations, washroom facilities and food services. The camp will be located at the existing airstrip between Fort Eureka and the existing barrel crushing area and north of the former First Air buildings.

4. Personnel

Total No. of personnel on site = (A) 50 Total No. of days on-site = (B) 360 **Total No. of Person days (A) × (B) = 18,000**

5. Timing

Period of operation: from Summer 2014 to Summer 2018

Proposed term of authorization: from June 2015 to September 2018

6a. Region (check all that apply):

☐ North Baffin	☐ Kivalliq	☐ Kitikmeot	☐ Transboundary: _____
☐ South Baffin	☐ National Park	☑ Qikiqtaaluk	

6b. Describe the location of the proposed project activities in a regional context, noting the proximity to the nearest communities and any protected areas.

The Eureka HAWS is located on the north side of Slidre Fiord, at the northwestern tip of Fosheim Peninsula, Ellesmere Island, Nunavut. The nearest community is the hamlet of Grise Fiord, which is located approximately 400 km south of the site. Quttinirpaaq National Park is located approximately 225 km to the northeast.

6c. Discuss the history of the site if it has been used for any project activities in the past.

The project site is located on land owned by Environment Canada (land reserve #1021) and operated by the Meteorological Service of Canada since 1947. Regular improvements and upgrades have been made to the buildings and infrastructure since that time as needed and in response to changing needs. Environment Canada (EC) is undertaking several project upgrades at the High Arctic Weather Station (HAWS) and airstrip in Eureka, Nunavut.

6d. Indicate if there are any known archaeological/palaeontological historical sites in the area.

Approximately 285 archaeological sites have been documented in Quttinirpaaq National Park, located approximately 225 km to the north east of Eureka. No archaeological sites have been documented at Eureka.

7. Land Status (check all that applies):

☑ Crown	☐ Commissioners'	☐ Municipal
☐ Inuit Owned Surface Lands	☐ Inuit Owned Sub-Surface Lands	

8a. Co-ordinates:

Min Lat (degree/minute)	79°59'N	Min Long (degree/minute)	85°57'W
Max Lat (degree/minute)	80°00'N	Max Long (degree/minute)	85°40'W

NTS Map Sheet No: 49G15

(Please ensure that maps of the project are attached (1:50,000 **if available**, 1:250, 000 **Mandatory**) available from Natural Resources Canada)

8b. If the project proposal includes a **camp**, please provide the coordinates of the camp location

Min Lat (degree/minute)	79°59.7'N	Min Long (degree/minute)	85°49.9'W
Max Lat (degree/minute)	79°59.7'N	Max Long (degree/minute)	85°49.9'W

If different from above for the camp:

NTS Map Sheet No: _____

Please ensure that maps of the project are attached (1:50,000 **if available**, 1:250, 000 **Mandatory**) available from Natural Resources Canada

Please note that additional location information may be required in a subsequent Project Specific Information Requirement (PSIR) submission. This may take the form of a digital Geographic Information Systems (GIS) file.

SECTION 4: NON-TECHNICAL PROJECT PROPOSAL DESCRIPTION

Please include a non-technical description of the project proposal, no more than 500 words, in English and Inuktitut (+Inuinnaqtun, if in the Kitikmeot). The project description should outline the following:

- The project activities, their necessity and duration;
- Method of transportation;
- Any structures that will be erected (permanent/ temporary);
- Alternatives considered; and
- Long-term developments, the projected outcome of the development for the area and its timeline.

IMPORTANT: IF THE PROPOSED ACTIVITIES REQUIRE SUBMISSION OF A NIRB PART 2 PSIR FORM, PLEASE COMPLETE SECTION 8 ONLY, OTHERWISE CONTINUE ON WITH SECTION 5.

1 Eureka Runway Recap

Environment Canada is planning to carry out a major reconstruction/upgrade of the Eureka runway. The work to the runway will be staged in order to ensure the airstrip is functional throughout. The runway improvements, including the main apron located on the north side of the runway and proposed new apron on the south side are located within the existing footprint of the existing runway and Fort Eureka. A worker camp is proposed for the duration of the construction period and will be located east of Fort Eureka and west of the existing drum crushing site.

Granular material will be extracted from the Black Top Creek borrow pit area located in the south east corner of the EC lease area and approximately 4 km east of Fort Eureka. In addition to the granular material required for the runway project, granular material will also be extracted and stored for use in the construction of the new water reservoir and for ongoing maintenance activities at HAWS.

The proposed schedule includes delivery of heavy construction equipment (e.g. bulldozers, dump trucks) and materials and supplies for the temporary worker camp on the 2015 sealift. The worker camp will be constructed in 2015 prior to commencement of construction in summer 2016. The construction period for the runway project will span three construction seasons (2016-2018).

2 New Multipurpose Building

The requirement for a new multipurpose building was identified by EC to provide better infrastructure support for the HAWS. The multipurpose building would provide cold and warm storage and a small carpentry shop. The building foundation, a rectangular shape was constructed during the summer construction season in 2015. The pre-engineered building and materials were delivered to the site on the 2015 sealift and will be stored onsite until the summer 2016 construction season. It is anticipated that the building and all associated infrastructure will be installed and operational by fall 2016.

3 Reservoir Upgrades

Environment Canada (EC) has identified a need to upgrade the water supply and treatment system at the HAWS. A new above ground water reservoir and water treatment system will be installed, including the Station Creek intake, new pumps and pump house, and water pipes. The new reservoir will be filled annually from Station Creek and provide sufficient supply for a maximum of 60 people.

The existing water supply is from Station Creek, which is located west of the existing water reservoir. Water is pumped from Station Creek between July and August, when the turbidity of the water is lower

than during the thawing period. The existing water reservoir is currently operating at capacity with water usage restricted during high population periods at the Station.
It is anticipated that construction materials will be delivered to Eureka on the annual sealift in 2016. Construction of the reservoir will occur during the 2017 construction season with an October completion date. Project phasing will ensure that disruption to the daily operation of the facilities is kept to a minimum and all water services are maintained.

4 Sewage and Wastewater System Upgrades

In addition to the upgrade to the water supply and treatment system, Environment Canada (EC) has also identified the need to upgrade the sewage and wastewater treatment system, which will include the provision of a new chemical/physical treatment system, and upgrades to the existing sewage lagoon. The existing wastewater facilities consist of a storage holding tank, a pump house and a lagoon that discharges effluent into the Slidre Fjord twice per year during the summer. Throughout the year, wastewater in the holding tank located inside the weather station building is discharged to the sewage lagoon by a 150mm heat traced pipeline.

The new wastewater sewage treatment system for the HAWS was designed based on study recommendations. It is anticipated that the upgrade will improve the performance of the wastewater treatment system, particularly, during periods when conditions in the lagoon are not conducive to biological activity.

It is anticipated that construction materials will be delivered to Eureka on the annual sealift in 2016. Construction will follow during the summer 2017 season.

SECTION 5: MATERIAL USE

1. List equipment to be used (including drills, pumps, aircraft, vehicles, etc.):

Equipment type and number	Size – dimensions	Proposed use

2a. Detail fuel and hazardous material use:

Fuel	Number of Containers and Capacity of Containers	Total Amount of Fuel (in Litres)	Proposed Storage Methods
Diesel	9-50,000L tanks 1-720,000L tank	1.2 million L	Existing fuel tank farm
Gasoline	Varies annually	Varies annually	Barrels with secondary containment system
Aviation fuel	Varies annually	Varies annually	Barrels with secondary containment system
Propane			Barrels with secondary containment system
Other			

Hazardous Materials and Chemicals		Total Amount of Hazardous Materials and Chemicals (in Litres)	

2b. Describe the proposed Spill Prevention Plan.

Eureka Emergency Plan (2010)

3a. Detail the anticipated daily water consumption rates

Daily amount (m^3)	Proposed water retrieval methods	Proposed water retrieval location
Reservoir storage capacity 2100m^3	Water is pumped from Station Creek in the Spring and stored in reservoir	Station Creek at reservoir

3b. Have you applied for a water License* with the Nunavut Water Board?

X YES ☐ **NO**

If yes, what class of licence?

☐ **Class A Water Licence** **X Class B Water Licence**

*Please provide a copy of the application or licence to the NIRB.

SECTION 6: WASTE DISPOSAL AND TREATMENT METHODS

1. List the types of waste associated with the proposed project activities:

Type of waste	Projected amount generated	Method of Disposal	Additional treatment procedures
Sewage (human waste)	60 workers	Existing on-site treatment system	
Greywater		Existing on-site waste treatment system	
Combustible wastes		Incineration	
Non-Combustible wastes		Landfill, as per Waste Management Plan	
Overburden (organic soil, waste material, tailings)		Not Applicable	
Hazardous waste		Approved containment, disposal off-site	
Other:			

2. Describe the proposed Waste Management Plan.

HAWS Waste Management Plan (2010).

SECTION 7: COMMUNITY INVOLVEMENT & REGIONAL BENEFITS

1. **List the community representatives that have been contacted and provide the minutes of the meetings if available:**

Community	Name	Organization	Date Contacted

SECTION 8: GENERAL QUESTIONS

1. **Will you be disturbing any known archaeological sites?**

☐ **YES** ☑ **NO**

SECTION 9: APPLICANT SIGNATURE

Please sign and date your application:

Signature **Title** **Date**

APPENDIX A
Project Type Definitions

Access Trail: A project proposal with the objective of providing vehicular access to an area of interest involving minimal alteration to the terrain.

Advanced Exploration: A project proposal with the objective of identifying size, grade, and physical characteristics of a mineral occurrence and to assess the economic and technical feasibility of developing the mineral deposit into a producing mine

All-Weather Road: A project proposal with the objective of road construction for use in all seasons.

Bulk Sampling: A project proposal with the objective of extracting of large samples of mineralized material involving hundreds to thousands of tonnes. Samples are selected as representative of the potential mineral deposit being sampled. May involve crushing/milling (on small-scale)

Harvesting activities: A project proposal with the objective of harvesting animals, marine mammals and/or fish from their natural habitats by means of hunting or trapping for traditional and commercial use.

Marine Based Activities: Any activity occurring in the marine environment, such as vessel use associated with land-based activities or disposal at sea.

*Please note that normal community re-supply or individual ship movements not associated with land-based project proposals shall not be screened by NIRB (Section 12.12.2 of NLCA).

Mine Development: A project proposal with the objective of extracting broken rock with mineralization of sufficient grade and tonnage to sustain commercial mining operations (ore). Mining a body of ore can be achieved by either open pit and/or underground development. Mine development may involve milling. Milling involves treatment of the extracted ore through a combination of mechanical and chemical processes to selectively recover the valuable mineral.

Mineral Exploration: A project proposal with the objective of exploring an area to find geological anomalies. It involves site reconnaissance (ground and/or air) to locate broad and fiscal mineral deposits.

Offshore Infrastructure: A project proposal with the objective of building off loading facilities constructed off the shoreline and connected to the mainland of the marine or freshwater environment. Examples include a jetty, dock, or port facility.

