AECOM

Project Proposal Report

PIN-C, Bernard Harbour Intermediate DEW Line Site

Public Services and Procurement Canada

Project number: 60688145

September 2024

Delivering a better world

Statement of Qualifications and Limitations

The attached Report (the “Report”) has been prepared by AECOM Canada Ltd. (“AECOM”) for the benefit of the Client (“Client”) in accordance with the agreement between AECOM and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations and conclusions contained in the Report (collectively, the “Information”):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”);
- represents AECOM’s professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to AECOM which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

AECOM shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. AECOM accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

AECOM agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but AECOM makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

Without in any way limiting the generality of the foregoing, any estimates or opinions regarding probable construction costs or construction schedule provided by AECOM represent AECOM’s professional judgement in light of its experience and the knowledge and information available to it at the time of preparation. Since AECOM has no control over market or economic conditions, prices for construction labour, equipment or materials or bidding procedures, AECOM, its directors, officers and employees are not able to, nor do they, make any representations, warranties or guarantees whatsoever, whether express or implied, with respect to such estimates or opinions, or their variance from actual construction costs or schedules, and accept no responsibility for any loss or damage arising therefrom or in any way related thereto. Persons relying on such estimates or opinions do so at their own risk.

Except (1) as agreed to in writing by AECOM and Client; (2) as required by-law; or (3) to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by Client.

AECOM accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information (“improper use of the Report”), except to the extent those parties have obtained the prior written consent of AECOM to use and rely upon the Report and the Information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to, and forms part of the Report and any use of the Report is subject to the terms hereof.

AECOM: 2015-04-13

Quality information

Prepared by	Prepared by	Checked by
Greg Wright on behalf of:	Greg Wright on behalf of:	
Emily Grishaber	Paula Petkovic	Tyler Huguet
Biologist	Environmental Professional	Environmental Planner

Verified by	Approved by
Nadia Baker	Greg Wright
Environmental Assessment and Permitting Specialist	Project Manager

Revision History

Revision	Revision date	Details	Authorized	Name	Position
REV-0	January 12, 2024	Draft for client review			
REV-1	March, 2024	Draft addressing client comments			
REV-2	September, 2024	Final			

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

Ms. Claire Brown
Project Manager
Northern Contaminated Sites Program, Western Region
Public Services and Procurement Canada
Suite 1000, 9700 Jasper Avenue
Edmonton, AB T5J 4C3

Prepared by:

AECOM Canada Ltd.
101 – 18817 Stony Plain Road NW
Edmonton, AB T5S 0C2
Canada

T: 780.486.7000
F: 780.486.7070
aecom.com

Executive Summary

PIN-C, Bernard Harbour (Inuit: Nulahugiua) is a former intermediate Distant Early Warning (DEW) Line site (the Site) located on the shores of Dolphin and Union Strait in the Kitikmeot Region of Nunavut (68.781824°N, 114.832372°W). The Site was constructed in 1958, abandoned in 1963, and Crown Indigenous Relations and Northern Affairs Canada (CIRNAC) became the custodian of the Site in 1965.

To protect environmental and human health under the Federal Contaminated Sites Action Plan (FCSAP), CIRNAC intends to remediate the Site by removing, treating, or isolating impacted soil, debris, and building materials from historical activities. A Remedial Action Plan (RAP) for the Site (AECOM 2023) details the proposed remedial activities (the proposed Project) for the Site. AECOM Canada Ltd. (AECOM) was retained by Public Services and Procurement Canada (PSPC), on behalf of CIRNAC, to prepare a Project Proposal Report (PPR) for the proposed Project which includes an effects assessment to evaluate the environmental, social, economic, and cultural effects of the proposed Project on identified Valued Components (VCs). VCs are environmental, social, economic, or cultural components that are considered important by a proponent, local communities, technical specialists and/or government agencies.

Identified Valued Components with potential for the proposed Project to interacts with are:

- Climate
- Geology, landforms and permafrost
- Topography and aesthetics
- Hydrology and physical marine environments
- Vegetation
- Fish and fish habitat
- Marine mammals
- Terrestrial wildlife
- Ecological integrity
- Cultural and heritage resources
- Socioeconomic resources

VCs were subject to an effects assessment, whereby avoidance and mitigation measures are identified and residual effects characterized using set criteria. The residual effects assessment criteria includes magnitude, scale (geographical extent), duration, frequency of occurrence, reversibility and likelihood of occurrence.

As the goal of the proposed Project is to remove, treat or isolate contaminated soils/substrates and debris to improve environmental, social, economic and cultural components both on and off the Site, it is expected that VCs will be positively impacted by the proposed Project in the long-term. However, in additional to evaluating long-term impacts, it is important to evaluate the potential for short- and medium-term impacts (i.e., the timeframe of the proposed Project) when mobilization, staging and remedial activities occur, and provide avoidance and mitigation measures to minimize the negative impacts to VCs. Additionally, it was conservatively assumed that even for VCs where avoidance and mitigation measures greatly reduced the residual effect, it was conservatively assumed that the residual effect cannot be reduced to zero. This precautionary approach screens in all VC-Project interactions for an effects assessment.

The outcome of the effects assessment was as follows:

- No long-term negative residual effects to VCs
    - Short to medium-term negative residual effects to VCs were identified, but none were characterized as significant post-avoidance and mitigation measures
- No negative cumulative effects to VCs

- Long-term positive residual impacts identified for the following VCs:
  - Topography and aesthetics
  - Geology, landforms and permafrost
  - Ecological integrity
  - Socio-economics

The effects assessment identified long-term positive effects from the proposed Project and did not identify any significant negative residual effects from the proposed Project in the short, medium or long-term. However, if negative residual effects of the proposed Project are later considered to be contributing to cumulative effects, monitoring and adaptive management will be applied. These initiatives would be coordinated with regulators and potentially affected communities, as applicable.

Community engagement is ongoing for the proposed Project and any concerns or comments will be addressed.

Glossary

AECOM	AECOM Canada Ltd.
AIA	Archaeological Impact Assessment
AMSRP	Abandoned Military Site Remediation Protocol
BDA	Buried debris area
BMP	Best management practice
°C	Celsius
CIRNAC	Crown Indigenous Relations and Northern Affairs Canada
cm	Centimetre
COSEWIC	Council on the Status of Endangered Wildlife in Canada
CSTF	Contaminated Soil Treatment Facility
DEW	Distant Early Warning
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
FCSAP	Federal Contaminated Sites Action Plan
GHG	Greenhouse gas
HADD	Harmful alteration, disruption or destruction
H&SP	Health and Safety Plan
km	Kilometre
m	Metre
mm	Millimetre
NWS	North warning system
PCB	Polychlorinated biphenyl
PHC	Petroleum hydrocarbon
POL	Petroleum, oil, and lubricant
PPR	Project Proposal Report
PSPC	Public Services and Procurement Canada
RAP	Remedial Action Plan
SAR	Species at risk
SRR	Shortrange radar
TESC	Temporary erosion and sedimentation control
VC	Valued Component

Table of Contents

Figures

Tables

1. Introduction

AECOM Canada Ltd. (AECOM) was retained by Public Services and Procurement Canada (PSPC), on behalf of Crown Indigenous Relations and Northern Affairs Canada (CIRNAC), to prepare a Project Proposal Report (PPR) for the PIN-C, Bernard Harbour (Inuit: Nulahugiuq) former intermediate Distant Early Warning (DEW) Line site (the Site) remediation project (the proposed Project). The goal of the PPR is to assess the environmental, social, economic, and cultural effects of the proposed Project and develop avoidance and mitigation measures for identified impacts where necessary.

1.1 Site Background

1.1.1 Site History

PIN-C, Bernard Harbour is a former intermediate DEW Line site located in the Kitikmeot Region of Nunavut, on the shores of Dolphin and Union Strait (68.781824°N, 114.832372°W) approximately 110 kilometres (km) north of the hamlet of Kugluktuk and approximately 390 km west of the hamlet of Cambridge Bay (**Figure 1**). The Site was constructed in 1958 and subsequently abandoned in 1963. CIRNAC became the custodian of the Site in 1965. The Site is composed of two distinct areas: the Station Area and the Beach (**Figure 2**). Historical facilities at the Site consist of the following: a Garage; a Warehouse; a Module Train; an Inuit House; petroleum, oil, and lubricants (POL) tank concrete foundations at the Station Area and Beach; a dismantled POL pipeline; and a downed Radar Antenna. The POL tanks at the Station Area and Beach have been removed since abandonment of the Site. There is an unnamed lake located approximately 1 km northwest of the Station Area that historically served as a drinking water source during DEW Line operations (West Lake) and another lake, the East Lake, located approximately 1 km southeast of the Station Area. There is also a North Warning System (NWS) shortrange radar (SRR) installation located approximately 5 km southwest of the Site, but it is not associated with the Project. Two contemporary NWS POL tanks are located at the Beach within the same footprint as the historic POL foundations. The airstrip, access roads and beach area are located within a Department of National Defense (DND) reserve. Any remedial work activities planned within these areas are included in this PPR.

1.1.2 Recent Works

Assessment and remediation activities at the Site since its abandonment have included the following:

- A hazardous material clean-up program, conducted jointly in 1995 by the Department of National Defence (DND), Environment Canada, and the Department of Indian Affairs and Northern Development, focused on removal of equipment considered hazardous or containing hazardous materials (ESG, 1993). Abandoned fuels were also removed and burned (ESG 1993; Holtz et al. 1986).
- An environmental investigation to ascertain the environmental status of the Site and to propose clean-up plans was conducted by the Environmental Sciences Group in 1992 (ESG, 1993).
- A supplemental environmental investigation, to better characterize contaminants of concern at the Site, was conducted by WESA Inc. in 2011 (WESA 2011).
- A Phase III ESA, to collect the data necessary to identify environmental/physical hazards at the Site, to identify remedial actions, and to collect sufficient information to prepare detailed remedial designs in accordance with the Abandoned Military Site Remediation Protocol (AMSRP), was conducted by AECOM in 2022 (AECOM 2022).
- ERM Consultants Canada Ltd. (ERM) conducted an Archeological Impact Assessment (AIA) of the Site to support the remedial planning. The objectives of the AIA were to identify any heritage sites affected by previous or planned activities at the Site, evaluate the existing or potential effects to these sites, and develop appropriate archaeological avoidance strategies and/or mitigation options for these sites. No archaeological sites or materials were observed or recorded (ERM 2022).

- A Remedial Action Plan (RAP) was prepared by AECOM in 2023 (AECOM 2023). The RAP provided the foundation for the development of a remedial design to address the environmental liabilities that were identified during the Phase III ESA. Remedial options for each clean-up item were developed and presented to the community of Kugluktuk for input and acceptance.

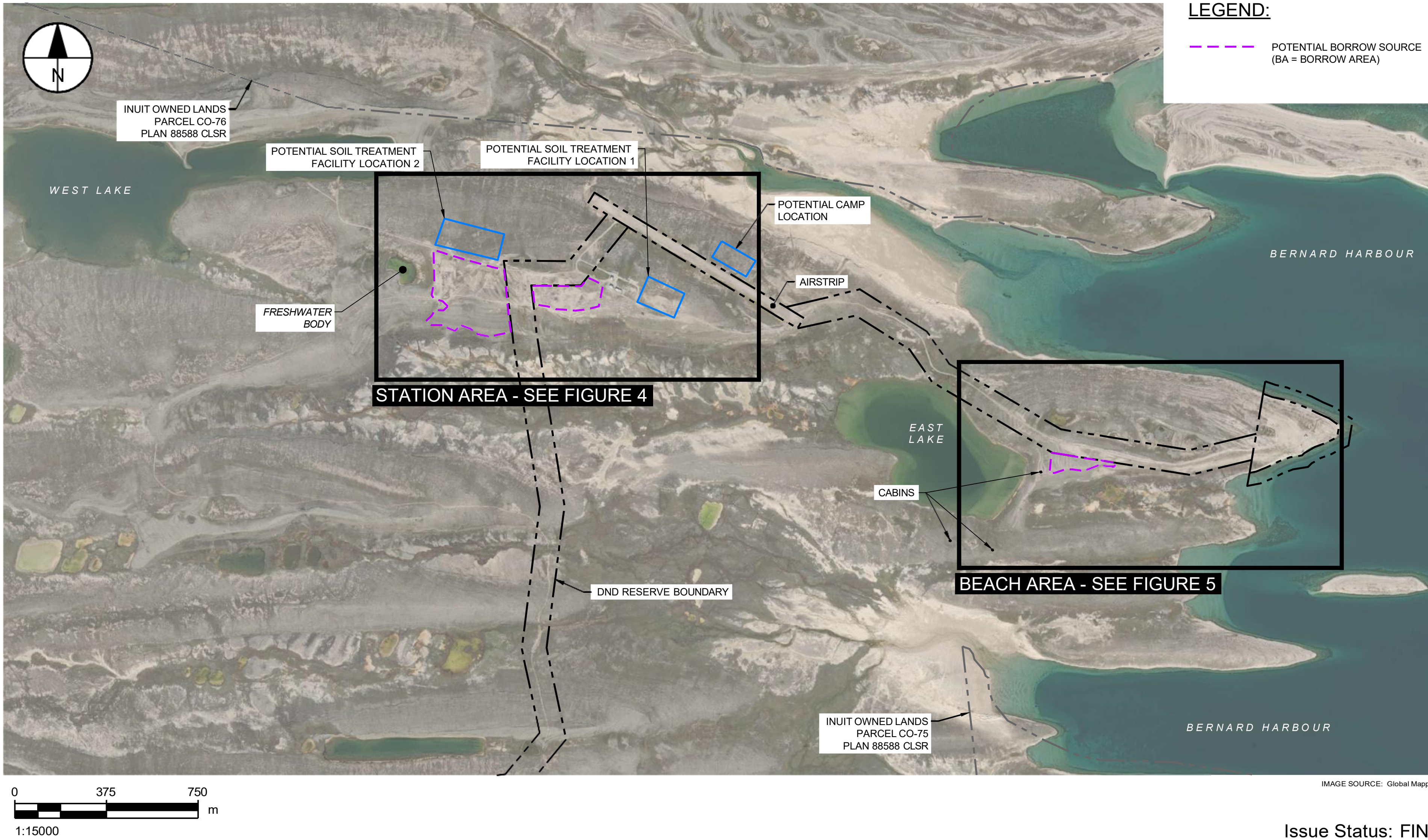
Issue Status: FINAL

PIN-C Bernard Harbour
Project Proposal Report
Public Services and Procurement Canada
Project No.: 60688145 Date: 2024-09-16