Oil and Gas Exploration/Activities: A project proposal that includes 1) exploration, such as seismic or geological mapping, 2) drilling of oil and gas wells, 3) construction and operation of a pipeline, a gas processing plant or any oil and gas facility within Nunavut.

Pits and Quarries: A project proposal with the objective of pitting, which involves the extraction of granular material (i.e. sands and gravels) and quarrying, which involves the removal of consolidated rock (i.e. bedrock, frozen soil).

Scientific Research: A project proposal with the objective of implementing a series of site activities comprised of observation of phenomena, measurement and collection of data necessary for scientific investigation in designated areas within a limited time period.

Seismic Survey: A project proposal with the objective of conducting a survey to map the depths and contours of rock strata by timing the reflections of sound waves released from the surface. Survey site locations may be offshore (not within 12 nautical miles of any coast), near shore, and extended onshore.

Site Cleanups: A project proposal with the objective of site cleanups (includes DEW line site cleanups), which focuses on the remediation of chemically contaminated soils, stabilization of landfills and dumps, demolition/disposal of infrastructure and debris and monitoring after cleanup is completed.

Tourism Activity: A project proposal with the objective of conducting travel predominantly for recreational, sport or leisure purposes within a designated area and limited time period.

Winter Road: A project proposal with the objective of building a road for winter use by leveling and compacting surface snow and ice. Winter road is removed at end of season.

Winter Trail: A project proposal with the objective of building a trail for winter use by a single pass of a tracked vehicle using a blade, if necessary.

SCREENING PART 2 FORM
PROJECT SPECIFIC INFORMATION REQUIREMENTS (PSIR)

1. SUBMISSIONS

The Proponent must submit all information pertaining to the Project as a whole. The information requirements below are designed for the purpose of environmental assessment and are not limited to the scope of a single permit or license application.

IMPORTANT: Please be advised of the following:

1. NIRB does not accept references to an ftp or web sites as a submission.

2. The Proponent must provide NIRB with 1 (one) electronic copy and 1 (one) hardcopy of the required information in English.

3. All maps should be shapefiles, be legible, and should include grids, be of appropriate scale, indicate the scale, include latitude and longitude references, NTS Maps numbers, title, legend and a north arrow. To the extent possible, avoid hand-drawn demarcations and faxed maps; and,

4. Please complete all required information in each section below. If the required information is not applicable to the project proposal, please indicate this in the response with "n/a". If the request has been provided in a different section or report, please note the section or report where the response can be found.

2. GENERAL PROJECT INFORMATION REQUIREMENTS

Project Coordinates and Maps

1. The preferred method for submitting project coordinates information is through the use of a Geographic Information System (GIS) compatible digital file. Although an ESRI ArcView 3.x shape file (in decimal degrees) is the preferred interchange format, the NIRB has the capacity to receive over 100 GIS and CAD related formats, including MapInfo and AutoCAD, provided proper format and projection metadata is also submitted. The NIRB requires coordinates for the project proposal which reflect the entire project area as defined by:

   - Area/sites of investigation;
   - Boundaries of the foreseen land use permit/right-of-way area(s) to be applied for;
   - Location of any proposed infrastructure or activity(s); and,

- Boundaries of the mineral claim block(s) where proposed activities will be undertaken.

The Eureka High Arctic Weather Station (HAWS) is located on the north side of Slidre Fiord, at the northwestern tip of Fosheim Peninsula, Ellesmere Island, Nunavut. Environment Canada's parcel of land extends from Station Creek east to Black Top Creek. The HAWS is located within this boundary directly west of Station Creek. The coordinates at the HAWS are 79°59'41"N and 85°56'W. The total area of the site is approximately 2.23 hectares. The Eureka airstrip is located 1.5 km northeast of the HAWS main site. The coordinates at the centre of the airstrip are 79°59'40"N and 85°48'42"W.

2. Map of the project site within a regional context indicating the distance to the closest communities. *(Provided as a separate shapefile).*
3. Map of any camp site including locations of camp facilities. *(Provided as a separate shapefile).*
4. Map of the project site indicating existing and/or proposed infrastructure, proximity to water bodies and proximity to wildlife and wildlife habitat. *(Provided as a separate shapefile).*

Project General Information

5. Discuss the need and purpose of the proposed project.

Environment Canada is proposing upgrades to its High Arctic Weather Station and runway airstrip at Eureka. The project includes recapping of the Eureka runway, installation of a new pre-engineered multiuse building, upgrades to the existing water treatment system including a new reservoir, and upgrades to the existing wastewater system. All the proposed improvements have been identified through facility reviews as infrastructure that has reached its end of life service. Studies to review and identify appropriate design solutions were undertaken for the proposed improvements. Improvements proposed are planned to meet existing regulatory conditions and anticipated capacity demands over the next 30 years.

6. Discuss alternatives to the project and alternative methods of carrying out the project, including the no-go alternative. Provide justification for the chosen option(s).

All project components underwent detailed studies to identify and revaluate alternative methods for carrying out the improvements. These detailed studies can be provided. Preferred alternatives have been selected based on environmental and geographic constraints, practicality and economic feasibility.

7. Provide a schedule for all project activities.

Runway Recap: June – August construction 2016, 2017, 2018
Multipurpose Building: June – August construction 2015, 2016
Water Reservoir upgrades: June – August construction 2017, 2018
Waste Water and Sewage Lagoon upgrades: June – August construction 2017, 2018

8. List the acts, regulations and guidelines that apply to project activities.

Canadian Environmental Protection Act
Fisheries Act
Migratory Birds Convention Act and Migratory Birds Regulations
Nunavut Waters and Nunavut Surface Rights Tribunal Act
Species at Risk Act

Wildlife Act
Nunavut Act
Transportation of Dangerous Goods Act and Regulations
Aeronautics Act
Federal Guidelines for Landfarming Petroleum Hydrocarbon Contamination
Nunavut Mining Safety Ordinance and the Territorial Quarrying Regulations
Northern Land Use Guidelines Pits and Quarries
Territorial Lands Act

9. List the approvals, permits and licenses required to conduct the project.

Nunavut Impact Review Board Approval
Nunavut Water Board Water Licence

DFO Operational Statement (OS) Conformity – *Not Applicable*

10. Indicate whether any of the following Department of Fisheries and Oceans (DFO) Operational Statement (OS) activities apply to the project proposal:
    - Bridge Maintenance
    - Clear Span Bridge
    - Culvert Maintenance
    - Ice Bridge
    - Routine Maintenance Dredging
    - Installation of Moorings

    Please see DFO's OS for specific definitions of these activities available from DFO's web-site at http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/index-eng.htm
11. If any of the DFO's OS apply to the project proposal, does the Proponent agree to meet the conditions and incorporate the measures to protect fish and fish habitat as outlined in the applicable OS? If yes, provide a signed statement of confirmation.

Transportation

12. Describe how the project site will be accessed and how supplies will be brought to site. Provide a map showing access route(s). *(Map is provided as a separate shapefile).*

Eureka is accessible by air and water. Supplies will be delivered to the HAWS through the annual sea lift via Fosheim Peninsula, one year prior to construction activities. Fixed wing aircraft will land at the Eureka Weather Station. Contractors, fresh food/produce and other supplies will be flown in on regularly scheduled charter flights.

13. If a previous airstrip is being used, provide a description of the type of airstrip (ice-strip/all-weather), including its location. Describe dust management procedures (if applicable) and provide a map showing location of airstrip. *(Map is provided as a separate shapefile).*

The Eureka airstrip is an all-weather airstrip located 1.5 km northeast of the HAWS main site. The coordinates at the centre of the airstrip are 79°59'40"N and 85°48'42"W. The Department of National Defence (DND) maintains Fort Eureka, located south of the Eureka runway. Environment Canada is planning to carry out a major reconstruction/upgrade of the Eureka runway. The requirement to upgrade the Eureka runway was identified in order to improve functionality and service to HAWS and Fort Eureka.

The work to the runway will be staged in order to ensure the airstrip is functional throughout. The runway improvements, including the main apron located on the north side of the runway and proposed new apron on the south side are located within the existing footprint of the existing runway and Fort Eureka. Granular material will be extracted from the Black Top Creek borrow pit area located in the south east corner of the Environment Canada lease area and approximately 4 km east of Fort Eureka.

Dust management procedures include ensuring vehicles are in good working order, lowering vehicle speeds on unpaved road surfaces, applying water to road surfaces as needed.

14. If an airstrip is being constructed, provide the following information: - *Not Applicable – a previously existing airstrip is being recapped.*
    a. Discuss design considerations for permafrost
    b. Discuss construction techniques
    c. Describe the construction materials, type and sources, and the acid rock drainage (ARD) and metal leaching (ML) characteristics (if rock material is required for airstrip bed).
    d. Describe dust management procedures.
    e. Provide a map showing location of proposed airstrip.

15. Describe expected flight altitudes, frequency of flights and anticipated flight routes.
    All flights are subject to Transport Canada's aviation regulation and standards .Charter flights originate from Resolute Bay, Montreal, and Winnipeg. The HAWS is serviced with a regular charter every six weeks which brings fresh produce, mail, and staff.

Camp Site

16. Describe all existing and proposed camp structures and infrastructure
    Construction crew members will be based out of the existing Eureka HAWS permanent year-round facilities, for the work to be conducted at the HAWS site. Fifty construction crew members will be housed in a temporary camp located at the airstrip.

17. Describe the type of camp: *Temporary and Permanent*
    Temporary Camp – modular style camp providing accommodations, food services, and wastewater treatment.
    Existing HAWS facility and infrastructure includes accommodations, food services, recreation, powerhouse, water treatment plant, wastewater treatment, waste management facilities, fuel storage, and a range of heavy equipment vehicles.

18. Describe the maximum number of personnel expected on site, including the timing for those personnel involved with the project.
    The maximum number of personnel expected at the permanent facilities is typically 8 to 10.
    The maximum number of personnel expected at the temporary facilities is 50.

Equipment

19. Provide a list of equipment required for the project and discuss the uses for the equipment. *Information still to be determined once a construction contractor has been selected.*
20. If possible, provide digital photos of equipment. *No photos are available at this time.*

Water

21. Describe the location of water source(s), the water intake methods, and all methods employed to prevent fish entrapment. Provide a map showing the water intake locations. *Map of all water intake locations based on information still to be determined once a construction contractor has been selected.*

    The existing water source is supplied from Station Creek's annual freshet, which is located west of the existing HAWS water reservoir. Water is pumped from Station Creek between July and August, when the turbidity of the water is lower than during the thawing period. The existing water reservoir is located at an elevation approximately 8 m below the main Station buildings. It has an active storage capacity of approximately 2100 m^3. There are two pumps on site that are used to pump water from Station Creek to the reservoir. The water from the reservoir is then pumped to storage tanks in the tank building, adjoining the maintenance garage, and subsequently pumped into tanks for further treatment located in the main complex building. To date, fish have not been observed in Station Creek.

22. Describe the estimated rate of water consumption (m^3/day). *Average estimated water consumption is a maximum of 20 m^3/day.*

23. Describe how waste water will be managed. If relevant, provide detail regarding location of sumps, including capacity of sumps and monitoring.
    Any water used during pit excavation will be returned to original sources will be free of hazardous materials but may contain trace amounts of salt ($CaCl_2$) used in drilling, no muds are used due to permafrost ground conditions. Camp wastewater, consisting of non-contaminated drinking water, will also pass through the existing facilities which consist of a storage holding tank, a pump house and a 2230 m^3 facultative single celled lagoon that discharges effluent into the Slidre Fjord twice per year during the summer. Throughout the year, wastewater in the holding tank located inside the weather station building is discharged to the sewage lagoon by a 150 mm heat traced pipeline. Project phasing will ensure that disruption to the daily operation of the facilities is kept to a minimum and all wastewater sewage services are maintained.

24. If applicable, discuss how surface water and underground water will be managed and monitored. *Not Applicable. Surface water monitoring will take place at a later date. Underground water is not expected due to the presence of permafrost throughout the project area.*

Waste Water (Grey water, Sewage, Other)

25. Describe the quantities, treatment, storage, transportation, and disposal methods for the following (where relevant):
    - Sewage – *See below, in addition to details outlined in the Nunavut Water Board Water Licence.*
    - *The existing wastewater facilities consist of a storage holding tank (located inside the weather station building), a pump house and a 2,230 m^3 facultative single celled sewage lagoon. Throughout the year, wastewater in the holding tank) is discharged to the sewage lagoon by a 150 mm heat traced effluent discharge pipe. Effluent is subsequently discharged from the lagoon into the Slidre Fjord twice per year, during the summer. The upgrades will include a new chemical/physical treatment system and upgrades to the existing sewage lagoon. The new wastewater sewage treatment*

system for the HAWS includes the option to add aeration and/or mixing to the holding tank in order to enhance organics removal prior to discharge to the lagoon. This is a simple and effective way to reduce the Biochemical Oxygen Demand (BOD) in an Arctic environment. It is anticipated that this upgrade will improve the performance of the wastewater treatment system, particularly during periods when conditions in the lagoon are not conducive to biological activity.

- Camp grey water– *Please refer to Nunavut Water Board Water Licence*
- Combustible solid waste– *Please refer to Nunavut Water Board Water Licence*
- Non-combustible solid waste, including bulky items/scrap metal– *Please refer to Nunavut Water Board Water Licence*
- Hazardous waste or oil– *Please refer to Nunavut Water Board Water Licence*
- Contaminated soils/snow– *Please refer to Nunavut Water Board Water Licence*
- Empty barrels/ fuel drums– *Please refer to Nunavut Water Board Water Licence*
- Any other waste produced – *Not Applicable*

26. If the project proposal includes a landfill or landfarm, indicate the locations on a map, provide the conceptual design parameters, and discuss waste management and contact-water management procedures. *Not Applicable.*

Fuel

27. Describe the types of fuel, quantities (number of containers, type of containers and capacity of containers), method of storage and containment. Indicate the location on a map where fuel is to be stored, and method of transportation of fuel to project site. *(Map is provided as a separate shapefile).*
Approximately 268 barrels of fuel with a capacity of approximately 5000 L each will be temporarily stored at the Eureka airstrip work site in the designated fuel storage area in the south apron. The storage area includes a secondary containment pad. Fuel will be transported to Eureka on the annual sea lift in accordance with the Transportation of Dangerous Goods Act and Regulations.

28. Describe any secondary containment measures to be employed, including the type of material or system used. If no secondary containment is to be employed, please provide justification. *Information still to be determined once a construction contractor has been selected.*

29. Describe the method of fuel transfer and the method of refuelling. *Information still to be determined once a construction contractor has been selected.*

30. Describe spill control measures in place. *Creation of spill contingency plan and information still to be determined once a construction contractor has been selected.*

Please refer to Environment Canada's fuel storage tank system regulations (*Storage Tank System for Petroleum and Allied Petroleum Products*) website at http://www.ec.gc.ca/st-rs/ for details on fuel storage requirements.

Chemicals and Hazardous Materials* *Information still to be determined once a construction contractor has been selected.*

**included but not limited to oils, greases, drill mud, antifreeze, calcium or sodium chloride salt, lead acid batteries and cleaners*

31. Describe the types, quantities (number of containers, the type of container and capacity of containers), method of storage and containment. Indicate the location on a map where material is to be stored, and method of transportation of materials to project site.
32. Describe any secondary containment measures to be employed, including the type of material or system used.
33. Describe the method of chemical transfer.
34. Describe spill control measures in place.

Workforce and Human Resources/Socio-Economic Impacts

35. Discuss opportunities for training and employment of local Inuit beneficiaries. – *Not Applicable, all work will be awarded through a completive bid process. Hiring and training is the responsibility of the successful contractors.*
36. Discuss workforce mobilization and schedule, including the duration of work and rotation length, and the transportation of workers to site.
    The majority of field personnel will work for eight weeks in July and August. Transportation to the site will typically be via Resolute Bay on charter flights.
37. Discuss, where relevant, any specific hiring policies for Inuit beneficiaries. – *Not Applicable*

Public Involvement/ Traditional Knowledge

38. Indicate which communities, groups, or organizations would be affected by this project proposal. – *Not Applicable, as the work is strictly confined to the Eureka HAWS and airstrip. Eureka has no permanent residents, and a number of research and operational staff rotate through the facility throughout the year.*
39. Describe any consultation with interested Parties which has occurred regarding the development of the project proposal. – *Not Applicable*
40. Provide a summary of public involvement measures, a summary of concerns expressed, and strategies employed to address any concerns. – *Not Applicable*
41. Describe how traditional knowledge was obtained, and how it has been integrated into the project. – *Not Applicable*
42. Discuss future consultation plans. – *Not Applicable*

3. PROJECT SPECIFIC INFORMATION

The following table identifies the project types identified in Section 3 of the NIRB, Part 1 Form. Please complete all relevant sections.

It is the proponent's responsibility to review all sections in addition to the required sections to ensure a complete application form.

Table 1: Project Type and Information Required

Project Type	Type of Project Proposal	Information Request
1	All-Weather Road/Access Trail	Section A-1 and Section A-2
2	Winter Road/Winter Trail	Section A-1 and Section A-3
3	Mineral Exploration	Section B-1 through Section B-4
4	Advanced Mineral Exploration	Section B-1 through Section B-8
5	Mine Development/Bulk Sampling	Section B-1 through Section B-12
6	Pits and Quarries	Section C
7	Offshore Infrastructure(port, break water, dock)	Section D
8	Seismic Survey	Section E
9	Site Cleanup/Remediation	Section F
10	Oil and Natural Gas Exploration/Activities	Section B-3 and Section G
11	Marine Based Activities	Section H
12	Municipal and Industrial Development	Section I

SECTION A: Roads/Trails

A-1. Project Information

1. Describe any field investigations and the results of field investigations used in selecting the proposed route (e.g. geotechnical, snow pack)
    - ***HAWS Runway Recapping:*** *The existing airport road located at the east end of the runway will be realigned and resurfaced to service the airport terminal. A new road will not be constructed in this case. Gravel access roads will be constructed to the aggregate extraction site.*
    - ***Reservoir Upgrades:*** *Construction of temporary gravel access roads as required to construct and service the new reservoir.*
    - *All access roads will be designed specifically for permafrost conditions.*

2. Provide a conceptual plan of the road, including example road cross-sections and water crossings. *Information still to be determined once a construction contractor has been selected.*

3. Discuss the type and volume of traffic using the road/trail (i.e. type of vehicles and cargo and number of trips annually). *The airport road will be used each time a flight arrives/departs. The volume varies each month and year. The volume of use is highest during June through September when the construction programs are underway. Cab trucks are the predominant vehicle to use this road.*
The reservoir temporary access road will be used during the construction phase (summer 2016, 2017) by cab trucks, dump trucks and excavator and grader vehicles.

4. Discuss public access to the road. *Not applicable.*

5. Describe maintenance procedures. *Regular inspections of the airport road, surface grading and infilling as needed will occur annually.*

The reservoir temporary access road will be inspected at the beginning of the second construction season, regraded and resurfaced if needed.

6. Describe whether any portion of the road will be located outside of the Nunavut Settlement Area and whether any other regulatory requirements must be met (e.g. CEAA). *The roads will be located solely on federal land and are subject to the Canadian Environmental Protection Act.*

A-2. All-Weather Road/Access Trail

7. Discuss road design considerations for permafrost. *Access roads required are to be constructed following best practices for protection of permafrost including a raised and compacted road bed. Vehicle rutting will be avoided during all Improvement Project construction activities by ensuring access roads are built to sustain the weight of all vehicles. Further details on design will be provided once the construction contractor is selected for the runway construction improvement project and the water reservoir improvement project.*

8. Describe the construction materials (type and sources for materials), and the acid rock drainage (ARD) and metal leaching characteristics of the construction materials. *Local sand/gravel materials only will be used.*

9. Discuss construction techniques, including timing for construction activities. *Construction activities including earth works (excavation, grading) and infilling for the access roads. All construction activities will occur June through August.*

10. Indicate on a map the locations of designated refuelling areas, water crossings, culverts, and quarries/borrow sources. *With reference to the access road*, *information still to be determined once a construction contractor has been selected.*

11. Identify the proposed traffic speed and measures employed to ensure public safety. Describe dust management procedures. *There are no interactions with the public at HAWS. All HAWS staff and contractors are subject to Health and Safety Plans for the site and contractors are subject to their project specific Health and Safety Plan. Dust management procedures include ensuring vehicles are in good working order, lowering vehicle speeds on unpaved road surfaces, applying water to road surfaces as needed.*

A-3. Winter Road/Trail – *Not Applicable*

12. Describe the surface preparation, including the use of snow berms or compaction, and any flooding. If flooding is to be used, provide the location of the water source on a map.
13. Describe the operating time period.
14. Identify the proposed traffic speed and measures employed to ensure public safety.
15. Discuss whether the selected route traverses any fish-bearing water bodies.

SECTION B: Mineral Exploration /Advanced Exploration /Development – *Not Applicable*

B-1. Project Information

1. Describe the type of mineral resource under exploration.

B-2. Exploration Activity

2. Indicate the type of exploration activity:
   - Bulk Sampling (underground or other)
   - Stripping (mining shallow bedded mineral deposits in which the overlying material is stripped off, the mineral removed and the overburden replaced)
   - Trenching
   - Pitting
   - Delineation drilling
   - Preliminary Delineation drilling
   - Exploration drilling
   - Geophysical work (indicate ground and/or air)
   - Other
3. Describe the exploration activities associated with this project:
   - Satellite remote sensing
   - Aircraft remote sensing
   - Soil sampling
   - Sediment sampling
   - On land drilling (indicate drill type)
   - On ice drilling (indicate drill type)
   - Water based drilling (indicate drill type)
   - Overburden removal
   - Explosives transportation and storage
   - Work within navigable waters
   - On site sample processing
   - Off site sample processing
   - Waste rock storage
   - Ore storage
   - Tailings disposal
   - Portal and underground ramp construction
   - Landfilling
   - Landfarming
   - Other

B-3. Geosciences

4. Indicate the geophysical operation type:
   a. Seismic (please complete Section E)
   b. Magnetic
   c. Gravimetric
   d. Electromagnetic
   e. Other (specify)
5. Indicate the geological operation type:
   a. Geological Mapping

b. Aerial Photography
c. Geotechnical Survey
d. Ground Penetrating Survey
e. Other (specify)

6. Indicate on a map the boundary subject to air and/or ground geophysical work.
7. Provide flight altitudes and locations where flight altitudes will be below 610m.