SITE LOCATION PLAN

Figure 1

Last saved by: SERBIND(2024-09-16) Last Plotted: 2024-09-16 Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm



Issue Status: FINAL

PIN-C Bernard Harbour
Project Proposal Report
Public Services and Procurement Canada
Project No.: 60688145 Date: 2024-09-16

OVERALL SITE PLAN

AECOM

Figure 2

2. Project Overview

2.1 Project Rationale

Historically, land use practices in Canada did not consider environmental consequences and the resulting contaminated sites are now a legacy of the past. As such, an approved Management Framework of policy and best practices was developed by the Treasury Board of Canada Secretariat for contaminated sites. Under this policy, individual departments are responsible for managing their contaminated sites. As part of the policy, the Federal Contaminated Sites Action Plan (FCSAP) was developed. The Site is part of the FCSAP and CIRNAC is the custodian of the Site. As such, the Site remediation will be compliant with the FCSAP requirements.

The purpose of the proposed Project is to protect environmental and human health by removing, treating, or isolating impacted soil, debris, and building materials.

2.2 Project Description

Based on the most recent information from the Phase III ESA (AECOM 2022) and the RAP for the Site (AECOM 2023), the remedial activities (the proposed Project) are expected to comprise the following.

- Setting up a work camp.
- Developing and reclaiming onsite borrow sources.
- Road upgrades and maintenance, including the replacement of a culvert at the East Lake.
- Constructing and operating the Contaminated Soil Treatment Facility (CSTF).
- Excavation of contaminated soil for placement in the CSTF or off-site disposal depending on the contamination present.
- Demolishing, packaging, and containerizing the onsite infrastructure (Garage, Warehouse, Module Train, Inuit House, and Radar Antenna) for offsite disposal. All waste will be sorted depending on whether it is hazardous or not.
- Clean concrete slabs will be left as is; stained or painted slabs will be regraded with clean fill; other concrete foundations will be placed in deeper excavations and covered.
- The concrete warehouse floor and support pillars will be collapsed in place and covered with clean fill.
- Buried debris areas that were found to be geotechnically stable will be regraded after surface debris collection and contaminated soil removal, where present; buried debris areas that are geotechnically unstable will be excavated, sorted, containerized and transported offsite for disposal at a licensed facility.
- Hazardous waste will be disposed off-site at an appropriate facility.
- Collection, packaging, and containerizing surface debris for off-site disposal at an appropriate facility.
- Backfilling, regrading, and reshaping work areas to blend with the natural terrain and provide positive drainage.
- Staging materials and equipment at the Beach for shipment offsite via sea lift. Transporting and disposing materials offsite at the Contractor's Designated Offsite Waste Disposal Facility (which may vary depending on the material and contamination).
- Decommissioning of work camp

2.3 Project Activities Schedule

It is anticipated, based on the assumption that the Contractor will mobilize to the Site via sealift, that the Contractor will mobilize during the fall of the first calendar year (Year 1) and initiate the construction of critical items at this time. Most of the remediation activities are anticipated to be completed during the second year (Year 2). The schedule presented is an estimation of the Contractor's activities and is subject to change.

The proposed Project may also be required to adhere to the restricted activity periods noted in **Section3.7.4**. Where work cannot be avoided during the restricted activity periods, additional mitigation measures may be required.

Year 1 (August 4 to September 28, 2025)

- Mobilize equipment and materials to site, and camp set up
- Road upgrades or maintenance
- Develop granular borrow sources
- Construction of the CSTF
- Excavate and transport contaminated soil to the CSTF for treatment
- Winterize materials and equipment, and demobilize personnel from the Site

Year 2 (June 1 to September 6, 2026)

- Mobilize personnel to the Site for the construction season and open camp.
- Operate the CSTF.
- Demolish, package, and containerize the buildings and antenna.
- Excavation of contaminated soil for off-site disposal or treatment in the CSTF depending on the contamination present.
- Excavating and sorting buried debris. The excavated material will be containerized and transported offsite for disposal at a licensed facility.
- Collection, packaging, and containerizing surface debris.
- Backfilling, regrading, and re-shaping work areas to blend with the natural terrain and provide positive drainage.
- Decommissioning the CSTF through removal of any associated infrastructure and reshaping the area.
- Reclaiming the granular borrow sources and access roads constructed to support remediation by contouring the areas to blend in with the natural surroundings while preventing ponding and erosion and to return the disturbed land to a usable state.
- Contractor stages materials, equipment, and packaged/containerized waste/contaminated soil at the Beach for retrograde shipment via sea lift. Transportation of waste/contaminated soil to off-site disposal facilities.
- Demobilize materials, equipment, and personnel from the Site.

2.4 Equipment

An equipment list was generated based on experience remediating similar sites, but the actual equipment used may vary due to availability or Contractor decisions. The following types of equipment are expected to be mobilized and used onsite:

- Excavator(s)
- Articulated trucks
- Dozers
- Graders
- Loader(s) (e.g., wheel loader, skid steer)
- Water truck
- Tractor
- All-terrain vehicles (ATVs)

2.5 Additional Considerations

Signage will be posted around the Site to inform users of the work that is happening. There will be exclusion zones for the excavation and demolition work but otherwise no additional steps are recommended to secure the Site from the Public.

The Contractor is expected to have spill contingency plans in place. These are to include a full range of clean up and protective equipment onsite for all materials that could potentially be spilled. The equipment should also be of an adequate capacity to treat the spill size.

The Contractor will determine fuel storage and the temporary waste staging area, and these locations will be outlined in the Contractor's pre-mobilization submittal plans to PSPC.

2.6 Project Approval and Permit Requirements

Land tenure for the Site is held by the Crown. The nearest Inuit Owned Land parcel is designated CO-75 and is located under 1 km to the southeast of the Site and extends to the Dolphin and Union Strait. CIRNAC, Nunavut Region is responsible for managing legacy contaminated sites on Crown Land in Nunavut.

There are territorial and federal regulatory requirements that are applicable for the proposed Project.

2.6.1 Regulatory Requirements

The proposed Project may be subject to the following federal and territorial environmental legislations, regulations, and/or guidelines.

2.6.1.1 Federal

- *Migratory Bird Convention Act*
- *Species at Risk Act*
- *Fisheries Act*
- *Canadian Environmental Protection Act*
- *Transportation of Dangerous Goods Act*
- Interprovincial Movement of Hazardous Waste Regulations (Current to October 18, 2022)
- Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (Current to October 18, 2022)

- Contaminated Sites Management Policy

2.6.1.2 Territorial

- *Wildlife Act*
- *Nunavut Planning and Project Assessment Act*
- Nunavut Agreement
- *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and associated regulations
- *Territorial Lands Act* and Territorial Land Use Regulations
- Nunavut Archaeological and Palaeontological Sites Regulations
- *Commissioner's Land Act*
- *Environmental Protection Act*
- *Public Health Act* and associated regulations
- Spill Contingency Planning and Reporting Regulations
- Nunavut Planning Commission
- Environmental Guideline for the General Management of Hazardous Waste (Government of Nunavut 2010)
- Environmental Guideline for the Burning and Incineration of Solid Waste (Government of Nunavut 2012)

2.6.2 Permits

The permits and/or approvals that may be required for the proposed Project are summarized in Table 1, with further considerations around hazardous waste, quarrying and archaeology discussed below.

Table 1. Permits and/or Approval for the proposed Project

Activity	Permits/Approvals	Regulatory Body	Timeline
Activities that use or deposit water, such as drawing water and disposal of greywater or wastewater.	Water License: Type A or B	Nunavut Water Board	Type A: up to 1 year Type B: up to 3 months[1]
Remediation	Conformity Review	Nunavut Planning Commission (NPC)	45 days
Remediation	Project Screening if NPC determines the proposed Project requires a screening by NIRB	Nunavut Impact Review Board (NIRB)	45 days
Remediation	Land Use Permit: Class A or Class B	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)	42 days once NPC conformity review and NIRB screening is complete
Remediation	Class 2 Nunavut Territory Archaeologist Permit	Government of Nunavut	3+ months for permit to be received. Permit valid for ~4 months.
In water work or Works near water (within 30 m) that may cause harmful alteration, disruption or destruction of fish and fish habitat (HADD)	Request for Review	Department of Oceans and Fisheries	Letter of Advice: 1 to 3 months Authorization: 8-10 months
Transportation of Dangerous Goods	Registered Carrier	Government of Nunavut	Varies
Quarrying activities – material or aggregate extraction	Quarry Permit	CIRNAC	45 days

Quarry Permit:

It is anticipated that Type 2, Type 3, and Type 5 granular material will be required to complete remediation of the Site. Potential borrow areas were identified in advance of the 2022 site assessment with consideration of soil type, avoiding contamination, minimizing haul distances, avoiding the need to construct new access roads, and avoiding the DND reserve boundary. The areas were visually assessed in the field and revised as applicable. Three borrow areas have been identified at the Station Area and one area has been identified along the road to the Beach:

- Borrow Area 1 is located on the Station Area ridge, approximately 400 m west of the Station Area buildings on the south side of the access road. It is comprised of a mix of undisturbed reworked beach ridge material and disturbed area previously used as a borrow source and built into pallet line storage pads. The pads are not contaminated, and the granular material is therefore available for use.
- Borrow Area 2 is located immediately adjacent to the Station Area buildings along the same ridge line as Borrow Area 1. The two borrow areas are separated purely because of the DND reserve section cutting between them; the same type of granular material was observed throughout.
- Borrow Area 3 consists of a granular stockpile accumulated from previous granular extraction to the east of the Station Area buildings.
- Borrow Area 4 is located west of the East Lake, approximately 1 km up the road from the Beach area. It has been previously used for granular extraction, likely for road construction. The lateral extent has been set based on a 100 m offset from the East Lake.

[1] Based on quantity of water proposed to be withdrawn, it is expected that the proposed project would fit under a Type B license.

The Contractor will be required to selectively extract, blend, crush and/or screen granular material from the borrow sources to satisfy the granular material specifications.

Table 2: Granular Material Requirements – Summary

Granular Material Type / Description	Estimated Volume Required (m^3)
Type 2 Well-graded sand and gravel that is used for construction of berms and covers. Required for the construction of the CSTF and for re-grading contaminated soil areas and BDAs. Available in borrow areas BA-01, BA-02 and BA-03 (Station Area) and borrow area BA-04 (Beach).	11,600
Type 3 Select material with a maximum particle size of 200 mm that is used for backfilling excavations and general site grading. Required for backfilling excavated BDAs and contaminated soil excavations. It should be noted that a volume of 315 m^3 of clean fill is expected from BDA excavations. This clean fill will likely contain small pieces of debris and is only recommended for use as intermediate backfill. The use of Type 2 material as excavation backfill is considered an acceptable alternative to Type 3.	2,000
Type 5 Consists of rounded particles with a maximum size of 5 mm free from angular particles, stones larger than 25 mm in diameter, and deleterious material that is used as geomembrane bedding material required for the construction of the CSTF.	900

Archaeological Permit

The Site was investigated by an archaeologist under a Class 2 Nunavut Territory Archaeologist Permit, No. 2022-16A, authorizing archaeological field research in connection with the proposed Project entitled: Archaeological Impact Assessment (AIA), Final Report, NU Permit 2022-16A. The AIA is provided under a separate cover (ERM 2022).

During the Phase III ESA, wooden cabins were observed in the surface debris areas (SDA-7, SDA-8, and SDA-9) (**Figure 2**). None of the cabins are associated with the DEW Line operation. All three cabins observed had fallen into disrepair with one of them having fully collapsed. According to the local wildlife monitors, the cabins are not used by the local community while hunting or fishing near the Site. As such, the cabins have been treated as surface debris to be collected, containerized, and transported off site for disposal at a licensed facility following volume reduction. It should be noted that only the cabin in SDA-7 was assessed as part of the AIA. It is recommended that the cabins in SDA-8 and SDA-9 be assessed for their value as “heritage resources” prior to being collected, containerized, and transported offsite for disposal. It is recommended that this assessment occur during the mobilization year (Year 1) as there will be wildlife monitors onsite and it is not anticipated that any surface debris collection will take place during that first year.

While not expected under the remedial action plan (AECOM 2023), if work is being completed outside of the Site area, additional archaeological investigation could be required.

3. Site Description

3.1 Site Location and Dimensions

The Site is located at approximately 68.781824°N, 114.832372°W in the West Kitikmeot Region of Nunavut Territory, approximately 110 km north of the hamlet of Kugluktuk and approximately 390 km west of the hamlet of Cambridge Bay (**Figure 1**). The Site is situated on the Nunavut mainland on the shore of Bernard Harbour, within the Dolphin and Union Strait.

The Site footprint is approximately 3.3 square kilometres (km^2) including two onsite lakes (approximately 2.2 km^2 excluding the lakes) and is composed of two distinct areas: the Station Area and the Beach (**Figure 2**). Major Site features include two lakes, buildings (a Garage; a Warehouse, a Module Train, and an Inuit House), POL tank concrete foundations at the Station Area and Beach, a dismantled POL pipeline, a downed Radar Antenna, and an airstrip. The airstrip, access roads and beach area are located within a DND reserve. There is an unnamed lake located approximately 1 kilometre (km) northwest of the Station Area buildings that historically served as a drinking water source during DEW line operations (the West Lake) and another lake, the East Lake, located approximately 1 km southeast of the Station Area buildings.

Ecologically, the Site is located within the Northern Arctic Ecozone, and, more specifically, within the Amundsen Gulf Lowlands Ecoregion (Agriculture and Agri-Food Canada and Environment Canada 1999). This ecoregion is among the coldest and driest of Canada's landscapes (Environment Canada 1999).

3.2 Climate

The Amundsen Gulf Lowlands are classified as having a low-arctic ecoclimate. The mean annual temperature is approximately -14 degrees Celsius (°C), with a summer mean of 2°C, and a winter mean of -28.5°C. The mean annual precipitation ranges from 100 to 200 millimetres (mm). Table 3 and Table 4 summarize average monthly and annual weather data measured at two nearby weather stations: Kugluktuk A (Kugluktuk, Nunavut, 67.82 N, 115.14 W, 22.601 m elevation) and Cambridge A (Cambridge Bay, Nunavut, 69.11 N, 105.14 W, 31.09 m elevation).

Table 3: Average Monthly and Annual Weather Data – Kugluktuk A

Month	Daily Average (°C)	Daily Maximum (°C)	Daily Minimum (°C)	Rainfall (mm)	Snowfall (cm)	Average Snow Depth (cm)
January	-27.3	-23.2	-31.4	0.1	19.6	31
February	-27.7	-23.4	-32	0	16.3	35
March	-25.3	-20.7	-29.8	0	19.4	39
April	-16.3	-11.4	-21.2	0.1	18.2	40
May	-5.3	-1.3	-9.2	4.3	16.2	24
June	5.5	9.9	1	14.6	2.1	2
July	10.9	15.6	6.1	44.4	0	0
August	9	13.1	4.8	44.9	0.2	0
September	3.3	6.5	0.1	31.4	7.7	0
October	-6.6	-3.5	-9.8	4.7	35	8
November	-18.7	-14.8	-22.6	0	25.5	19
December	-24.5	-20.3	-28.6	0	21.9	26
Annual	-10.3	-6.1	-14.4	144.5	182.1	19

Source: 1981-2010 Climate Normals & Averages, Environment and Climate Change Canada. *Accessed on December 15, 2023.* (https://climate.weather.gc.ca/climate_normals/index_e.html) (Government of Canada 2023a).

Table 4: Average Monthly and Annual Weather Data – Cambridge A

Month	Daily Average (°C)	Daily Maximum (°C)	Daily Minimum (°C)	Rainfall (mm)	Snowfall (cm)	Average Snow Depth (cm)
January	-32	-28.5	-35.4	0	6.7	24
February	-32.5	-28.9	-36.1	0	5.9	27
March	-29.3	-25.3	-33.2	0	8.4	31
April	-20.8	-16.3	-25.3	0	6.9	34
May	-9.3	-5.6	-13	1	7.2	34
June	2.7	5.8	-0.3	10	3.8	9
July	8.9	12.8	4.9	23.9	0.1	0
August	6.8	9.8	3.8	23.9	1.8	0
September	0.3	2.5	-1.9	12.7	6.8	0
October	-10.4	-7.3	-13.5	0.6	15.9	8
November	-22.3	-18.8	-25.7	0	9.8	16
December	-28.3	-24.9	-31.8	0	6.8	20
Annual	-13.9	-10.4	-17.3	72.1	80.2	17

Source: 1981-2010 Climate Normals & Averages, Environment and Climate Change Canada (https://climate.weather.gc.ca/climate_normals/index_e.html). (Government of Canada 2023a)

3.3 Climate Change Projections

The Climate Atlas of Canada (Climate Change in Canada | Climate Atlas of Canada) provides a mapbased integrated source of information related to climate change projections for all of Canada. The Site provides projections based on two rates of climate change: a high carbon scenario (Representative Concentration Pathway [(RCP] 8.5) which assumes continuous large amounts of carbon dioxide emissions and a low carbon scenario (RCP 4.5) which assumes drastic reductions of emissions that will stabilize the concentration of green house gases (GHGs) in the atmosphere by the end of this century.

Bernard Harbour is included in the Climate Atlas of Canada map grid area 'Cape Krusenstern'.

The mean annual air temperature is expected to increase from -11.7°C[2] to:

- -8.6°C between 2021 and 2050, and to -5.5°C between 2051 and 2080 based on the RCP 8.5
- -9.1°C between 2021 and 2050, and to -7.6°C between 2051 and 2080 based on the RCP 4.5

Annual precipitation is expected to increase from 191 mm to:

- 215 mm between 2021 and 2050, and 239 mm between 2051 and 2080 based on the RCP 8.5
- 210 mm between 2021 and 2050, and 224 mm between 2051 and 2080 based on the RCP 4.5

The annual number of frost-free days is expected to increase from 65 days to:

- 89 days between 2021 and 2050, and 111 days between 2051 and 2080 based on the RCP 8.5
- 88 days between 2021 and 2050, and 97 days between 2051 and 2080 based on the RCP 4.5

An effect of these projections may be an increase in active layer depth (i.e., permafrost degradation); however, these projections would also likely work to increase surficial vegetation which would help insulate permafrost.

In terms of projected sea level rise considerations, the Site is within a region that is subject to continued vertical crust displacement (i.e., isostatic rebound) following the last glaciation, which would help offset

[2] Interpolated from nearby weather stations for data collected 1976-2005.

sea level rise. James et al. (2021) have calculated relative sea level projections at the year 2100 which account for vertical crust displacement combined with sea level rise; relative sea level projections at the Site are expected to vary from 0 to 20 centimetres (cm) (90th percentile) based on the RCP 4.5, and from 20 to 40 cm (90th percentile) based on RCP 8.5. Based on the projected sea level rise at the Site, there is an increased risk of storm surges, flooding and resulting erosion. The projected sea level rise should be considered for planning and maintenance of existing and proposed future infrastructure.

Tidal ranges are not expected to be altered due to climate change.

3.4 Geology and Permafrost

The Bernard Harbour area lies within the zone of continuous permafrost (>90 % coverage). Bedrock geology is comprised of carbonates with intermingled siliciclastic sedimentary deposits and is overlain by glacial deposits. The Station Area is dominated by glacial depositional landforms in the form of drumlins. Glacier flow has reworked till into oblong shapes (with glacial flow direction likely from east to west). The beach landing area is dominated by marine depositional features. Intervals of rapid isostatic uplift combined with changes in sea level have resulted in a series of beach ridges. Permafrost patterned ground – of varying type depending on soil types – is present across the Site and surrounding areas. The following geomorphologic units describe the terrain at the Site:

- Glacial till (drumlin). The Station Area (northern half) and the airstrip are dominated by glacial till (in the form of drumlins) comprised of sand, gravel, and cobbles with varying proportions of fine grained soils (i.e., silt and clay). Permafrost features in the form of ice wedge polygons and sorted frost circles are present along shallow slopes, whereas linear permafrost features (e.g., stone stripes) are found along the slopes.
- Reworked glacial till beach ridges. The Station Area (southern half) and the area downslope are dominated by reworked glacial till beach ridges. Marine reworked glacial till is comprised of defined strandlines along drumlin slopes that are continuous and parallel and are composed of primarily well sorted sand and gravel.
- Marine or glaciolacustrine sediment. Further south from the Station Area, relatively flat-lying and poorly drained marine and glaciolacustrine sediment dotted with numerous ponds (thermokarst terrain), ice wedge polygons, and erosional channels can be observed. Material in this area is comprised of sand, gravel, and cobbles with varying proportions of fine-grained soils.
- Modern marine beach. The modern marine beach zone, located along the coastline of the beach landing area, includes active beach and other recently deposited materials consisting of sand, gravel, and cobbles.
- Raised marine beach. The raised marine beach, located immediately adjacent to and further inland from the modern marine beach, is comprised of well defined linear strandlines that are continuous and parallel to the current coastline. Beach sequences are composed of sand, gravel, and cobbles with varying proportions of fine grained soils. Small ponds and wet areas can be observed along the existing plateau.
- During the 2022 field investigation test pits were excavated on site. The permafrost depth varied across the site. Frost was not identified in all test pits but was identified in a number of test pits between 1.3 - 1.6 meters below ground surface (mbgs). The excavation depth was limited by the equipment used, reaching a maximum depth of 1.6 mbgs, which suggests that permafrost may be deeper than 1.6 mbgs in some areas. An average depth for permafrost of 1.5 mbgs has been assumed across the site, though actual depth may vary.

3.5 Topography and Aesthetics

The Bernard Harbour area lies within the western portion of the Northern Arctic Ecozone. As such, the topography of the area is characterized by low rolling plains covered by glacial moraine. Small hills with several small lakes and marshes dominate the Site itself. The substrate varies across the Site ranging from sandy gravel to coarse-grained gravel; south of the Station Area ridge, the substrate becomes quite humic, with the presence of fine-grained sand and silt material. The coastlines in this area are characterized by wide flat plains that extend up to 10 km inland. Most of these coastal plains were once submerged beneath the sea and following their release from the crushing weight of glacial ice, they have rebounded over the past few thousand years.

The Station Area of the Site is located 1.7 km from the coast on an elevated ridge approximately 43 m above sea level. On the northeast side, the ridge drops off through several small, raised beaches to the coast. The airstrip is situated at a lower elevation approximately 250 m to the north of the Station Area buildings. The Beach area lies to the east of the Station Area on a small peninsula that extends out into the Strait.

Historical facilities at the Site consist of a garage, a warehouse, a module train, and an Inuit House. These facilities are still standing but have suffered from prolonged weathering and some vandalism. The interiors of these structures have been exposed to the effects of weathering, the windows have all been broken out, and most doors have been damaged and/or wedged open. There is a downed radar antenna located along the side of the ridge to the south of the Station Area buildings; the concrete anchor pads are still present along the top of the ridge. POL tank concrete foundations are located at the Station Area and Beach, and a dismantled POL pipeline that once connected these locations has been disconnected and dismantled and its sections laid in piles on the ground east of the module train; the barrel supports and markers for the interconnecting pipeline are still in place spanning approximately 2.6 km from the Station Area buildings to the Beach.

There is also a North Warning System (NWS) shortrange radar (SRR) installation located approximately 5 km southwest of the Site that is not part of the proposed Project. Two contemporary NWS POL tanks are located at the Beach within the same footprint as the historic POL foundations, but they are not part of the proposed Project and are currently in use.

Surface debris consisting of metal barrels, scrap metal (e.g., equipment components, rubbish, mechanical parts, framing, piping, cables), scrap wood (e.g., plywood, pallets, crates, framing, timbers), electrical components, and miscellaneous debris (e.g., bathtub, furniture) can be found littered across the site covering an area of approximately 161,812 m^2.