B-4. Drilling

8. Provide the number of drill holes and depths (provide estimates and maximums where possible).
9. Discuss any drill additives to be used.
10. Describe method for dealing with drill cuttings.
11. Describe method for dealing with drill water.
12. Describe how drill equipment will be mobilized.
13. Describe how drill holes will be abandoned.
14. If project proposal involves uranium exploration drilling, discuss the potential for radiation exposure and radiation protection measures. Please refer to the *Canadian Guidelines for Naturally Occurring Radioactive Materials* for more information.

B-5. Stripping/ Trenching/ Pit Excavation

15. Discuss methods employed. (i.e. mechanical, manual, hydraulic, blasting, other)
16. Describe expected dimensions of excavation(s) including depth(s).
17. Indicate the locations on a map.
18. Discuss the expected volume material to be removed.
19. Discuss methods used to determine acid rock drainage (ARD) and metal leaching potential and results.

B-6. Underground Activities

20. Describe underground access.
21. Describe underground workings and provide a conceptual plan.
22. Show location of underground workings on a map.
23. Describe ventilation system.
24. Describe the method for dealing with ground ice, groundwater and mine water when encountered.
25. Provide a Mine Rescue Plan.

B-7. Waste Rock Storage and Tailings Disposal

26. Indicate on a map the location and conceptual design of waste rock storage piles and tailings disposal facility.
27. Discuss the anticipated volumes of waste rock and tailings.
28. Discuss methods used to determine acid rock drainage (ARD) and metal leaching (ML) potential and results.

B-8. Stockpiles

29. Indicate on a map the location and conceptual design of all stockpiles.
30. Describe the types of material to be stockpiled. (i.e. ore, overburden)
31. Describe the anticipated volumes of each type of material to be stockpiled.
32. Describe any containment measures for stockpiled materials as well as treatment measures for runoff from the stockpile.
33. Discuss methods used to determine acid rock drainage (ARD) and metal leaching (ML) potential and results.

B-9. Mine Development Activities

34. Indicate the type(s) of mine development activity(s):
    - Underground
    - Open Pit
    - Strip Mining
    - Other
35. Describe mine activities.
    - Mining development plan and methods
    - Site access
    - Site infrastructure (e.g. airstrip, accommodations, offshore infrastructures, mill facilities, fuel storage facilities, site service roads)
    - Milling process
    - Water source(s) for domestic and industrial uses, required volumes, distribution and management.
    - Solid waste, wastewater and sewage management
    - Water treatment systems
    - Hazardous waste management
    - Ore stockpile management
    - Tailings containment and management
    - Waste rock management
    - Site surface water management
    - Mine water management
    - Pitting and quarrying activities (please complete Section C)
    - Explosive use, supply and storage (including on site manufacturing if required)
    - Power generation, fuel requirements and storage
    - Continuing exploration
    - Other
36. Describe the explosive type(s), hazard class, volumes, uses, location of storage (show on map), and method of storage.

B-10. Geology and Mineralogy

37. Describe the physical nature of the ore body, including known dimensions and approximate shape.
38. Describe the geology/ mineralogy of the ore deposit
39. Describe the host rock in the general vicinity of the ore body.
40. Discuss the predicted rate of production.

41. Describe mine rock geochemical test programs which have been or will be performed on the ore, host rock, waste rock and tailings to determine acid generation and contaminant leaching potential. Outline methods and provide results if possible.

B-11. Mine

42. Discuss the expected life of the mine.
43. Describe mine equipment to be used.
44. Does the project proposal involve lake and/or pit dewatering? If so, describe the activity as well as the construction of water retention facilities if necessary.
45. Discuss the possibility of operational changes occurring during the mine life with consideration for timing. (e.g. open pit to underground)
46. If project proposal involves uranium mining, consider the potential for radiation exposure and radiation protection measures. Particular attention should be paid to *The Nuclear Safety and Control Act*.

B-12. Mill

47. If a mill will be operating on the property in conjunction with mining, indicate whether mine-water may be directed to the mill for reuse.
48. Describe the proposed capacity of the mill.
49. Describe the physical and chemical characteristics of mill waste as best as possible.
50. Will or does the mill handle custom lots of ore from other properties or mine sites?

SECTION C: Pits and Quarries

1. Describe all activities included in this project. *All applicable activities are provided in bold below.*
   - **Pitting**
   - **Quarrying**
   - Overburden removal
   - **Road use and/or construction (please complete Section A)**
   - Explosives transportation and storage
   - Work within navigable waters
   - **Blasting**
   - **Stockpiling**
   - **Crushing**
   - Washing
   - Other

2. Describe any field investigations and the results of field investigations used in determining new extraction sites.
   The identification of a borrow pit for extraction and crushing of granular material was conducted in summer 2015. The borrow bit is located in the Black Top Creek valley, south east of the runway, approximately 4 km from the Eureka Airport Terminal Building. Aggregate extraction and crushing will occur at the Black Top Creek extraction site. Aggregate for use in the sewage and wastewater system upgrade phase of the project will be stockpiled in the vicinity of the sewage lagoon located at the main site. Gravel from the runway capping project and stockpiled near the lagoon site will be used in the sewage lagoon upgrading project.

3. Identify any carving stone deposits. *Not Applicable.*

4. Provide a conceptual design including footprint. – *Information still to be determined once a construction contractor has been selected.*

5. Describe the type and volume of material to be extracted. *Granular material will be extracted from the Black Top Creek borrow pit area. Approximately 160,900 m^3 granular material is required for the runway project, and approximately 75,000 m^3 of granular material will be extracted and stored for use in the construction of the new water reservoir and for ongoing maintenance activities at HAWS.*

6. Describe the depth of overburden. *The overburden is the granular material to be extracted.*

7. Describe any existing and potential for thermokarst development and any thermokarst prevention measures. *EC to complete this item. To be determined.*

8. Describe any existing or potential for flooding and any flood control measures. *As there is minimal rainfall in area, therefore minimal flood control measures are required.*

9. Describe any existing or potential for erosion and any erosion control measures. *Not Applicable.*

10. Describe any existing or potential for sedimentation and any sedimentation control measures. *Not Applicable.*

11. Describe any existing or potential for slumping and any slump control measures.

12. Describe the moisture content of the ground. *To be determined, but expected to be minimal.*

13. Describe any evidence of ice lenses. *EC to complete this item. To be determined.*

14. If blasting, describe methods employed. *Refer to existing licence. Best construction practices for an Arctic environment will be followed.*

15. Describe the explosive type(s), hazard class, volumes, uses, location of storage (show on map), and method of storage. *Information still to be determined once a construction contractor has been selected.*

16. Discuss methods used to determine acid rock drainage (ARD) and metal leaching (ML) potential and results. *Not applicable.*

17. Discuss safety measures for the workforce and the public. *All project work is through a competitive bid process, the successful contractor will be responsible for health and safety and environmental project plans associated with each project component.*

SECTION D: Offshore Infrastructure – *Not Applicable*

D-1. Facility

1. Describe any field investigations and the results of field investigations used in selecting the site (i.e. aerial surveys, bathymetric surveys, tidal processes, shoreline erosion processes, geotechnical foundation conditions)
2. Provide a conceptual plan, profile description and drawing(s) indicating shoreline, facility footprint, tidal variations, required vessel draft, keel offset, deck height freeboard
3. Discuss how anticipated loads on the seabed foundation and on the offloading platform will be incorporated into the design.
4. Describe how vessels will manoeuvre around the facility. (e.g. pull alongside or in front)
5. Discuss the anticipated life of the facility.
6. Describe whether part of the facility or project will be located outside of the Nunavut Settlement Area and whether any other regulatory requirements must be met (e.g. CEAA).

D-2. Facility Construction

7. Describe the types of material used for construction (i.e. granular or rock, steel piling or sheet piling, concrete). If material is granular, consider acid rock drainage potential, metal leaching potential, percentage of fines, size.
8. Describe dredging activities.
9. Indicate source of granular or rock material used in construction.
10. List quantities of the various types of material used in construction.
11. Describe construction method(s).
12. Indicate whether a site engineer will be on-site to inspect construction.
13. If proposed construction method involves dumping of fill into water, discuss measures for mitigating the release of suspended solids.

D-3. Facility Operation

14. Describe maintenance activities associated with the facility (e.g. dredging, maintenance to account for potential settlement of facility,)
15. Discuss whether the public will have access to the facility(s) and describe public safety measures.
16. Describe cargo and container handling, transfer and storage facilities.
17. Indicate whether fuel will be transferred from barges at this site and describe the method of that fuel transfer.
18. Discuss frequency of use.

D-4. Vessel Use in Offshore Infrastructure

19. Please complete Section H

SECTION E: Seismic Survey – *Not Applicable*

E-1. Offshore Seismic Survey

1. Indicate whether the survey is 2D or 3D at each site.
2. Describe the type of equipment used, including:
   - Type and number of vessels including length, beam, draft, motors, accommodation capacity, operational speeds when towing and when not towing
   - Sound source (type and number of airguns)
   - Type and number of hydrophones
   - Number, length, and spacing of cables/ streamers
3. On a map, indicate the grid, number of lines and total distance covered by each line, the distance to nearby community/communities and sensitive areas (e.g., National Parks, National Wildlife Areas, Migratory Bird Sanctuaries, recognized breeding grounds or migratory routes).
4. Indicate the discharge volume of the airguns, the depth of airgun discharge, the noise levels of acoustic signal at various distances from the source (e.g.,500 metres,1000 metres), and the frequency and duration of airgun operation at each site.
5. Discuss the potential for dielectric oil to be released from the streamer array, and describe proposed mitigation measures.
6. Indicate whether additional seismic operations are required for start-up of operations, equipment testing, repeat coverage of areas.
7. Indicate whether air gun procedures will include a “ramping up” period and, if so, the proposed rate of ramping up.
8. Indicate whether the measures described in the *Statement of Canadian Practice for Mitigation of Noise in the Marine Environment* will be adhered to for this project.
9. Describe whether any part of the project will be located outside of the Nunavut Settlement Area and whether any other regulatory requirements must be met (e.g. CEAA).

E-2. Nearshore/Onshore Seismic Survey

10. For each site, indicate whether nearshore and onshore surveys will be conducted during the ice season or once the ice has melted
11. Describe how nearshore and onshore areas will be accessed.
12. Describe the survey methods to be used (e.g. explosive charge, vibration, air or water gun, other)
13. Describe equipment to be used
14. If applicable, indicate number, depth and spacing of shot holes
15. Describe explosive wastes including characteristics, quantities, treatment, storage, handling, transportation and disposal methods.

E-3. Vessel Use in Seismic Survey

16. Please complete Section H.

SECTION F: Site Cleanup/Remediation

1. Describe the location, content, and condition of any existing landfills and dumps (indicate locations on a map). *(Map is provided as a separate shapefile). The active landfill is located at the south-east end of the runway. A barrel crushing area is also located south of the runway and east of the proposed worker camp location.*

2. Identify salvageable equipment, infrastructure and/or supplies. *Given its remote location, past practices at HAWS consist of the draining of all fluids from redundant equipment/vehicles and storage onsite as a repository for parts, if needed. All drained fluids are stored and removed from the site as per the HAWS waste management plan.*

3. Provide a list of all contaminants to be cleaned up, anticipated volumes and a map delineating contaminated areas. This includes buildings, equipment, scrap metal and debris, and barrels as well as soil, water (surface and groundwater) and sediment.
    - *(Map is provided as a separate shapefile).*
    - *The proposed site for the worker camp associated with the runway improvement project is located on lands north of the buildings associated with the former First Air lease. The Phase III ESA results did identify and delineate a small area of hydrocarbon related contaminated soils adjacent to the buildings. In the Former First Air lease area, there is petroleum hydrocarbon (PHC) contamination from two aboveground fuel storage tanks (ASTs). It is proposed to install an ATCO modular work camp north of this area for use by the workers. Although vapour intrusion is generally a concern for buildings in proximity to PHC contamination, due to the use of trailers that do not have any foundation, there is very minimal connection between the contaminated soil and the indoor environment. Therefore, no concern is associated with the use of the former First Air lease area for a work camp. The proposed worker camp and associated infrastructure will not interact or infringe on the specific known contamination sites. All contaminated soil will be removed and stored in an approved facility following all applicable regulations.*
    - *Soil contamination exists within the drainage channel adjacent to the east side of the existing reservoir. Delineation and monitoring of the contamination has been the subject of a number of studies and is well documented. Petroleum hydrocarbon contaminated soil (PHC) located within the footprint of the reconstructed water reservoir and related infrastructure will be remediated with disposal/storage of these soils in an approved waste management site.*
    - *The location of the new water reservoir is east of the HAWS tank farm and is downgradient of known contamination. Environmental site assessments confirmed the presence of many contaminants in the area, including BTEX, PHC F1 to F3, PAHs and metals. The proximity of the drinking water reservoir, and future reservoir, to the contamination may pose a potential risk to the quality of the drinking water. It is noted that samples collected from the current reservoir have not shown the presence of any PHCs and other parameters have met drinking water guidelines. Decommissioning will include remediation of the PHC contaminated soil and sediment in the vicinity. Additionally, it is proposed to include consideration of subsurface contamination migration routes in the design of the groundwater collection system. This would be accompanied by a robust monitoring program to ensure that there was no contamination entering the reservoir.*

- *The new reservoir will be constructed north of the existing reservoir located between Station Creek and the water treatment facility, therefore minimizing pumping and piping requirements for water handling. It will have 4 m of active storage depth, which will maximize the ratio of active storage to ice allowance. The earthwork will involve a cut of 1,300 m^3 and a fill of 35,000 m^3. The cut material will be wasted and the imported material will be used to construct the berms at a 3:1 slope. Petroleum hydrocarbon contaminated soil (PHC) located within the footprint of the reconstructed water reservoir and related infrastructure, including the cut soil, will be remediated with disposal/storage of these soils in an approved waste management site.*
- *A membrane liner will be installed to prevent seepage losses and instability of the outside slopes. The liner will be low permeability, chemically resistant to petroleum, and suitable for the Arctic climate. It will be protected on both sides with sand or geotextile to prevent damage during construction or during ice movement. A perforated sub-drainage system will also be installed below the membrane liner to prevent uplift. The purpose of this system is to collect and treat the groundwater prior to discharging into Station Creek (downstream side of raw water intake system). The new reservoir will be constructed while maintaining operations in the existing reservoir.*
- *The existing water reservoir will be decommissioned along with obsolete related infrastructure after the new reservoir is in operation. Since significant PHC contamination exists within the drainage channel adjacent to the east side of the current reservoir, decommissioning will also include remediation of the PHC contaminated soil and sediment in the vicinity.*

4. Describe the degree of pollution/contamination, and list the contaminants and toxicity. *Described above*.

5. Describe technologies used for clean-up and/or disposal of contaminated materials. Include a list of all the physical, chemical and biological cleanup/ remediation methods, operational procedures, and the dosage/frequency of reagents and bacterial medium. *All work will be awarded through a completive bid process. The successful contractors will be responsible for identifying appropriate technologies; however, at the drinking water reservoir site, a membrane liner and groundwater collection system is proposed.*

6. Identify and describe all materials to be disposed of off site, including the proposed off site facilities, method of transport and containment measures. *All hazardous materials such as fuel, lubricants, and coolants generated during construction will be stored and removed from HAWS on the annual sealift. Transportation of these materials are subject to the Transportation of Dangerous Goods Act and Regulations.*

7. Discuss the viability of landfarming, given site specific climate and geographic conditions. *Not applicable.*

8. Describe the explosive types, hazard classes, volumes, uses, location of storage (indicate on a map), and method of storage (if applicable). *Not applicable.*

9. If blasting, describe the methods employed. *Not applicable.*

10. Describe all methods of erosion control, dust suppression, and contouring and re-vegetation of lands. *Relevant to the water reservoir upgrade activities:*

- *Erosion control structures (temporary matting, geotextile filter fabric), as appropriate to prevent erosion and release of sediment and/or sediment laden water during the construction phase. All berms are to be graded correctly and to contract specifications;*
- *Barriers will be required during extraction of contaminated soils to prevent material from entering surface water, Station Creek or the existing drinking water reservoir;*
- *Dust management procedures include ensuring vehicles are in good working order, lowering vehicle speeds on unpaved road surfaces, applying water to access road surface as needed.*

11. Describe **all** activities included in this project. *All applicable activities are provided in bold below.*
    - Excavation (please complete Section B-5)
    - **Road use and/or construction (please refer to Section A)**
    - **Airstrip use and/or construction (please refer to Section 2: 13 and 14)**
    - **Camp use and/or construction (please refer to Section 2: 16, 17, and 18)**
    - **Stockpiling of contaminated material (please refer to Section C)**
    - **Pit and/or quarry (please refer to Section C)**
    - Work within navigable waters (please complete Section H)
    - Barrel crushing
    - Building Demolition
    - Other

SECTION G: Oil and Natural Gas Exploration/Activities – *Not Applicable*

G-1. Well Authorization

1. Identify the location(s) of the well centre(s) by latitude and longitude. Attach a map drawn to scale showing locations of existing and proposed wells.
2. Indicate if the site contains any known former well sites.
3. Include the following information for each well:
    a. Well name
    b. Surface location
    c. Proposed bottomhole location
    d. Ground elevation (in metres)
    e. Spacing area (in units)
    f. Identify the well type:
        i. Production
        ii. Injection
        iii. Disposal
        iv. Observation
        v. Storage
        vi. Experimental
        vii. Other (specify)
    g. Identify the well classification:
        i. Exploratory wildcat

ii. Exploratory outpost
iii. Development

h. Drilling operation (deviation):
   i. Vertical
   ii. Directional
   iii. Horizontal
   iv. Slant

i. Objective Zones (copy chart style below)

Objective Formation	Fluid (oil/gas/water)	Depth (mTVD)	Core (Y/N)

j. Proposed Total Depth in mTDV and mMD.
k. Formation of Total Depth
l. Sour well? (yes or no)
   i. If Yes: Maximum H_2S concentration in mol/kmol
      Emergency planning zone radius in km
m. Blowout Prevention (Well Class I – VI)
n. Deviation Surveys
   i. Will be run at intervals less than 150m? (yes or no)
o. Wireline logs
   i. Will run logs in hole for surface casing? (yes or no)
   ii. Will run a minimum of 2 porosity measuring logs? (yes or no)

G-2. On-Land Exploration

4. Indicate if the site contains any known:
   a. Waste Dumps
   b. Fuel and Chemical Storage Areas
   c. Sump Areas
   d. Waste Water Discharge Locations
5. Attach maps drawn to scale showing locations of existing and proposed items identified in (2) above, as well as all proposed:
   a. Sumps
   b. Water sources
   c. Fuel and chemical storage facilities
   d. Drilling mud storage areas
   e. Transportation routes
6. If utilizing *fresh water*, estimate maximum drawdown and recharge capability of the river or lake from which water will be drawn.
7. Indicate if permafrost is expected to be encountered under:
   a. Camp Facilities
   b. Well Site
   c. Access Routes
   d. Sumps
   e. Other: _____
8. Indicate any potential for encountering artesian aquifers or lost circulation within the surface hole (to casing depth).

9. Will drilling wastes contain detrimental substances (including, but not limited to, oil-based or invert mud and high salinity fluids)? If yes, indicate the substances and estimated volumes.
10. Indicate methods for disposal of drilling wastes:
    a. Sump
    b. Down Hole (requires NEB approval)
    c. On-Site Treatment (provide plan)
    d. Off-Site (give location and method of disposal)
11. If a sump is being used, attach the following information:
    a. scale drawings and design of sumps
    b. capacity in cubic metres
    c. berm erosion protection
    d. soil permeability and type
    e. recycling/reclaiming waters
    f. surface drainage controls
    g. abandonment procedures
12. Attach the proposed or existing contingency plan which describes the course of action, mitigative measures and equipment available for use in the event of system failures and spills of hazardous materials.
13. Attach an outline of planned abandonment and restoration procedures.

G-3. Off-Shore Exploration

14. Will drilling wastes contain detrimental substances (including, but not limited to, oil-based or invert mud and high salinity fluids)? If yes, indicate the substances and estimated volumes.
15. Attach the proposed or existing contingency plan which describes the course of action, mitigative measures and equipment available for use in the event of system failures and spills of hazardous materials.
16. Attach an outline of planned abandonment and restoration procedures.
17. Please complete Section H.

G-4. Rig

18. Type of Rig. Draw works, make and model
19. Derrick/Mast make and model
20. H.P. available to draw-works

SECTION H: Marine Based Activities – *Not Applicable*

H-1. Vessel Use – *Not Applicable*

1. Describe the purpose of vessel operations.
2. List classes and sizes of vessels to be used.
3. Indicate crew size.
4. Indicate operating schedule.
5. Provide a description of route to be traveled (include map).
6. Indicate whether the vessel will call at any ports. If so, where and why?

7. Describe wastes produced or carried onboard including the quantities, storage, treatment, handling and disposal methods for the following:
    a. Ballast water
    b. Bilge water
    c. Deck drainage
    d. Grey and black water
    e. Solid waste
    f. Waste oil
    g. Hazardous or toxic waste
8. List all applicable regulations concerning management of wastes and discharges of materials into the marine environment
9. Provide detailed Waste Management, Emergency Response and Spill Contingency Plans
10. Does the vessel(s) possess an Arctic Pollution Prevention Certificate? If yes, indicate the date of issue and the name of the classification society.
11. Describe the source of fresh water and potable water
12. Indicate whether ice-breaking will be required, and if so, approximately where and when? Discuss any possible impacts to caribou migration, Inuit harvesting or travel routes, and outline proposed mitigation measures.
13. Indicate whether the operation will be conducted within the Outer Land Fast Ice Zone of the East Baffin Coast. For more information on the Outer Land Fast Ice Zone, please see the Nunavut Land Claims Agreement (NLCA), Articles 1 and 16.
14. Indicate whether Fisheries or Environmental Observers or any other *Qualified Marine Observer* will be onboard during the proposed project activities. If yes, describe their function and responsibilities.
15. Describe all proposed measures for reducing impacts to marine habitat and marine wildlife (including mammals, birds, reptiles, fish, and invertebrates).
16. Describe whether any part of the project will be located outside of the Nunavut Settlement Area and whether any other regulatory requirements must be met (e.g. CEAA).