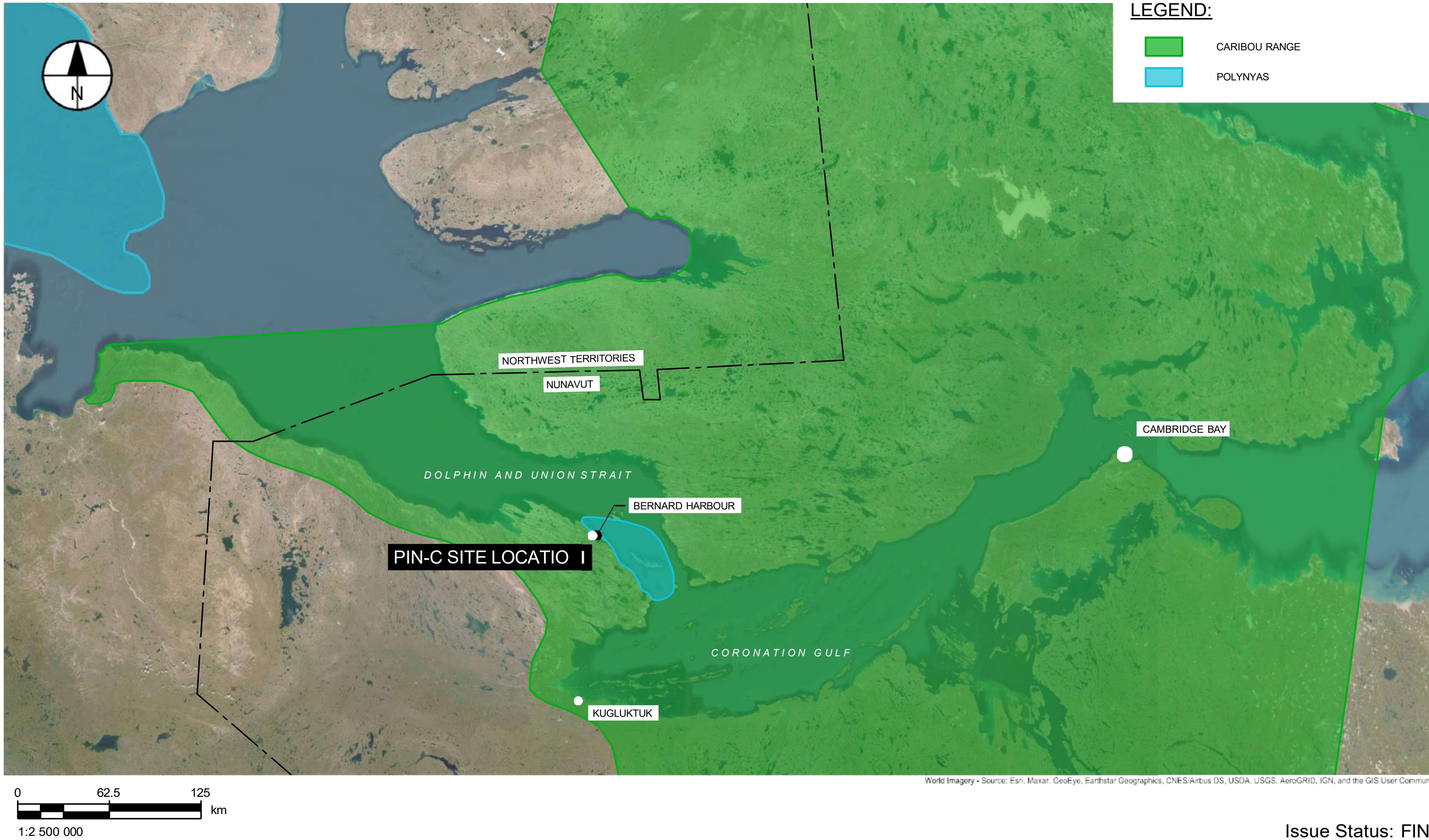
3.6 Hydrology & Physical Marine Environment

The onsite aquatic features are two freshwater lakes, a pond, and number of wetted areas (**Figure 2**). The marine environment adjacent to the Site is made up of the Dolphin and Union Strait which connects the Coronation Gulf (to the south), with the Amundsen Gulf (to the north) and is covered either by sea ice or polynyas during much of year (**Figure 3**). Polynyas are areas of persistent open water surrounded by sea ice created by strong upwelling or currents which prevent sea ice from freezing. These persistent open water areas amongst sea ice are important access points between the sea and atmosphere for wildlife, and are nutrient-rich, biologically productive areas. As shown in Figure 3, caribou use the sea ice for their migration routes.

Onsite, there are two lakes. One is located 1 km northwest of the Station Area buildings and historically served as a drinking water source during Dew Line operations (known as ‘the West Lake’) and the other lake, the East Lake, is located approximately 1 km southeast of the Station Area buildings. An access road connects the West Lake with the Station Area. An access road connecting the Station Area to the Beach runs to the north of the East Lake and is within ~50 m of the shore of East Lake. The outlet for East Lake has a previously placed culvert that is no longer functional, and some minor erosion and settlement has occurred. This culvert will be replaced and made functional as part of the proposed Project. The culvert is approximately 3 – 3.5 m in length and was meant to provide passage over the ephemeral stream connecting East Lake and the Dolphin and Union Strait. It is believed that the flow would come from the Dolphin and Union Strait into the East Lake.

A shallow and relatively small pond (**Figure 4** and **Figure 5**) and various wetted areas onsite are located within the Beach area, but without surface connectivity to the marine environment, and to the west of the Station Area. These waterbodies range from 25 m to 125 m across at their widest points.

At the time of the site visit in 2022, no onsite water features were observed to have surface connectivity to the ocean; however, the possibility of seasonal surface or seasonal/year-round sub-surface connectivity between onsite freshwater features and the marine environment cannot be discounted. Additionally, replacement of the collapsed culvert in the East Lake is expected to restore connection to the marine environment. No fish were observed in either East or West Lake and the ephemeral stream between the Dolphin and Union Strait and East Lake was dry at the time of the site visit.



Issue Status: FINAL

PIN-C Bernard Harbour
Project Proposal Report
Public Services and Procurement Canada
Project No.: 60688145 Date: 2024-09-16

MARINE ENVIRONMENT OF KITIKMEOT REGION OF NUNAVUT

AECOM

Figure 3

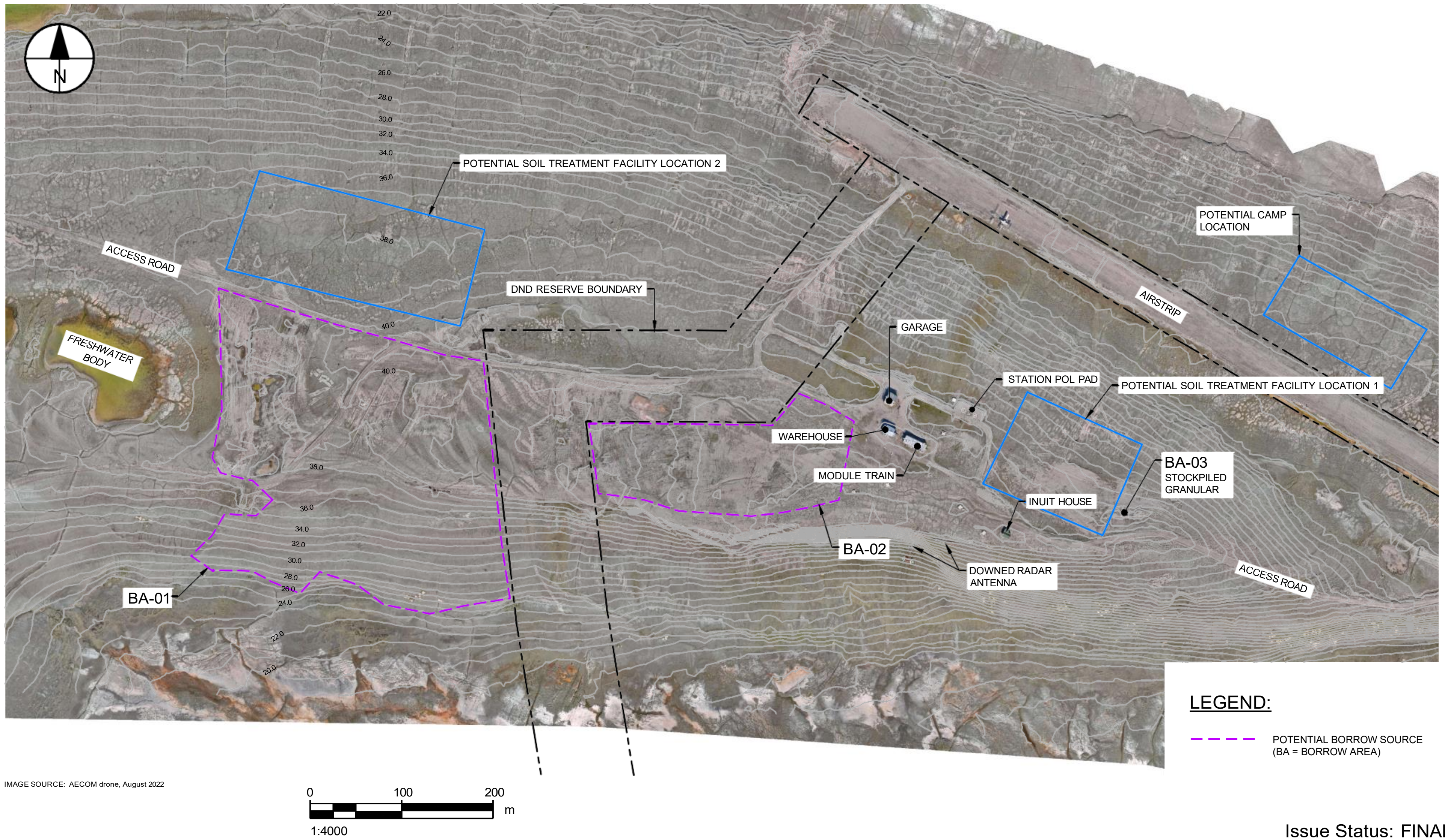


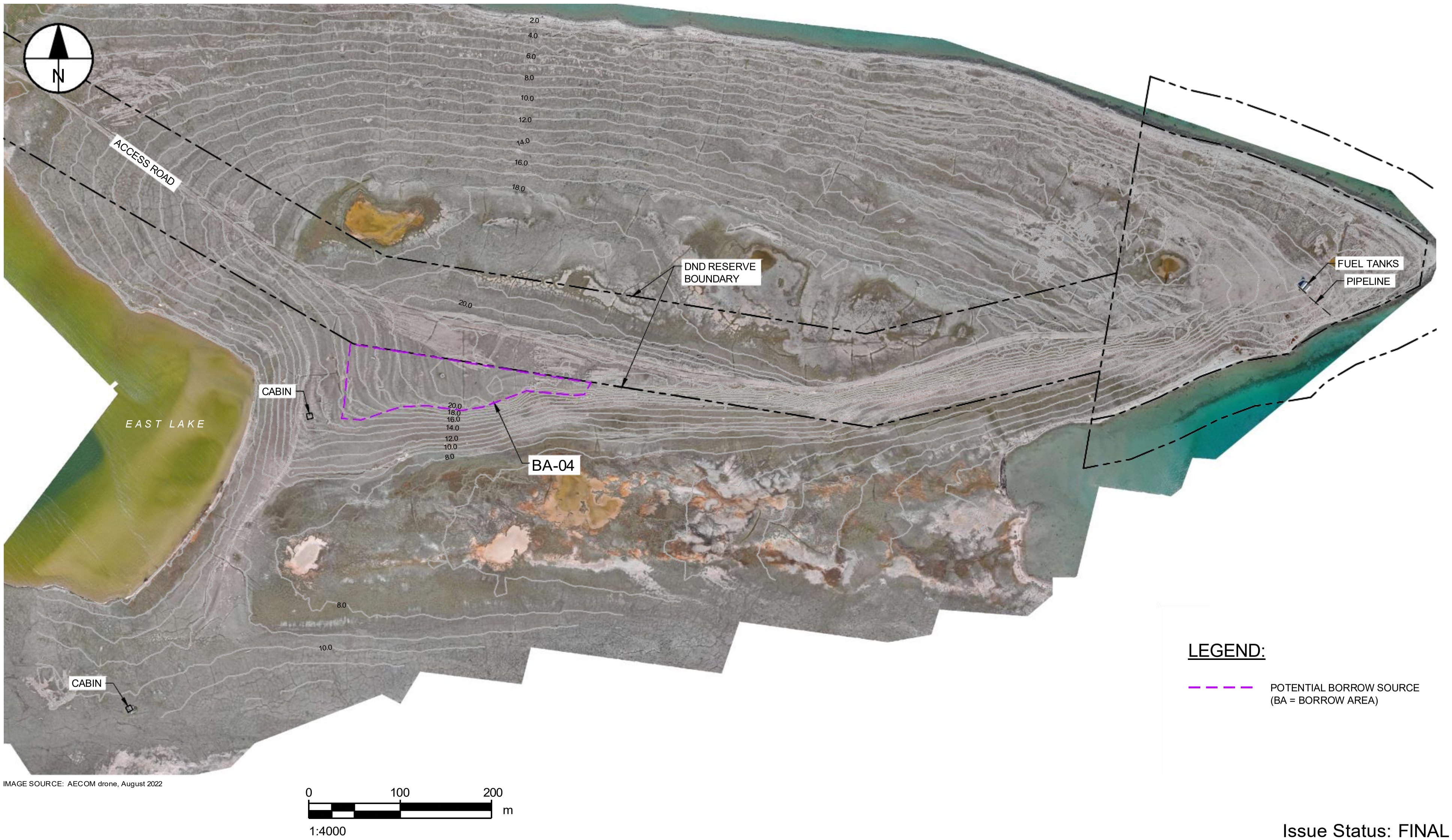
IMAGE SOURCE: AECOM drone, August 2022

Issue Status: FINAL

STATION AREA
SITE PLAN

AECOM

Figure 4



Issue Status: FINAL

PIN-C Bernard Harbour
Project Proposal Report
Public Services and Procurement Canada
Project No.: 60688145 Date: 2024-09-16

BEACH AREA
SITE PLAN

AECOM

Figure 5

Environment Canada (https://tides.gc.ca/en/stations) provides daily tidal predictions at stations along Canadian coasts. The tides at Bernard Harbour range from low tides of 0 m to high tides of 0.7 m annually, with nearby stations to the east and south at Austin Bay and Kugluktuk ranging from 0 to 0.5 m and 0 to 0.6 m, respectively. This tidal range of ~0.7 m is relatively small compared to other coastal regions in Canada.[3]

The depth of Bernard Harbour extending offshore from the Site is shallow (1-3 m) near-shore and increases in depth with increased distance from the shoreline. Shallow water depths are also located along the shores of islands adjacent to the Site, such as Chantry Island, Cox Island, and Teddy Bear Island, located between 1-2 km from the proposed Project. Deeper water pockets (~20 m depths) are present between the land mass of the proposed Project Site and nearby islands. Extending perpendicular from the shores adjacent to the proposed Project Site towards Dolphin and Union Strait, water depths become shallower approximately 400 m, and then again at 1 km offshore before reaching Dolphin and Union Strait. Water depths of Dolphin and Union Strait surpass 20 m beyond the channel between Chantry and Teddy Bear Island. Dolphin and Union Strait reaches 100 m depths mid-channel (Fisheries and Oceans Canada (DFO) 2023).

3.7 Vegetation

Plant life in the Northern Arctic Ecozone is generally sparse and plant colonization is impossible for all but the hardiest of species, due to the exceedingly dry climate, permafrost, frost-churned soils, and gale force winter winds. The number of plant species is very low – only about 140 species compared with 3,000 in southern Canada. On the other hand, moss and lichen seem to thrive in this ecosystem – over 600 species are found in the Northern Arctic compared with about 500 in the more temperate latitudes. Relatively lush “oases” can also be found scattered across the landscape, confined mainly to coastal lowlands, sheltered valleys, and moist, nutrient-rich corridors along streams and rivers. These oases often support thick hummocky carpets of sedges, mosses, and lichens and are vital to many species of wildlife.

Vegetation in the Amundsen Gulf Lowlands is characterized by a nearly continuous cover of dwarf tundra vegetation including dwarf birch, willow, northern Labrador tea, Dryas spp. (dwarf shrub), and Vaccinium spp. (dwarf shrub).

During the 2022 site assessment, the Site was sparsely vegetated in worked locations, and patchy to continuous in less disturbed and low-lying areas (e.g., south of the Station Area) (AECOM 2022). Plants consisted mainly of low-lying willows, sedges, grasses, and a variety of wildflowers. Numerous lichens and mosses were also found throughout the area.

3.7.1 Species at Risk

A search of the Species at Risk in Nunavut (Government of Canada 2022), the Species at Risk Registry (Government of Canada 2023b), and various Council on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, identified no vascular plant, moss or lichen Species at Risk (SAR) with potential to overlap the Site area.

Although not COSEWIC assessed, Drummond Bluebell (*Mertensia drummondii*) is a known globally rare plant with very limited distributions within Nunavut (Government of Canada 2022). This species has a known distribution within 60 km (northwest along the shoreline) of the Site.

3.8 Fish and Wildlife

3.8.1 Fish

The two onsite lakes may provide habitat for freshwater or anadromous fish species; however, no fish were observed during the 2022 Site visit and given that the ice-off season for these waterbodies only lasts a few summer months, it is unlikely that the freshwater features onsite or adjacent to Site provide habitat to fish. Additionally, no surface connectivity was observed during the 2022 Site visit between the larger waterbodies (i.e., two onsite lakes) and the marine environment of Dolphin and Union Strait. Additionally,

[3] At the extreme end, Bay of Fundy tidal ranges are routinely 16 m, and are among the biggest tides in the world.

it is believed that the onsite lakes do not provide overwintering habitat as the lakes freeze over and possibly throughout the water column. Adjacent to the Site, Dolphin and Union Strait supports a number of fish including some species of particular ecological importance, which are described below.

Arctic Char (*Salvelinus alpinus*) belong to the trout and salmon family (Salmonidae) and can be anadromous (moving between fresh water and sea water during their life history) or freshwater-restricted, living their entire lives in lakes or rivers. In Nunavut, Arctic Char is the second-most widely consumed country food after caribou and is an extremely important subsistence resource and a nutritious food for Inuit. The Site is not located within an area of concentration for Arctic Char (Oceans North Conservation Society et al. 2018) and Arctic Char are not of conservation concern as they are considered abundant throughout the Canadian Arctic. As stated above, during the 2022 site assessment no connectivity between the marine environment and the two onsite lakes was observed; therefore, it is unlikely that the Site supports anadromous fish species, such as Arctic Char. This could change with culvert replacement in the East Lake; however, the connectivity to the marine environment is via an ill-defined ephemeral stream.

Arctic Cod (*Boreogadus saida*) are a pelagic (live in the water column) species of fish of the smelt family (Osmeridae). Arctic Cod is a key component of the Arctic marine ecosystem, responsible for up to 75% of the energy transfer between plankton and vertebrates (fish, seals, whales, and marine birds). Narwhal (*Monodon monoceros*) are believed to feed predominantly on Arctic Cod. Due to this role, as well as their abundance, Arctic Cod are a critically important food source for the animals which are eaten by Inuit. Arctic Cod are also harvested by many Inuit communities. Arctic Cod are not of conservation concern as they are abundant throughout the Canadian Arctic, though data on Arctic Cod presence in proximity of the Site is limited (Oceans North Conservation Society et al., 2018). It is possible that Bernard Harbour provides habitat to Arctic Cod, as this species is found in shallow or deep cold ocean waters and can also be found near the bottom of the sea ice.

Capelin (*Mallotus villosus*) are a forage (small, short-lived) species of fish. Capelin are important part of the Arctic marine food web as they are the main forage species for many larger predatory fish such as cod (family Gadidae) and anadromous Arctic Char (*Salvelinus alpinus*), seabirds and marine mammals such as Beluga Whales (*Delphinapterus leucas*). They also represent a high amount of biomass available as prey to these species. Due to this role in the food web, as well as their abundance, Capelin are a critically important food source for the animals that are eaten by Inuit. Some Inuit eat Capelin, but this has not been mentioned during engagement with Inuit from Kugluktuk. Capelin home range includes the Dolphin and Union Strait and this species is not of conservation concern. While Bernard Harbour could be used as spawning habitat for Capelin, this is unlikely as this species only exhibit this spawning behaviour in the warmer water reaches of their range.

3.8.2 Marine Mammals

There are 21 species of marine mammals that occur in Canadian Arctic waters, either as permanent residents year-round or as transient visitors (Oceans North Conservation Society 2018). Within the Amundsen Gulf, potential marine mammal occurrences may include Bowhead Whales (*Balaena mysticetus*), Beluga Whales, Ringed Seals (*Pusa hispida*), and Polar Bears (Oceans North Conservation Society 2018).

Bowhead Whales are the longest-living mammal on Earth, believed to live to upwards of 100 years. Bowhead Whales live in Arctic waters year-round with a preference for straits, bays and estuaries. Bowheads feed by swimming forward with their mouths open, capturing small prey such as zooplankton that they filter through their baleen. Bowhead Whales tend to be found at the edge of ice for much of the year and migrate north and south as ice expands and retracts seasonally (Oceans North Conservation Society 2018).

Beluga Whales are long-lived, medium-sized toothed whales. Belugas are generalist feeders with a diet of small fish and crustaceans, Capelin and shrimp. Belugas select both shallow water and deepwater habitats, using echolocation to communicate, navigate and search for food. Belugas migrate seasonally with animals generally moving towards estuaries and open water in summer, foraging grounds in fall, and mobile pack ice for the winter (Oceans North Conservation Society 2018).

Ringed Seals consume a variety of fish and invertebrates including Arctic Cod, sculpins, mysids and shrimp. Ringed Seals have a circumpolar distribution in all parts of the Arctic Ocean and are an ice-associated species. Ringed Seals maintain breathing holes in the ice and create lairs under snow on ice surface for giving birth and nursing young. Ringed Seals use shore-fast ice or stable pack ice in winter and are thought to disperse to forage during the open-water season (Oceans North Conservation Society 2018).

Polar Bears are the largest four-legged carnivore in the world, with a diet consisting primarily of ringed seals. Occasionally Polar Bears will consume Bearded Seals (*Erignathus barbatus*), Walruses (*Odobenus rosmarus*), Beluga Whales and Narwhals. During summers on land, Polar Bears will also eat fish, eggs, kelp, Lemmings (*Lemmus lemmus*), carrion and berries. Polar Bear seasonal distributions depend on the area where they and their prey occur (Oceans North Conservation Society 2018).

3.8.3 Wildlife

The extreme cold climate, harsh conditions, and limited plant communities of the Northern Arctic are reflected in the relatively low diversity and low abundance of wildlife compared to environments in more southern latitudes. Few insect species, a total absence of reptiles and amphibians, and less than 20 species of mammals occur in the Amundsen Gulf Lowlands ecozone. Many bird species on the other hand, utilize the site seasonally and year-round.

Characteristic mammals of the Amundsen Gulf Lowlands include Muskox (*Ovibos moschatus*), caribou (Rangifer family), Arctic Hare (*Lepus arcticus*), Ground Squirrel (*Spermophilus parryii*), Arctic Fox (*Vulpes lagopus*), Polar Bear (*Ursus maritimus*) and seal (Phocidae family). Characteristic birds of the Amundsen Gulf Lowlands include raptors, seabirds, and waterbirds.

There were several observations of wildlife interacting with the Site during the 2022 Site visit. At the time of Site visit, a caribou was observed onsite near the Station Area and there was evidence (odour and widespread presence of hair on the floor) of the open garage (onsite structure) being used by caribou for shelter. Arctic hare and ground squirrels were also regularly observed around the Station Area. A stoat (likely Tundra Stoat) was observed by the wildlife monitor emerging from a burrow underneath the Garage slab.

Several species of birds were observed including Horned Larks (*Eremophila alpestris*), Savannah Sparrows (*Passerculus sandwichensis*), Canada Geese (*Branta canadensis*) and two species of gulls (Laridae family) (ESG 1992).

3.8.4 Species at Risk

Aquatic and terrestrial SAR were identified to have potential habitat within or near (i.e., Dolphin and Union Strait) the proposed Project. These are compiled in Table 5 below.

A search of Species at Risk in Nunavut (Government of Canada 2022), the Species at Risk Registry (Government of Canada 2023b), the aquatic Species at Risk map (DFO 2022), and various COSEWIC Status Reports, identified a number of fish and wildlife SAR with potential to overlap the proposed Project activities and/or the Site area[4]. These were compiled and are provided in Table 5 below. SAR are afforded special protections under the federal *Species at Risk Act*.

The Species at Risk Registry (Government of Canada 2023b) identified two freshwater fish, and no marine or anadromous fish, that have a range overlapping with the Site. Additionally, the Species at Risk Registry (Government of Canada 2023b) identified three marine mammals that may be found in the Dolphin and Union Strait. According to the aquatic Species at Risk map (DFO 2022), there is no critical habitat for at risk marine or anadromous fish within Dolphin and Union Strait. The Species at Risk Registry (Government of Canada 2023b) and the Species at Risk in Nunavut (Government of Canada 2022) identified five birds and five terrestrial mammals that could overlap with the proposed Project activities and/or the Site area.

[4] All web-based databases accessed December 2023.