H-2. Disposal at Sea – *Not Applicable*

17. Provide confirmation you have applied for a *Disposal at Sea* permit with Environment Canada.
18. Provide a justification for the disposal at sea.
19. Describe the substance to be disposed of, including chemical and physical properties.
20. Indicate the location where the disposal is to take place.
21. Describe the frequency of disposals (disposals per day/week or month).
22. Describe the route to be followed during disposal and indicate on a map.
23. Indicate any previous disposal methods and locations.
24. Provide an assessment of the potential effects of the disposal substance on living marine resources.
25. Provide an assessment of the potential of the disposal substance, once disposed of at sea, to cause long-term physical effects.
26. Describe all mitigation measures to be employed to minimize the environmental, health, navigational and aesthetic impacts during loading, transport and disposal.

SECTION I: Municipal and Industrial Development

The installation of the new multipurpose building, water reservoir upgrades, and upgrades to the existing wastewater treatment system at the HAWS are the subject of the following section.

1. Describe the business type, including public, private, limited, unlimited or other.
   The HAWS is onward and operated by Environment Canada.

2. Describe the activity (e.g. development of quarry, development of hydroelectric facility, bulk fuel storage, power generation with nuclear fuels or hydro, tannery operations, meat processing and packing, etc.). *More detail is provided in number 5.*

   - ***Multipurpose Building*** *– The requirement for a new multipurpose building was identified by EC to provide better infrastructure support for the HAWS. The multipurpose building will provide cold and warm storage and a small carpentry shop. The existing storage buildings and carpentry shop located south of the main operations complex have reached the end of their service life and the new building is required to replace these buildings. The site selected for the new building is located north of the main operations complex between the HADACS building (Department of National Defence) and the incinerator building (Environment Canada). The building foundation, a rectangular shape, was constructed during the summer construction season in 2015. The building will be completed in the summer of 2016.*

   - ***Water Reservoir Upgrades*** *– Environment Canada (EC) has identified a need to upgrade the water supply and treatment system at the HAWS. A new above ground 26,400 m^3 water reservoir and water treatment system will be installed, including the Station Creek intake, new pumps and pump house, and water conveyance pipes and appurtenances. The new reservoir will be filled annually from Station Creek and provide sufficient supply for a maximum of 60 people.*

   - ***Sewage and Wastewater Treatment System Upgrades*** *– In addition to the upgrade to the water supply and treatment system, Environment Canada (EC) has also identified the need to upgrade the sewage and wastewater treatment system, which will include the provision of a new chemical/physical treatment system, and upgrades to the existing sewage lagoon.*

3. Describe the production process or service provision procedures. *Public Works and Government Services Canada will prepare Terms of Reference for a competitive bid process. The Contract will be administered through Public Works and Government Services Canada.*

4. Describe the raw materials used in this activity, the storage and transportation methods. If hazardous materials are included in raw materials, products or by-products; include safety regulations methodology.

   Raw materials for use in the multipurpose building foundation and in upgrading the sewage lagoon berm include granular material from an onsite borrow pit (see Section C). Raw materials are not hazardous and do not require any special considerations for storage or transportation of said materials.

5. Provide detailed information about the structure and/or building in which the activity will be conducted.
    - ***Multipurpose Building*** *– The new multipurpose building is a new building which will be constructed between the HADACS building and the incinerator building. The building footprint was excavated the leveled during the 2015 construction season and involved earthworks (removal of material, leveling and tamping of footprint area. Granular material required for the foundation was extracted from the borrow pit located west of the Environment Canada property. An extraction permit was obtained from the Nunavut government. Aggregate was crushed at the extraction site and transported in a dump truck to the project site for use. Thermosyphons and concrete foundation were constructed. The thermosiphon system allows the permafrost to remain frozen. Installation of the flat-loop thermosiphon system was completed during the 2015 construction season following best practices in Arctic environments. Installation includes preparing a foundation of fine granular material, laying of piping, covering and tamping pipes with additional fine granular material. The pre-fabricated steel building to be constructed includes insulated pre-engineered Behlen steel metal panels and a steel roof and will consist 330 m^2 of heated space including a second storey/mezzanine of approximately 80 m^2 and approximately 200 m^2 of unheated storage space. The heated space will include overhead fuel fired unit heaters with chimneys and associated piping. An enclosed space, independent from the storage area, will be used as a carpentry/woodworking shop that will include a thermostatically controlled HVAC system. The unheated space will include two vehicle openings and two access/egress doors located at each end of the building.*

    - ***Water Reservoir Upgrades*** *– Site preparation activities include constructing a temporary access road to the new reservoir site and the excavation of the reservoir footprint. Granular material required will be extracted from the Black Top Creek borrow pit located east of the runway. Aggregate extraction and crushing will occur at the Black Top Creek extraction site. The existing water reservoir will be decommissioned along with obsolete related infrastructure after the new reservoir is in operation. Since significant PHC contamination exists within the drainage channel adjacent to the east side of the current reservoir, decommissioning will also include remediation of the PHC contaminated soil and sediment in the vicinity.*

      The new pipeline required to convey water from Station Creek to the reservoir will be 100 mm in diameter and 125 m long. Three pumps (two operational and one standby) will be required to fill the reservoir. A new Pump House and conveyance system will be constructed between the reservoir and treatment system, and will be installed with a diameter of 150 mm and a length of approximately 100 m. This pipeline will be heat traced, insulated, and self-draining. Three pumps (two operation and one standby) will be required at the Pump House.

      The new reservoir will be constructed north of the existing reservoir located between Station Creek and the water treatment facility, therefore minimizing pumping and piping requirements for water handling. It will have 4 m of active storage depth, which will maximize the ratio of active storage to ice allowance. The earthwork will involve a cut of 1,300 m3 and a fill of 35,000 m3. The cut

material will be wasted and the imported material will be used to construct the berms at a 3:1 slope. A membrane liner will be installed to prevent seepage losses and instability of the outside slopes. The liner will be low permeability, chemically resistant to petroleum, and suitable for the Arctic climate. It will be protected on both sides with sand or geotextile to prevent damage during construction or during ice movement. A perforated sub-drainage system will also be installed below the membrane liner to prevent uplift. The purpose of this system is to collect and treat the groundwater prior to discharging into Station Creek (downstream side of raw water intake system). The new reservoir will be constructed while maintaining operations in the existing reservoir.

The existing water treatment plant will be upgraded and a new emergency water supply system will be installed, which will include a portable desalination treatment system, with water conveyance and distribution storage tanks. New berm construction will be completed using imported, manufactured granular material. The berm and collection swale to be located along the east side of the reservoir will intercept potential contamination of water.

Soil contamination exists within the drainage channel adjacent to the east side of the existing reservoir. Petroleum hydrocarbon contaminated soil (PHC) located within the footprint of the reconstructed water reservoir and related infrastructure will be remediated with disposal/storage of these soils in an approved waste management site.

- ***Sewage and Wastewater Treatment System Upgrades*** *- A new sequencing batch reactor (SBR) and upgrades to the sewage lagoon will entail construction of wastewater force main or gravity pipes, and pumps and pump house. SBR technology has previously been used in remote locations. A separate building will not be required and the SBR will be containerized as a portable system with limited structural requirements on site. A concrete pad or support (600 mm x 600 mm) will be required to support the SBR. The anaerobic tank allows for additional treatment of primary and secondary sludge, while providing storage capacity. The updated tank will accommodate aeration and/or mixing, and be designed to minimize debris accumulation. The updated system will enhance biological treatment and provide increased storage capacity within the holding tank. Increased capacity will serve to buffer peak flows. During average flow scenarios, such as in the winter months, the larger holding tank will decrease the frequency that wastewater is required to be pumped to the lagoon. Effluent will be discharged to the existing lagoon which functions as a retention/holding pond, prior to its release into the fiord. Effluent is released twice annually into the fiord.*

  Upgrades to the lagoon includes a thorough cleaning, sludge removal, slope repairs, and the addition of a new lining. Gravel from the runway capping project and stockpiled near the lagoon site will be used in this project. All obsolete infrastructure will be decommissioned and disposed of in accordance with the HAWS waste management plan, after the new sewage treatment system is in operation.

6. List the PPE (personal protective equipment) and tools to be used to protect personal health and safety. *Minimum PPE expected of contractors include safety boots, hard hats, safety vests, and gloves, communication with the HAWS station manager is also expected. The construction is awarded through a competitive process, consequently, the successful contractor will be responsible for developing a worker health and safety and plan.*

7. Describe the firefighting equipment that are or will be installed. *Information still to be determined once a construction contractor has been selected.*

8. Describe the noise sources, noise level in work area, technical measurements that will be adopted to abate the noise levels and regulatory requirements for noise abatement and noise levels. *Information still to be determined once a construction contractor has been selected.*

9. Describe the type of gaseous emission that will be produced during this activity. Include the allowable thresholds and mitigation measures. *Information still to be determined once a construction contractor has been selected.*

10. Describe odours that the activity might release and include corresponding allowable threshold. Describe mitigation measures if thresholds are exceeded. *Information still to be determined once a construction contractor has been selected.*

11. Describe radiation sources that might be emitted during the activity. Include type and source and include mitigation measures. Also describe preventative measures for human exposure (i.e. PPE). *Not Applicable.*

12. Discuss the employee safety and environment protection training program. *All project work is through a competitive bid process, the successful contractor will be responsible for health and safety and environmental project plans associated with each project component.*

13. If the activity involves a bulk fuel storage facility, include drawings showing the bulk fuel storage facility location in proximity to natural water courses, high water marks, etc. *EC to provide this portion.*

14. If the activity involves the development of a new quarry or expansion of an existing quarry, complete Section C. *Refer to Section C.*

4. DESCRIPTION OF THE EXISTING ENVIRONMENT

Describe the existing environment, including physical, biological and socioeconomic aspects. Where appropriate, identify local study areas (LSA) and regional study areas (RSA).

Please note that the detail provided in the description of the existing environment should be appropriate for the type of project proposal and its scope.

The following is intended as a guide only.

Please refer to Section 4 of the Environmental Impact Assessment Report for the Eureka High Arctic Weather Station Improvements, included in the application package, for greater detail on the Existing Environment.

Physical Environment

Please note that a description of the physical environment is intended to cover all components of a project, including roads/trails, marine routes, etc. that are in existence at present time.