Table 5. Species at Risk Ranges Which Overlap the Proposed Project

Common Name	Scientific Name	SARA Status	Habitat	Potential Habitat in the Proposed Project Area
Fish				
Atlantic Cod- Arctic Lakes Population	*Gadus morhua*	Not listed, under consideration for addition to Schedule 1. Special concern under COSEWIC.	Inhabit lakes where seawater enters only during the highest summer tides. These lakes are considered stratified, having a freshwater surface layer of water a few metres deep, with a larger saltwater layer beneath it. The cod live only in the saltwater layer, except for very short trips into the freshwater layer. (Government of Canada 2010)	**Low potential.** The onsite lakes are not known to have surface connectivity to the marine environment.
Fourhorn Sculpin – Freshwater form	*Myoxocephalus quadricornis*	Not listed, under consideration for addition to Schedule 1. Data deficient under COSEWIC.	Inhabit freshwater lakes of the Arctic where no other freshwater species occur. (COSEWIC 2003)	**Low potential.** The onsite lakes are not thought to provide over-wintering habitat and therefore likely do not support fish.
Marine Mammals				
Bowhead Whale (Bering-Chukchi-Beaufort population)	*Balaena mysticetus*	Special Concern	Inhabits Arctic and sub-Arctic marine waters, frequenting bays, straits and estuaries. During the winter months, the whales are found in areas with a combination of open water and broken pack ice (Government of Canada 2022)	**Moderate potential.** Likely presence in Dolphin and Union Strait.
Beluga Whale	*Delphinapterus leucas*	Threatened (Government of Canada 2023b). COSEWIC assessments: Eastern High Arctic – Baffin Bay population – special concern. Cumberland Sound population – Endangered. Ungava Bay population – endangered. Western Hudson Bay population – not at risk. (Government of Canada 2021). Eastern Hudson Bay population – threatened. James Bay population – not at risk	Extensive distribution in northern Canada. Summer congregations in Amundsen Gulf and Melville Sound in the west, and in Peel Sound and Barrow Strait to the east. Latitudinal range extends from the High Arctic southward to James Bay and the St. Lawrence Estuary.	**Low potential.** Population ranges typically do not extend to the proposed Project Site.
Narwhal	*Monodon monoceros*	Not listed, under consideration for addition to Schedule 1. Special concern under COSEWIC.	Inhabit a vast area, but little is known of their specific habitat requirements. In summer, they show a preference for coastal areas with deep water and shelter from the wind. Some individuals summer in sounds, bays, channels, and inlets, particularly along the coast of northern Baffin Island. During their fall migrations, Narwhals show preference for deep fjords and the continental slope. Narwhals spend their winters in deep, ice-covered water in Baffin Bay and Davis Strait. The quality of the ice appears to be a key aspect of their habitat selection (Government of Canada 2022).	**Low potential.** Typical habitat is in Arctic Ocean waters east of the proposed Project Site.
Ringed Seal	*Pusa hispida*	Not listed, under consideration for addition to Schedule 1. Special concern	Live in Arctic waters and use sea ice as a platform to raise pups, rest and moult. In winter and spring, breeding adults prefer stable, landfast ice with good snow coverage, such as pressure ridges, bays and coastlines. During the open-water season, seals move around through areas where they can find food (Government of Canada 2022).	**Moderate potential.** Likely presence in Dolphin and Union Strait. Habitat strongly linked to sea ice. Waters adjacent to Project Site have polynyas which prevent freezing.
Land Mammals				
Dolphin and Union Caribou	*Rangifer tarandus*	Special Concern. COSEWIC identified as Endangered	Sea ice connecting Victoria Island and the mainland is an important habitat need (ECCC 2017). The summer range of the Dolphin and Union caribou population is Victoria Island and some ancillary islands (ECCC 2017). The population crosses the sea ice to the mainland to overwinter; they avoid areas of deep or sleet-covered snow (ECCC 2017).	**Moderate potential.** The current range of the Dolphin and Union caribou population overlaps with the Site (ECCC 2017) and one caribou was observed at the proposed Project location during the 2022 Site visit.
Peary Caribou	*Rangifer tarandus pearyi*	Endangered. COSEWIC identified as Threatened	Peary Caribou are found in small groups on the Arctic islands of Nunavut and the Northwest Territories. Summer habitat includes river valley slopes or other moist areas, and upland plains with abundant sedges, willows, grasses and herbs. Winter habitat includes exposed areas like hilltops and raised beach ridges where the snow is thinner, and it is easier to find food. They have recently been seen outside of typical range habitats (Government of Canada 2022).	**Low potential.** The current range of the Peary caribou population does not overlap with the Site; however, they have been observed outside of typical range. The Site is located on an exposed beach ridge representing potential winter habitat. Vegetation at the Site is likely too sparse to provide summer habitat.

Common Name	Scientific Name	SARA Status	Habitat	Potential Habitat in the Proposed Project Area
Fish				
Wolverine	*Gulo gulo*	Special Concern	Resident in forests and tundra where it forages over large areas. Females den under snow-covered rocks, logs or within snow tunnels (COSEWIC 2014).	**Moderate potential.** Site conditions provide potential habitat for the wolverine.
Polar Bear	*Ursus maritimus*	Special Concern	Sea ice, type and distribution, and the density and distribution of ice-dependent seals (COSEWIC 2018). Maternal denning sites are generally located near the coast on land in snowdrifts and in some locations in frozen ground (COSEWIC 2018). Breeding occurs between March and June; maternal denning starts in late fall to April (Government of Nunavut 2023). Polar bears in the polar basin and the Canadian Arctic Archipelago spend their summers along the edge of the persistent pack ice whereas in other areas of the Canadian High Arctic polar bears are forced onto land for several months during the open water season while they wait for new ice (COSEWIC 2018).	**Moderate potential.** The Northern Beaufort Sea subpopulation overlaps the Site. Remediation activities are anticipated to occur in July or August, which does not overlap the maternal denning period or the breeding period, additionally there will be a lack of sea ice, which they hunt from, during the remediation activities.
Grizzly Bear	*Ursus arctos*	Special Concern	A habitat generalist, using a wide variety of habitat types: coastal forests, alpine tundra, mountain slopes, boreal forest, grasslands, and the Arctic tundra. Becoming more common in Nunavut and Northwest Territories (Government of Canada 2022).	**Moderate potential.** Grizzly bears have a large range and are not limited to any one habitat type. Nunavut has seasonally dependent abundance of productive habitat and food supplies.
Birds				
Eskimo Curlew	*Numenius borealis*	Endangered	Breeding habitat consists of upland tundra and barrens (treeless dwarf shrub-graminoid tundra), and grassy meadow habitat (Government of Canada 2022).	**Low potential.** The probable breeding areas for the Eskimo curlew overlaps the Site (Government of Canada 2022). However, the Site is dominated by coarse limestone gravels and cobbles, which is not suitable breeding habitat. There may be potential habitat in proximity to the Site in the vegetated area surrounding the cobble beach.
Peregrine Falcon anatum/tundrius	*Falco peregrinus anatum/tundrius*	Special Concern. COSEWIC identified as Not at Risk	Breeding habitats range from Arctic tundra to coastal islands and includes major urban centres (Government of Canada 2022 Nests are generally on cliff ledges, ranging from 50 m to 200 m high, or crevices; nests in tundra on top of pingos, or escarpments, in quarries, in trees or on various anthropogenic structures (Government of Canada 2022).	**Low potential.** Although the breeding range of the peregrine falcon anatum/tundrius overlaps the Site typical nest sites are located on cliff ledges or in rock crevices at heights of 50 to 200 m, which are not present at the proposed Project Site (Government of Canada 2022).
Red–necked Phalarope	*Phalaropus lobatus*	Special Concern	Breeding habitats consist of arctic tundra wetlands including fens, bogs, and other wetlands near open water sources, and <43% of the landscape is covered in water (Government of Canada 2022). Their ranges include open water, with graminoid vegetation, aquatic emergent plants, and minimal mud or shrubs (Government of Canada 2022). Nests are located in places with graminoid vegetation and near water, the vegetation cover protects nest from predators (Government of Canada 2022).	**Low potential.** While there is open water in the Site area, it lacks graminoid vegetation which is a requirement for substantive nesting habitat.
Harris's Sparrow	*Zonotrichia querula*	Not listed, under consideration for addition to Schedule 1. Special concern	Breeds in open taiga (sparse woodland) near the Arctic tree line. It nests on the ground, hidden in dense shrubby vegetation dominated by dwarf birch, alder and willow. Breeding territories typically include coniferous trees (Government of Canada 2022).	**Low potential.** The Site is near to the species' northern range. Proposed Project site lacks wooded habitat typical for species.
Short–eared Owl	*Asio flammeus*	Threatened	Breeding habitats consist of open habits including arctic tundra, taiga, bogs, marshes, grasslands, old pastures, and sand-sage. In the Arctic, breeding habitat is primarily arctic tundra and estuaries (COSEWIC 2021). Preferred nesting sites are areas of dense grasslands and tundra with small willow (COSEWIC 2021).	**Low potential.** No breeding habitat nor preferred nesting habitat are present within the Site. There is breeding habitat within the vegetated and wetted areas adjacent to the Site.

3.8.5 Restricted Activity Periods

Below is a summary of the restricted activity periods for the fish and wildlife sensitivity ranges for the Site and how that relates to the schedule for proposed remediation work (Table 6). Restricted activity periods refer to windows of time where certain species groups are more vulnerable due to seasonal behaviours, and in which mitigation measures should be implemented to ensure these groups are not adversely impacted by Project-related activities. Appropriate mitigation measures to minimize potential interactions with fish and wildlife in restricted activity periods are listed in Section 5.8 – 5.10 in the potential interactions tables.

Table 6. Restricted Activity Periods

Wildlife VCs	Restricted Activity Periods	Interactions with Project Activities Timing
Migratory bird nesting period: N10 zone[1]	Late May to mid-August	Yes, remediation activities will overlap the migratory bird nesting period. A migratory bird nest sweep is recommended. Refer to Section 5.10 for more details on mitigation measures.
Caribou calving period[2]	May 1 to July 15	Yes, the remediation activities overlap with the caribou calving period. Refer to Section 5.10 for more details on mitigation measures.
Caribou sea ice crossing[2]	October 15 to February 15 and April 1 to May 31	No, the remediation activities do not overlap the caribou sea ice crossing restricted activity period.
Marine mammals[3]	January 1 to December 31 (year-round) No approaching marine mammals closer than: • 100 m for whale, dolphin, and porpoise • 100 m for walrus • 300 m for walrus on the shore (June 1 to October 31) • 200 m for killer whale	Yes, remediation activities will overlap the marine mammal habitat in Dolphin and Union Strait where Bernard Harbour is located.
Fish and fish habitat[4]	Spring spawning fish: May 1 to July 15 Fall spawning fish: August 15 to June 30 Spring and fall spawning fish, or unknown fish species (i.e., fish species not identified): August 15 to July 15	Yes, remediation activities will overlap with the fall spawning restricted activity period. Arctic Char is a fall spawning species; however, it is considered a low potential that Arctic Char inhabit the site at any life stage.

Source: [1]ECCC 2018, [2] noted by AECOM biologist, [3]Marine Mammal Regulations, [4]DFO 2013

3.9 Traditional Land Use and Archaeological Resources

Traditional land use information was obtained during the 2022 Site assessment from Mr. Taptuna and Mr. Niptanatiak, experienced local wildlife monitors and members of the Kugluktuk Hunters and Trappers Association. Both Mr. Taptuna and Mr. Niptanatiak have numerous years of experience working on a variety of DEW Line site remediation projects and other environmental monitoring and remediation projects across the Canadian north.

According to Mr. Taptuna and Mr. Niptanatiak, the cabins closest to the Site are no longer used; however, the Kugluktuk Hunters and Trappers Association operates a cabin on an island approximately 4 km southeast of the Site that is used regularly for aquatic and terrestrial environmental monitoring programs. The overall Bernard Harbour area is a common camping location when Kugluktuk residents are caribou hunting or fishing; indeed, a father and young son were camping near the Site and visited the site assessment crew, and Mr. Niptanatiak's father was planning to camp nearby around the same time as the

AECOM site assessment. Modern tent rings were also observed at the Station Area near the Inuit House as well as six (6) tent rings at the Beach Area.

While camping in the area, the men indicated that drinking water was obtained from either sea ice, or a stream located on the mainland near the HTA cabin north of the Site; the nearby lakes were not used by locals for drinking water. They also indicated that the inland lakes on the Site were not used for fishing. This information is consistent with information obtained from the local Inuit at the many other Nunavut sites, including over 20 DEW Line sites, that AECOM has assessed in the past.

An AIA of the PIN-C Bernard Harbour Site as well as some nearby previously undisturbed areas which may be affected by future remediation activities, was conducted (ERM 2022). The objective of the AIA was to determine if any heritage sites were impacted during the previous use of the site and to ascertain if future proposed Project activities, both within and beyond the previously disturbed area, have the potential to affect archaeological resources.

The AIA was comprised of desktop assessment and field assessment. The field component of the AIA was completed in July 2022 under Nunavut Class 2 Archaeologist Permit issued to Brent Murphy, who was accompanied by two Inuit from Kugluktuk for the fieldwork.

The AIA reported that there are 51 previously recorded archaeology sites within 60 km of the proposed Project, 10 of those are within 10 km of the proposed Project. No affected heritage sites were identified or recorded at the PIN-C Bernard Harbour Site in the AIA (ERM 2022), nor at nearby areas of previously undisturbed terrain where proposed Project remediation activities are planned.

During the Phase III ESA, three wooden cabins were observed, with one having fully collapsed. Local wildlife monitors indicated that these cabins are not used by the community for hunting or fishing. The cabins will be assessed during the work program to determine if they qualify as heritage resources. If not, they will be collected and removed as surface debris for disposal at a licensed facility.

3.10 Historical Land Use

In addition to the traditional land use noted, the Site and surrounding area were used for a number of pursuits. The Site is situated near a Hudson's Bay Company trading post and a Royal Canadian Mounted Police post occupied during the first half of the twentieth century. The PIN-C Site was constructed during the early years of the Cold War and operated by the DND between 1958 and 1963 as part of the DEW Line radar stations. In 1965 the custody of the Site passed to the Department of Indian Affairs and Northern Development which is now CIRNAC. There is an NWS SRR installation located approximately 5 km southwest of the Site. Two contemporary NWS POL tanks are located at the Beach within the same footprint as the historic POL foundations.

3.11 Socio-economic Factors

The Inuit have inhabited the Northern Arctic Ecozone for thousands of years and their traditional land uses have included hunting, trapping, and fishing (Government of Canada 1999). More recently, mining, exploration, oil and gas development have been occurring throughout the region (Government of Canada 1999). The region is rich in mineral and hydrocarbon reserves, and these areas have 59% of Canada's estimated oil resource and 48% of potential gas resources (Government of Canada 1999). The treatment of contaminated soil, disposal of waste, and construction of temporary camps suggest potential socio-economic implications for the local community (AECOM 2022).