- Proximity to protected areas, including:
  i. designated environmental areas, including parks;
  ii. heritage sites;
  iii. sensitive areas, including all sensitive marine habitat areas;
  iv. recreational areas;
  v. sport and commercial fishing areas;
  vi. breeding, spawning and nursery areas;
  vii. known migration routes of terrestrial and marine species;
  viii. marine resources;
  ix. areas of natural beauty, cultural or historical history;
  x. protected wildlife areas; and
  xi. other protected areas.
- Eskers and other unique landscapes (e.g. sand hills, marshes, wetlands, floodplains).
- Evidence of ground, slope or rock instability, seismicity.
- Evidence of thermokarsts.
- Evidence of ice lenses.
- Surface and bedrock geology.
- Topography.
- Permafrost (e.g. stability, depth, thickness, continuity, taliks).
- Sediment and soil quality.
- Hydrology/ limnology (e.g. watershed boundaries, lakes, streams, sediment geochemistry, surface water flow, groundwater flow, flood zones).
- Tidal processes and bathymetry in the project area (if applicable).
- Water quality and quantity.
- Air quality.
- Climate conditions and predicted future climate trends.
- Noise levels.
- Other physical Valued Ecosystem Components (VEC) as determined through community consultation and/or literature review.

Eureka is located on Ellesmere Island, Nunavut, which is the northernmost island in the Canadian Arctic Archipelago. The Arctic Ocean surrounds the Archipelago to the north and west, with Greenland to the east and the Canadian mainland to the south. Eureka itself is on the western side of Fosheim Peninsula in northern Ellesmere Island. Eureka is located on the north side of Slidre Fiord and surrounded to the northeast and northwest by ridges that rise about 600 m above mean sea level. The Eureka HAWS is not in close proximity to protected areas.

Climate, Temperatures, Air Quality, and Noise

Eureka's climate is typical for the Canadian Arctic Archipelago. Eureka experiences a long, dark winter and a short, intense summer with continuous daylight. The winter conditions promote a strong surface-based temperature inversion. The transition to summer occurs with a rapid warming and the breakdown of the Arctic winter vortex. Over the 54 year record, the average temperature at Eureka is -19.1°C, with the highest and lowest observed temperatures of 20.0°C and -54.6°C recorded 22 July 2007 and 15 February 1979, respectively. Trends in temperature across the entire observing record can be summarized as follows:

- *A cooling trend from the early 1950s to early 1970s;*
- *A warming period from the early 1970s to early 1980s;*
- *A brief cooling period in the mid-1980s; and*
- *A warming trend up to the present day.*

Eureka is typified by a polar desert climate. Annual precipitation averages only 79.1 mm per year, with the majority (60.3 mm on average) falling as snow in the autumn and winter months. Rain is typically confined to the months of July and August, where rainfall events can be intense. The maximum recorded daily precipitation events observed at Eureka in July and August were 20.8 mm (27 July 1997) and 41.7 mm (17 August 1953), respectively.
Minimum recorded particulate levels are considered to represent the true ambient dust levels and the maximum recorded particulate levels are considered to represent the ambient dust levels as influenced by the ongoing project work and other operations within the project area. True ambient noise data are indicative of a remote wilderness environment where noise levels are relatively low and are strongly influenced by sounds of nature and wind induced noise effects.

Geology, Hydrogeology, Sediment and Soil Quality, and Hydrology

The Eureka HAWS is situated in the Eureka Hills Ecoregion, within the Northern Arctic Ecozone. The topography in the area is rolling and ridged, and reaches altitudes of no greater than 1000 m above sea level. Underlying strata include Mesozoic and Tertiary sandstone and shale, which have large trenches cut out of them. The trenches form the sinuous, curving drainage that is apparent in the area. The geology of the HAWS site is composed of silty clay, with some gravel and cobble.

Regionally, sinuous drainage formed by carving of the underlying sandstone is apparent, as well as within the study area. Water has formed gullies and seasonal creeks that drain into the Slidre Fjord of the Fosheim Peninsula, and subsequently into the Eureka Sound and Arctic Ocean. The main natural source of surface fresh water at the HAWS is Station Creek, which is seasonally flowing. It flows in early June on the west side of the main facilities at the HAWS, from north to south. Flow from the creek discharges into the salt water of Slidre Fjord and ultimately into Eureka Sound and the Arctic Ocean. The HAWS is in an area of continuous permafrost. In high, dry locations the active layer is at approximately 0.60 metres below surface and in wet, low areas permafrost is located at approximately 0.80 metres below surface. On south facing slopes, the active layer can reach a depth of approximately 1.2 metres. The water reservoir is the source of domestic water, which is also located on the west side of the main facilities. The reservoir is replenished yearly by the seasonal pumping of Station Creek. A sewage lagoon is located at the south end of the site's facilities on the shore of Slidre Fjord.

The drainage area of Station Creek, at the HAWS, is approximately 109.6 km^2. Based on two methods, it was found that the mean seasonal flow in Station Creek could range from 0.9 m^3/s to 5.1 m^3/s, and was also estimated to be 3.0 m^3/s. The overall water quality for Station Creek, was assessed by collecting and analysing water samples from the reservoir. At the time of sampling (August 2010), the water reservoir had a temperature of 5.9ºC, an electrical conductivity (EC) of 797 µS/cm, and a pH of 7.49. Water quality parameters of Station Creek were generally below the Canadian Drinking Water Quality Guidelines (CDWQG) with the exception of the following:

- *turbidity exceeded the Aesthetic Objective (AO) with a value of 3.27 Nephelometric Turbidity Units (NTU);*
- *Total Dissolved Solids (TDS) was measured at a concentration of 544 mg/L, exceeding the AO of 500 mg/L in August 2010;*
- *historically, dissolved sodium has almost doubled the AO ranging from 333 to 507 mg/L; and*
- *aluminum exceeded the AO for the first time since sampling began with a concentration of 0.215 mg/L.*

Biological Environment

- Vegetation (terrestrial as well as freshwater and marine where applicable).
- Wildlife, including habitat and migration patterns.
- Birds, including habitat and migration patterns.
- Species of concern as identified by federal or territorial agencies, including any wildlife species listed under the *Species at Risk Act (SARA)*, its critical habitat or the residences of individuals of the species.
- Aquatic (freshwater and marine) species, including habitat and migration/spawning patterns.
- Other biological Valued Ecosystem Components (VEC) as determined through community consultation and/or literature review.

Vegetation

The Eureka HAWS site is in Ecodistrict 21, situated within the Eureka Hills ecoregion of the Northern Arctic ecozone. The ecoregion includes Axel Heiberg and Ellesmere Islands. General descriptions of plant communities include low-growing herbs and shrubs such as purple saxifrage, Dryas spp., arctic willow, sedge and arctic poppy.

The extreme environmental conditions have a significant impact on the ecological recovery of vegetation at disturbed sites at Eureka. Low light levels, extremely low ambient temperatures and lack of moisture and nutrients limit plant productivity. While a precipitation value of 50-150 mm per year has been used for HAWS assessments, the climate conditions listed by Agriculture Canada for the ecodistricts indicates average precipitation at the lower end of this range. Average total precipitation for the ecodistrict is 68 mm/year, with 53 mm of that being snow. Precipitation occurs mostly during summer (10-12 mm/month) either as rain or snow, however due to evaporation of moisture during summer months, the area experiences a deficit of 361 mm of moisture annually. There are only 16 effective growing days annually (days above 5oC adjusted for day length) in the area around Eureka. The area has >90% continuous permafrost, with <20% ground ice.

Changes to vegetation are expected in the High Arctic terrestrial ecosystem as a result of warming ambient temperatures. Long-term monitoring programs were established in Quttinirpaaq National Park in 1990 using several measures of environmental change. Changes recorded between 1990 and 2002 include warming soil temperatures, with an increase in the depth of the active layer. Changes in permafrost caused changes in the hydrological conditions and soil moisture. A review of climate changes in the Canadian Arctic indicate that the ambient temperature has increased 1.5 to 3oC between 1953 and 2007, while precipitation has increased by roughly 10%. If these trends continue, the plant community will undergo changes in species and numbers in response to the changing environment.

Wildlife

The HAWS has been in place since 1947 however there are no rigorous surveys of the animal community in the area, the species abundance, or other measures of species presence. While some ecological information is available for many species based on studies conducted in the south, important site specific data, such as the numbers of nesting sites for breeding birds, or the density of small mammal species, are not available. For example, the number of ground nesting breeding birds during the summers would allow some estimation of the impacts of disturbed ground from borrow sites or new construction. The Arctic Biodiversity Assessment (CAFF 2013) estimated that the high Arctic portion of the Canadian Archipelago has a very low biodiversity, with roughly 10 resident mammal species.

Some data are available from breeding bird surveys at other sites in the High Arctic. Pattie (1977) reported the numbers of regular and occasional breeding birds on Devon Island, a high Arctic ecosystem roughly 500 km to the south of Eureka. Most of the bird species were shorebirds, seabirds and colonial waterfowl. The dominant terrestrial birds that were present every year of the survey were the rock ptarmigan, the Lapland longspur and the snow bunting, with the raven and snowy owl less common. Pattie reported a density of 40 birds per km^2 in July 1972 at Sildre Fiord, with 12 species of birds, equivalent to other high Arctic sites. These results corresponded with a survey reported by Nettleship and Maher (1973) at Hazen Lake, roughly 300 km to the northeast of Eureka. Trefry et al. (2010) reported several years of breeding bird survey results from the east coast of Ellesmere Island. Snow buntings, Lapland longspur and Baird's sandpiper were the most abundant species. The density of snow buntings was 1.0 to 1.5 pairs per km^2, while the Lapland longspur reached 1.5 to 2.0 pairs per km^2. These results were used to include the snow bunting as a representative songbird in the selection of Valued Ecosystem Components in the current assessment.

Parks Canada has conducted periodic surveys of wildlife on north Ellesmere Island to establish wildlife presence and numbers before the establishment of Quttinirpaaq National Park. Data for 1989 to 1997 (summarised in 1 file), 2002 and 2008 were obtained in spreadsheet form from J. Chisholm, Nunavut Field Unit, Parks Canada, Iqaluit. No detailed methods were included in the data, although most transects were flown with two observers in small aircraft in early to mid-June. The 1989 to 1997 data set included a number of marine species, including ringed seal, bearded seal and walrus, however the marine transects extended far north of Ellesmere Island and are not relevant for Eureka. The surveys indicated that the dominant terrestrial mammal is the muskox, with several dozen in the area at any time (Table 4.4). Peary caribou are also present although their numbers were consistently low. The number of arctic hare is variable with only 10 reported annually for the 10 year span from 1989 to 1997, yet over 3500 in 2008. The arctic hare was often observed in groups of 20-30 animals. Dominant birds include the gyrfalcon and the snowy owl. Snow geese (not shown in Table) are also reported in fairly large numbers. Table A provides a summary of species

reported to be present in the area in addition to Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or SARA status.

Table A Wildlife Species Summary and COSEWIC/SARA Status

Species	Scientific Name	Niche	COSEWIC/SARA Status
Terrestrial System			
Plants and lichen	-	Producer	-
Rock ptarmigan	*Lagopus mutus*	Widely distributed land bird feeding on seeds	No assessment
Snowy owl	*Bubo scandiacus*	Predatory bird, nesting in far North in summer	Not at Risk
Nearctic collared lemming (or Peary Land Collared Lemming)	*Dicrostonyx groenlandicus*	Widely distributed small mammal; food source for upper trophic levels	No assessment
Nesting songbird[1]			
Arctic fox	*Vulpes lagopus*	Predator feeds/scavenges in terrestrial and marine systems.	Not at Risk
Peary Caribou	*Rangifer tarandus pearyi*	Large herbivore, subsistence hunting, traditional diet	High Arctic population: Schedule 2, Endangered
Muskox	*Ovibos moschatus*	Large herbivore, subsistence hunting, traditional diet	Not at Risk
Marine System			
Benthic Invertebrates	-	Could be highly exposed to run-off in nearshore environment	-
Arctic sculpin	*Myoxocephalus scorpiodes*	Benthic species; habitat is littoral zone	No assessment
Arctic cod	*Bareogadus saida*	Pelagic species; widely distributed food source for upper trophic levels	No assessment
Ivory gull	*Pagophila eburnea*	Endangered species that feeds in the nearshore marine environment	Schedule 1, Endangered
Ringed seal	*Phoca hispida*	Widely distributed; food source for polar bear	Not at Risk
Polar bear	*Ursus maritimus*	Top marine predator	Special Concern

Socioeconomic Environment

- Proximity to communities.
- Archaeological and culturally significant sites (e.g. pingos, soap stone quarries) in the project (Local Study Area) and adjacent area (Regional Study Area).
- Palaeontological component of surface and bedrock geology.
- Land and resource use in the area, including subsistence harvesting, tourism, trapping and guiding operations.
- Local and regional traffic patterns.

- Human Health, broadly defined as a complete state of wellbeing (including physical, social, psychological, and spiritual aspects).
- Other Valued Socioeconomic Components (VSEC) as determined through community consultation and/or literature review.

While Eureka has no permanent residents, a number of research and operational staff rotate through the facility. The closest Inuit community is the hamlet of Grise Fiord, which has a population of approximately 130 (as of the 2011 census), and it is located approximately 400 km south of Eureka, at the southern tip of Ellesmere Island. This Inuit community is the northernmost community in Canada.

Resolute Bay is a hamlet located approximately 625 km south of Eureka and 900 km south of Quttinirpaaq National Park, on Cornwallis Island. It is the location of the closest major airport to Eureka and to the national park. Resolute Bay has a population of approximately 214 (as of the 2011 census).

Other communities on Ellesmere Island consist of transient communities conducting scientific research, including universities and government agencies, which is a major activity in the national park region, and in Eureka. The Polar Continental Shelf Project (PCSP) (Natural Resources Canada (NRCan)), based in Resolute Bay, provides logistical support for these activities.

The residents of Ellesmere Island include the year-round permanent residents of Grise Fiord, the military and civilian personnel associated with Canadian Forces Station, Alert (located approximately 480 km northeast of Eureka and 45 km northeast of the national park), the summer base of operations for the Canadian Department of National Defence at Eureka, the personnel working at the weather station at Eureka, and the Parks Canada staff working in Quttinirpaaq from May through August each year.

The HAWS station is home to 8 full time staff year round. A three (3) month rotation for staff is the normal length of each tour. The station sees a number of transients that include contractors, researchers, maintenance and occasionally tourists or expedition teams. The numbers of transients vary each year but predominately come to the station May through October. The station provides beds for 50, including the full time staff. In addition to the weather station offices, other features include full industrial kitchen and dining room, laundry facilities, recreation room, library/office, and TV room.

Archaeology

There are hundreds of archaeological sites located on Ellesmere Island, the majority of which are concentrated in Quttinirpaaq National Park, located approximately 225 km to the north east of Eureka. About 285 archaeological sites have been documented in the national park. Archaeological evidence unearthed in Quttinirpaaq National Park has revealed that the park and the surrounding region have been occupied by humans for centuries. People have resided on Ellesmere Island for thousands of years,

5. IDENTIFICATION OF IMPACTS AND PROPOSED MITIGATION MEASURES

1. Please complete the attached Table 1 – Identification of Environmental Impacts, taking into consideration the components/activities and project phase(s) identified in Section 4 of this document. Identify impacts in Table 1 as either positive (P), negative and mitigable (M), negative and non- mitigable (N), or unknown (U). *Please refer to Table 1.*

2. Discuss the impacts identified in the above table. *Please refer to Section 6 of the Environmental Impact Assessment Report for the Eureka High Arctic Weather Station Improvements, included in the application package.*

3. Discuss potential socioeconomic impacts, including human health. *Please refer to Section 6.5 of the Environmental Impact Assessment Report for the Eureka High Arctic Weather Station Improvements, included in the application package.*

4. Discuss potential for transboundary effects related to the project. *Not Applicable.*

5. Identify any potentially adverse effects of the project proposal on species listed under the *Species at Risk Act (SARA)* and their critical habitats or residences, what measures will be taken to avoid or lessen those effects and how the effects will be monitored. *Please refer to Section 6.4 of the Environmental Impact Assessment Report for the Eureka High Arctic Weather Station Improvements, included in the application package.*

6. Discuss proposed measures to mitigate all identified negative impacts. *Please refer to Section 6 of the Environmental Impact Assessment Report for the Eureka High Arctic Weather Station Improvements, included in the application package.*

6. CUMULATIVE EFFECTS

A cumulative impact (or effect) can be defined as the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

Discuss how the effects of this project interact with the effects of relevant past, present and reasonably foreseeable projects in a regional context.

Please refer to Section 9 of the Environmental Impact Assessment Report for the Eureka High Arctic Weather Station Improvements, included in the application package.

7. SUPPORTING DOCUMENTS

Where relevant, provide the following supporting documents:

- Abandonment and Decommissioning Plan
- Existing site photos with descriptions
- Emergency Response Plan
- Comprehensive Spill Prevention/Plan (must consider hazardous waste and fuel handling, storage, disposal, spill prevention measures, staff training and emergency contacts)
- Waste Management Plan/Program
- Monitoring and Management Plans (e.g. water quality, air pollution, noise control and wildlife protection etc.)
- If project activities are located within Caribou Protection Areas or Schedule 1 Species at Risk known locations, please provide a Wildlife Mitigation and Monitoring Plan

In addition, for Project Type 9 (Site Cleanup/Remediation), please provide the following additional supporting documents:

- Remediation Plan including cleanup criteria and how the criteria were derived.
- Human Health Risk Assessment of the contaminants at the site.

Please refer to complete application package for additional supporting documents.

TABLE 1 - IDENTIFICATION OF ENVIRONMENTAL IMPACTS

			ENVIRONMENTAL COMPONENTS	PHYSICAL	designated environmental areas (i.e. Parks, Wildlife Protected areas)	ground stability	permafrost	hydrology/ limnology	water quality	climate conditions	eskers and other unique or fragile landscapes	surface and bedrock geology	sediment and soil quality	tidal processes and bathymetry	air quality	noise levels	BIOLOGICAL	vegetation	wildlife, including habitat and migration patterns	birds, including habitat and migration patterns	aquatic species, incl. habitat and migration/spawning	wildlife protected areas	SOCIO-ECONOMIC	archaeological and cultural historic sites	employment	community wellness	community infrastructure	human health
PROJECT ACTIVITIES																												
CONSTRUCTION	Runway Recap	Aggregate extraction and stock piling					M	M	M			M			M	M		M	M	M								
		Construction of gravel access roads to aggregate extraction site					M		M			M	M		M	M		M	M	M								
		Runway resurfacing							M			M	M		M	M		M	M	M								
		Membrane installation for fuel storage areas					M					M	M		M	M		M	M	M								
		Construction of a temporary camp					M	M	M			M	M		M	M		M	M	M								M
	New Multipurpose Building	Thermosyphons and concrete foundation					M					M	M		M	M		M	M	M								
		Construction of pre-engineered building													M	M		M	M	M								
	Reservoir Upgrades	Construction of new water reservoir					M	M	M			M	M		M	M		M	M	M	M							
		Upgrades to the existing water treatment plant													M	M		M	M	M								
		New emergency water supply system														M		M	M	M								
		Decommissioning of the existing water reservoir and existing obsolete related infrastructure						M	M			M	M		M	M		M	M	M	M							
		Construction of a new small pump house building					M								M	M		M	M	M								
		Construction of access roads as required to construct and service the reservoir					M	M	M			M	M		M	M		M	M	M								M
		Decommissioning of existing water reservoir after the new reservoir is in operation						M	M			M	M		M	M		M	M	M	M							
	Sewage and Wastewater System Upgrades	Construct new chemical/physical treatment system					M					M	M		M	M		M	M	M								
		Upgrade the existing sewage lagoon					M	M	M			M	M			M		M	M	M								
		New utililidors as required to move wastewater from the main building to the treatment plant and from the treatment plant to the lagoon								M						M		M	M	M								

TABLE 1 - IDENTIFICATION OF ENVIRONMENTAL IMPACTS (Cont'd)

			ENVIRONMENTAL COMPONENTS	PHYSICAL	designated environmental areas (i.e. Parks, Wildlife Protected areas)	ground stability	permafrost	hydrology/ limnology	water quality	climate conditions	eskers and other unique or fragile landscapes	surface and bedrock geology	sediment and soil quality	tidal processes and bathymetry	air quality	noise levels	BIOLOGICAL	vegetation	wildlife, including habitat and migration patterns	birds, including habitat and migration patterns	aquatic species, incl. habitat and migration/spawning	wildlife protected areas	SOCIO-ECONOMIC	archaeological and cultural historic sites	employment	community wellness	community infrastructure	human health
PROJECT ACTIVITIES																												
		Gravel from the runway capping project will be stockpiled near the lagoon site for the use of this project								M		M				M		M	M	M								
		All obsolete infrastructure will be decommissioned and disposed of in an environmentally friendly manner, after the new sewage treatment system is in operation								M		M	M			M		M	M	M								
OPERATION	Runway Recap	Regular use and maintenance of runway						M	M							M		M	M	M								
		Re-fueling aircraft						M	M				M					M	M	M								
	New Multipurpose Building	Regular use and maintenance																M	M	M								
	Reservoir Upgrades	Regular use and maintenance of reservoir and ancillary buildings (i.e., pump house)						M	M							M		M	M	M								
	Sewage and Wastewater System Upgrades	Regular use and maintenance of sewage treatment plant and lagoon facilities						M	M	M								M	M	M								
DECOMMISSIONING (N/A)	Runway Recap	Not contemplated at this time nor in the foreseeable future																										
	New Multipurpose Building	Not contemplated at this time nor in the foreseeable future																										
	Reservoir Upgrades	Not contemplated at this time nor in the foreseeable future																										
	Sewage and Wastewater System Upgrades	Not contemplated at this time nor in the foreseeable future																										

Note: Please indicate in the matrix cell whether the interaction causes an impact and whether the impact is
- P = Positive
- N = Negative and non-mitigatable
- M = Negative and mitigatable
- U = Unknown

If no impact is expected please leave the cell blank

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