The community of Kugluktuk is the nearest community to the site. The Site is accessible by helicopter, plane, or boat in the summer and by snowmobile in the winter. Visual evidence of recent human activity at the Site was observed during the 2022 field program and the 2023 AIA (ERM 2022). Evidence of human activity included debris suggesting recent use (ERM, 2023) and a father and son camping and hunting while site assessment work was taking place (AECOM 2022). Even so, the current unremediated state of the Site constrains full use of the Site and area. Current and future use of the Site is expected to be for recreational and traditional land use purposes (e.g., hunting, fishing, camping, etc.) or caching food, equipment, or fuel.

4. Valued Components

The purpose of this PPR is to conduct an effects assessment which identifies all impacts remedial activities could have to Valued Components (VCs). A VC is defined as an environmental, social, economic, or cultural component that is considered important by the proponent, local communities, technical specialists and/or government agencies.

For the proposed Project effects assessment, components were identified as VCs through community engagement, desktop review, and 2022 Site visit. To determine if a VC should be included in the effects assessment (Section 5), the VCs are evaluated for interactions with the proposed Project. Interactions can be positive or negative in nature. If an interaction is identified, then the VC is retained for inclusion in the proposed Project effects assessment.

Table 7 provides each identified VC, with rationale for VC inclusion or exclusion in the assessment of proposed Project-related effects.

Table 7. Valued Components Screening

Valued Component	Potential Interaction with Project activities	Determined to be a Valued Component	Potential Interactions (pre-avoidance and pre-mitigation measure implementation)
Climate	Yes	Yes	The use of aircraft and sealift for mobilization of people, equipment, materials, and debris to and from site has the potential to impact air quality in the local area and along the flight/shipping paths.
			The transport of debris and/or contaminated materials offsite by sealift has the potential to impact air quality in the region.
			The use of motorized equipment, vehicles and ATVs onsite to conduct Project-related work has the potential to impact air quality in the local area.
Geology, Landforms and Permafrost	Yes	Yes	There will be excavations for the remediation which has the potential for erosion or soil compaction, changes in soil structure and organic matter content
			There is a potential for additions of chemical or physical pollutants (i.e., spills) to soil.
			Potential impacts to permafrost (onsite incineration).
			Potential impacts to permafrost (excavation).
			Remediation will include the cleanup of debris and contaminated soils; yielding an overall improvement of Site geological conditions.
Topography & Aesthetics	Yes	Yes	Temporary negative impacts to topography and aesthetics of the Site; however these are expected to be out-weighed by the long-term positive impacts of returning the Site to align with the natural landscape.
Hydrology & Physical Marine Environment	Yes	Yes	There is potential for interactions between onsite equipment/personnel with freshwater and marine features on, or adjacent to, the Site.
			Direct interaction of marine vessels with the physical marine environment adjacent to the Site and along shipping route.
			Potable and non-potable water source required for the temporary onsite camp.
			Culvert maintenance may alter Site hydrology.
Vegetation	Yes	Yes	There is potential for direct disturbance to or removal of the local vegetation onsite.
			There is potential for changes to the species composition or community structure onsite.
			There is a potential for wildfire to occur with the incineration of debris onsite.
Fish and Fish Habitat	Yes	Yes	Direct (in-water works for culvert maintenance) and indirect interaction of onsite equipment/personnel with onsite fish and fish habitat (freshwater features).
			Indirect interaction of onsite equipment/personnel with the marine environment adjacent to the Site. The Dolphin and Union Strait is a marine environment that supports marine mammals and fish populations, including SAR species.
			Interaction of vessel traffic (e.g., sealift) with marine fish and fish habitat during transport to/from Site. Interaction of moored/beached vessel traffic (e.g., sealift) with marine fish and fish habitat onsite.
			Potable and non-potable water source required for the temporary onsite camp.
Marine Mammals	Yes	Yes	Indirect interaction of onsite equipment/personnel with the marine environment adjacent to the Site. The Dolphin and Union Strait is a marine environment that supports marine mammals and fish populations, including SAR species.
			Interaction of vessel traffic (e.g., sealift) with sea ice or marine mammals during transit in Dolphin and Union Strait to/from Site. Interaction of moored/beached vessel traffic with marine mammals onsite/in Bernard Harbour.
Wildlife (including birds and terrestrial mammals)	Yes	Yes	Remediation activities will occur within the migratory bird nesting period.
			Direct disturbance, disruption, visual and noise, during remediation activities from equipment and onsite personnel
			Potential change in species composition and distribution, and any impacts to endangered and special species
			Potential habitat change / loss of wildlife habitat due to the removal of onsite structures which will be removed during the remediation activities.
			Potential SAR wildlife encounters during remediation activities.
Ecological Integrity	Yes	Yes	Potential changes in species composition or community structure, effects on rare, endangered or special resource species. This could occur for species on and off site.
Cultural and Heritage Resources	No	No	As outlined in the AIA (ERM 2022), there were no potentially Project affected heritage sites identified or recorded. The impacts that the Project could potentially have on traditional users relative to hunting and trapping in the proposed Project area, are captured under the Socio-economic Resources VC.
Socio-economic Resources	Yes	Yes	Potential direct effects to local traditional land use.
			The proposed Project has potential to cause direct and/or indirect effects on the local and/or regional economy, businesses, other agencies and their services.
			As the Site is a contaminated site there is potential public health or safety issues related to carrying out the remediation activities onsite.
			Potential loss or alteration of previously undiscovered heritage resources or culturally important areas as a result of the proposed Project.

5. Effects Assessment

5.1 Methods

The VCs identified as having the potential to interact, positively or negatively, with the proposed Project were carried forward into the Effects Assessment (see Section 4 for VC identification and evaluation). Each potential negative interaction for any given VC, is herein assessed for avoidance and mitigation measures, with the goal of reducing or removing the negative interaction. Positive interactions generally do not have avoidance or mitigation measured applied.

Proposed Project-related avoidance and mitigation measures that are feasible (technically and economically) and acceptable (by applicable regulators) are applied to avoid, reduce, or eliminate[5] the proposed Project-related impacts on VCs. After implementation of avoidance and mitigation measures, the VC-Project interaction that remains is the residual effect. A residual effect is where the anticipated future VC condition resulting from the proposed Project is different than the condition expected to occur in the absence of the proposed Project. Residual effects can be negative or positive in nature and the effect can be short or long-term.

In this effects assessment, it has been conservatively assumed that even for VCs where mitigation and avoidance measures greatly reduce the residual effect, the residual effect cannot be zero. This precautionary approach screens in all VC-Project interactions for an effects assessment.

The residual effects assessment criteria are outlined in Table 8 and include magnitude, scale (geographical extent), duration, frequency of occurrence, reversibility and likelihood of occurrence.

Further, residual effect ‘significance’ was also assessed. If a residual effect identified as negative in nature is assessed as ‘significant’; the effect is likely to result in a change in the VC that will alter its condition or state beyond an acceptable level. In the case of a positive residual effect, ‘significant’ would be an effect likely to result in a lasting change, benefiting the Site or region ecologically and/or socio-economically.

Generally, the definition of ‘significant’ may comprise either a quantitative or qualitative threshold above which the residual effect would be considered significant. For the proposed Project, evaluation of significance was based on professional judgement guided by environmental and socio-economic standards (i.e., land use plans, policies, legislation, regulations and guidelines).

The residual effects for all VCs are summarized in **Section 5.12**. Cumulative effects, that is the combined environmental impacts (positive or negative) that accumulate over time and space as a result of the Project are summarized in **Section 6**.

[5] For this effects assessment a precautionary approach has been employed, where it is assumed that the risk of an effect can be reduced but not eliminated.

Table 8. Residual Effects Assessment Criteria

Criteria	Description
Magnitude	The measure of the amount of change to the VC: • Negligible – no detectable change from existing conditions • Low – change is detectable but well within established criteria/standards or range of natural variability • Moderate – change approaches the limits of established criteria/standards or range of natural variability • High – change exceeds established criteria/standards or beyond range of natural variability
Scale	The area within which the change to the VC occurs: • Site – area of contamination • Local Study Area – 100 m buffer around the Site • Regional • National
Duration	The amount of time over which the effect will be present: • Short-term – Effect lasting a few days to a few months. Effect is detectable during remediation activities. • Medium-term – Effect lasting several months to a few years. Effect is detectable up to the end of remediation activities. • Long-term – Effect lasting several years but not permanent. Effect is detectable for a defined period after remediation activities. • Permanent – Effect is detectable after remediation activities for an indefinite amount of time or are irreversible.
Frequency	How often the effect might occur: • Once – effect may occur one time • Infrequent – effect may occur rarely • Frequent – effect may occur intermittently • Continuous – effect may occur continually
Reversibility	The likelihood that the VC will recover from an effect: • Reversible • Irreversible
Likelihood	The probability of the effect occurring: • Low – effect not likely to occur • Moderate – effect may occur • High – effect is likely to occur

5.2 General Avoidance & Mitigation Measures

Avoidance and mitigation measures are employed as a means of avoiding and reducing negative VC-Project interactions. Avoidance measures are the preferred option. Avoidance measures may include appropriate design, sizing of equipment, and incorporation of applicable recommendations from previous projects or studies. Project impact mitigations focus upon design elements, alternative remediation techniques and long-term operational practices.

Mitigation measures may include the implementation of best management practices (BMPs), recommendations from regulators, and industry standards as well as maintaining compliance with legislation, regulations, and guidelines, and considering improvements to the design of the proposed Project. There are a number of environmental, health, safety, and emergency response procedures to be outlined in the specifications package for the proposed Project that a Contractor will be expected to prepare and implement. These will include procedures such as wildlife management and protection plan, spill contingency plan, and temporary erosion and sedimentation control (TESC) plan.

5.3 Climate

Table 9 below provides the potential climate interactions with the proposed Project, the mitigation measures to reduce the potential impacts, and the residual impacts. The climate-Project interactions identified are all related to GHG emissions. Climate change projections for metrics such as sea level rise, annual precipitation, temperature and frost-free days would not be expected to be altered by proposed Project activities.

Preliminary GHG emissions estimates were prepared for the various treatment/disposal option presented in the RAP (AECOM 2023). For all offsite disposal options, the GHG emissions associated with transporting the contaminated soil/non-hazardous waste from the Site via sealift represented the single largest contribution to the emissions totals (greater than 70% of the total). This contribution became more pronounced as the total quantity of material being removed from the Site increased.

It is assessed that the GHG emissions from conducting the proposed Project can be mitigated, but not entirely avoided. The residual impacts are assessed as short-term and are not expected to be significant (will not result in a change in the climate that will alter its condition or state beyond an acceptable level).

Table 9. Potential Climate Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
The use of aircraft and sealift for mobilization has the potential to impact local and regional air quality.	The use of aircraft and sealift to mobilize crew and supplies to and from the Site has the potential to impact air quality through GHG emissions in the local area and along the flight/shipping path. The mobilization of the crew and mobilization and set-up of camp materials to the site for the approximate ~14 weeks is anticipated to be less impactful to the climate (i.e., emissions) in comparison to flying crew in and out daily.	• The aircraft and vessels to be used will be of appropriate size. • The aircraft and vessels to be used will have up to date maintenance records. • Planning of flights, shipments and logistics will be conducted in advance to limit the number of trips needed by air or sea.	Magnitude: Low Scale: Regional Duration: Short-term Frequency: Frequent Reversibility: Reversible Likelihood: High **Significant: No**
The transport of debris and/or contaminated materials offsite by sealift has the potential to impact air quality in the region.	The use of sealift to transport materials offsite has the potential to impact air quality through GHG emissions in the local area and along the shipping path. The use of a sealift to transport materials offsite is anticipated to be less impactful to the climate (i.e., emissions) in comparison to flying out the material by plane or helicopter.	• The vessels to be used will be of appropriate size. • The vessels to be used will have up to date maintenance records. • Planning of shipments and logistics will be conducted in advance to limit the number of trips needed by air or sea.	Magnitude: Low Scale: Regional Duration: Short-term Frequency: Infrequent Reversibility: Reversible Likelihood: High **Significant: No**
The use of motorized equipment, vehicles and ATVs onsite to conduct proposed Project-related work has the potential to impact air quality in the local area.	The use of motorized equipment, vehicles, and ATVs onsite has the potential to impact air quality through GHG emissions in the local area. Equipment will be used for travel across Site, removal of debris and contaminated soil, quarrying activities, regrading, and loading the sealift.	• The equipment to be used will be of appropriate size. • The equipment to be used will have up to date maintenance records. • Work will be planned and staged to improve efficient equipment use.	Magnitude: Low Scale: Local Study Area Duration: Short-term Frequency: Frequent Reversibility: Reversible Likelihood: High **Significant: No**

5.4 Geology, Landforms, and Permafrost

Table 10 below provides the potential geology, landform or permafrost interactions with the proposed Project, the mitigation measures to reduce the potential negative impacts, and the residual (post-mitigation) impacts. The very purpose of the proposed Project, is to improve the Site conditions, including soils. This is reflected in the first VC-Project interaction listed in the table below, in which the interaction is positive, and the residual impact is permanent and significant (will result in an effect likely to result in a lasting change, benefiting the Site or region ecologically). The remaining three VC-Project interactions identified have residual effects that are negative, but all are short-term in duration and have a low likelihood of occurrence. Overall, the negative residual effects identified are expected to be short-term in duration and are expected to be outweighed by positive long-term effects from the proposed Project on this VC.

Table 10. Potential Geology, Landform or Permafrost Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Remediation will include the cleanup of debris and contaminated soils; **yielding an overall improvement of the local environment (clean soil).**	The proposed Project will improve overall soil/substrate condition through the containment and removal of contaminated soils and debris.	• This is a positive interaction. No mitigations apply.	Magnitude: High Scale: Site Duration: Permanent Frequency: Continuous Reversibility: Irreversible Likelihood: High **Significant Positive Effect: Yes**
There will be excavations for the remediation which has the potential for erosion or soil compaction, changes in soil structure and organic matter content.	Excavations and borrow-pits will be components of the remediation. The substrate at Site is limestone cobbles and gravel underlain by sandy substrate.	• Minimize the area of disturbance to the extent practicable. Limit the amount of access trails around the Site. • Install temporary erosion and sedimentation control (TESC) measures around the edge of disturbance and sensitive areas, slopes, upslope water bodies, or areas where there is a risk of erosion. • TESC measures will be inspected to ensure they are functioning properly. If any deficiencies are noted, these will be addressed as soon as practicable. • Soil TESC measures will be removed when the risk of erosion and sedimentation has been eliminated.	Magnitude: Low Scale: Local Study Area Duration: Short-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**
There is a potential for additions of chemical or physical pollutants (i.e., spills) to soil.	The use of equipment onsite has the potential to introduce contamination from inadvertent spills and/or release to the soils/substrate and terrain.	• Follow the Spill Contingency Plan that will be developed for the proposed Project. • Fuel will be stored/managed according to applicable guidelines and best management practices. • Ensure that any vehicles, all-terrain vehicles, and equipment arrive onsite in a clean condition, are well maintained, free of fluid leaks. Spot check vehicles and equipment will be undertaken. • Equipment, all-terrain vehicles, and vehicles will be inspected at start of workday to ensure there are no leaks or damage. When equipment is parked overnight or longer, drip trays will be	Magnitude: Low Scale: Site Duration: Short-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**

Potential Interactions	Description	Mitigation Measures	Residual Impacts
		placed underneath. These drip trays will be inspected for leaks prior to their use on site. • Ensure safety data sheets, spill kits, fire extinguishers and emergency shutoffs are available before starting work that involves fueling or fuel transport. • A spill kit, of sufficient size and sufficient quantity of absorbent materials, will be located within each vehicle and piece of mobile equipment.	
Potential impacts to permafrost from onsite incineration.	Non-hazardous combustible wastes will be disposed of onsite by incineration where appropriate.	• Select burning sites on non-vegetated areas, such as gravel / sand pads. • Use only one burn site for the duration of proposed Project work. • Use a portable incinerator as appropriate • Extinguish fires immediately upon daily completion of burning using cold water (i.e., do not allow coals to linger and heat the ground).	Magnitude: Low Scale: Site Duration: Short-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**
Potential impacts to permafrost from excavation.	Excavation has the potential to expose permafrost layer.	• Replace excavated soils as soon as practical, do not leave open excavations.(See Page 20 permafrost)	Magnitude: Low Scale: Site Duration: Short-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**

5.5 Topography & Aesthetics

Table 11 below provides the potential VC (topography and aesthetics) interaction with the proposed Project, the mitigation measures to reduce the potential negative impacts, and the residual (post mitigation) impacts. Post-remediation it is expected that there will be an overall improvement to topography (mimicking natural condition of local area) and aesthetics (removal of structures and debris).

Table 11. Potential Topography and Aesthetics Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Impacts to topography and aesthetics of the Site; **yielding an overall improvement of conditions.**	The movement of debris, structures and soils during remediation activities may have a temporary negative impact to topography and aesthetics of the Site; however, in the long-term (post-remediation), the topography is expected to be returned to the natural condition of the local area and the aesthetics of the Site are expected to be improved as compared to the pre-remediation condition.	• Minimize the area of disturbance to the extent practicable. Limit the amount of access trails around the Site. • Replace excavated soils as soon as practical, do not leave open excavations.	Magnitude: Moderate Scale: Site Duration: Permanent Frequency: Constant Reversibility: Irreversible Likelihood: High **Significant Positive Effect: Yes**

5.6 Hydrology & Physical Marine Environment

Table 12 below outlines the potential interactions of the remediation activities and the mitigation measures to reduce the potential interaction to hydrology and physical marine environment adjacent to the Site. As discussed in Section 3.5, the aquatic features on or proximate to the Site are two freshwater lakes (onsite), a number of smaller freshwater waterbodies onsite, the Dolphin and Union Strait (marine waterbody to the west of Site), sea ice and polynyas. Polynyas are areas of persistent open water surrounded by sea ice created by strong upwelling or currents which prevent sea ice from freezing and have been mapped within Dolphin and Union Strait. Apart from the polynyas, the Dolphin and Union Straight forms continuous sea ice throughout much of the year. This “ice-on” period will not overlap with the proposed Project, which is scheduled to occur between June and September, and therefore there is no potential VC-Project interaction for sea ice or polynyas.

As the camp will be located onsite, potable and non-potable water sources are required. It is expected that CIRNAC will obtain Water License(s) for use of the onsite lakes (West Lake and/or East Lake; Figure 2). The West Lake has historically been used as a drinking water source during Dew Line operations and is located closer to the proposed work camp area, while the East Lake has debris present on its shores and is potentially seasonally inundated by the marine environment, and therefore may not be suitable as a potable water source. Water samples from both lakes were submitted for laboratory analysis and had similar results for general parameters, BTEX, and dissolved metals but there is debris present on the shores of East Lake. It will be for the Contractor to determine the most practical source(s).

Offsite marine environment impacts due to onsite erosion or surface run-off are unlikely to occur, as the onsite materials are predominantly greater than gravel size (i.e., not easily mobilized), the topography of the Site is relatively flat, and any onsite works within a 30 m setback from the freshwater and marine shorelines will implement necessary mitigation measures. The exception to this is the potential in-water works for culvert replacement adjacent to East Lake in an ephemeral streambed and historical debris removal on the marine shoreline, but mitigations (e.g., DFO measures to protect fish and fish habitat), are expected to greatly reduce potential impacts.

While some Site access is expected to be by marine vessel within Bernard Harbour – an access point previously established and used during active DEW Line operations – best practice will be followed to mitigate potential impacts to the marine environment both locally and regionally. Short-term negative impacts to onsite freshwater features are unlikely to occur once mitigation for erosion, sedimentation, or accidental spill is implemented. Additionally, it is expected that the remedial works to remove contaminants from the Site could have a long-term positive impact on water quality for onsite waterbodies, surface water and groundwater. As such, with mitigations implemented negative residual effects identified in the table below are minimal and are expected to be outweighed by the expected positive long-term effects from the proposed Project on this VC.

Table 12. Potential Hydrology and Physical Marine Environment Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
There is potential for interactions between onsite equipment/personnel with freshwater and marine features on, or adjacent to, the Site.	Personnel and equipment onsite have the potential to directly impact water quality of freshwater aquatic features through physical or chemical disturbance from culvert replacement, excavations, debris removal, marine beaching, foot traffic, and accidental spills. Freshwater features onsite and adjacent to the Site are assumed to be fish-bearing. Impacts could include changes to the surface hydrology of the Site, changes to water quality in the freshwater and/or marine environment, and changes to the physical marine environment.	• Avoidance of direct contact with aquatic areas onsite and adjacent to the Site. Minimize disturbance, where possible. 30 m setbacks from top of bank from fish habitat will be implemented. • Any work within 30 m of freshwater and/or marine water sources will utilize appropriate mitigation (e.g. monitoring and TESC measures) • Seeking a DFO RfR for culvert replacement if required. Referencing DFO's Code of Practice: Culvert Maintenance. • Development of an Environmental Management Plan which will include a cultural resources plan, a wildlife management and protection plan, an erosion and sediment control plan (TESC measures), and a dust and particulate control plan. • Development of a spill response plan. Implement spill prevention and response protocols. • Emergency spill kits will be kept with all working machinery during all proposed Project phases. • Plan the locations of temporary workspaces to minimize the need for aquatic area disturbance (i.e., sealift beaching). • Inform onsite personnel about avoiding and minimizing impacts to the aquatic areas of the Site. • Frequency of sealift beaching in marine environment should be minimized to avoid cumulative impacts (e.g., erosion, run-off, elevated turbidity • If required, TESC measures (i.e., silt fences) will be implemented between the edge of disturbance and any water bodies. The TESC measures will be maintained and inspected daily during the remediation activities to ensure they are properly working. • Use of biodegradable hygiene products only. • For culvert replacement, complete potential in-water work by hand where possible, and with clean equipment. • Maintain clean work sites.	Magnitude: Low Scale: Site and Local Study Area Duration: Medium-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**

Potential Interactions	Description	Mitigation Measures	Residual Impacts
		• Conduct routine equipment and infrastructure inspections. • Comply with appropriate regulations, guidelines and proposed Project approvals, including treatment of contaminated water to approved discharge limits. • Comply with fuel storage and handling guidelines and best practices, including personnel training, storage setbacks, secondary containment, and regular storage inspection. • Restriction of all fueling, servicing and staging of machines to designated areas. • Conduct regular inspections of all machinery to reduce the risk of a spill by identifying and correcting potential equipment failures.	
Direct interaction of marine vessels with the physical marine environment adjacent to the Site and along shipping route.	Vessels used for the proposed Project have the potential to impact the marine environment through accidental spill. Vessels are expected to travel long-distances for disposal of contaminated soils and debris. Additionally, vessels may require re-fueling in Bernard Harbour (adjacent to Site) Interaction of vessel traffic (e.g., sealift) with sea ice is not expected as the proposed Project is scheduled for the open water season. Interaction of vessel traffic with sealife on the seafloor or shoreline (unintentional and intentional grounding)	• Conduct routine equipment/vessel inspections. • Restriction of all fueling, servicing and staging of machines to designated areas. • Development of a spill response plan. Implement spill prevention and response protocols. • Emergency spill kits will be kept with all working machinery during all proposed Project phases. • Use of licensed vessels and personnel governed by Transport Canada. Transport Canada regulates environmental response. • Navigation within Bernard Harbour – previously established access and route will be followed (established during active DEW Line operations)	Magnitude: Low Scale: Regional Duration: Medium-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Potable and non-potable water source required for the temporary onsite camp.	It is expected that the "West Lake" (northwest of the Site) will serve as a water source for both potable and non-potable water for the camp and Site activities since it has historically been used as a drinking water source during DEW Line operations. However, as noted earlier in Section 5.6, the East Lake could also be used. Water use will need to be managed so as not to impact the lake ecological services.	• CIRNAC will obtain Water Licenses that the Contractor will abide by.	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**
Potential in-water works onsite could impact Site hydrology; however, the change would likely represent the hydrology of the Site's natural condition.	Culvert replacement could impact Site hydrology, depending on the condition the culvert is in currently. It is expected that the culvert would function to allow a natural outlet for the East Lake.	• Potential in-water works are limited to culvert replacement. A DFO RfR will be sought as required to ensure no violation of the *Fisheries Act* or *Species at Risk Act*. • Referencing DFO's Code of Practice: Culvert Maintenance. • Follow DFO's measures to protect fish and fish habitat	Magnitude: Low Scale: Site Duration: Long-term Frequency: One-time Reversibility: Reversible Likelihood: Low **Significant: No**

5.7 Vegetation

Table 13 below outlines the potential interactions of the remediation activities with vegetation, identifies the mitigation measures to reduce the potential interaction to vegetation, and states the residual negative impacts.

As discussed in Section 3.6, the Site is sparsely vegetated in disturbed locations, and patchy to continuous in less disturbed and low-lying areas (e.g., south of the Station Area), which is in keeping with the characteristics of the Amundsen Gulf Lowlands. Negative residual effects identified in the table below are expected to be short-term to medium-term in duration and will likely be outweighed by the expected positive long-term effects from the proposed Project on this VC. Positive effects from the proposed Project could include improved growing conditions for native vegetation, on account of removal of contaminants that may be impeding onsite native flora growth (through physical or chemical impacts). Additionally, no vegetation SAR are expected to overlap the Site.

Table 13. Potential Vegetation Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Direct disturbance to or removal of local vegetation	There is potential to disturb the local vegetation due to Site remediation including impacting the overall vegetative communities at the Site. Vegetation disturbance or removal can cause soil stability issues and possible siltation of adjacent aquatic resources.	• Maintain groundcover, low-lying shrubs, and vegetated areas where possible. Minimize disturbance to vegetation wherever possible. • Plan the locations of temporary workspaces to minimize the need for vegetation and soil disturbance. • Inform onsite personnel about avoiding and minimizing impacts to the vegetation onsite. • Access frequency should be minimized to avoid cumulative impacts (e.g., compaction, erosion). • If required, TESC measures will be implemented between the edge of disturbance and any water bodies. The TESC measures will be maintained and inspected daily during the remediation activities to ensure they are properly working.	Magnitude: Low Scale: Site Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Moderate **Significant: No**
Potential changes in species composition or community structure.	Vegetation exists onsite though at low coverage. Physical site disturbance, paired with potential for invasive species to be inadvertently brought onsite through person or equipment, yields a potential for weeds or invasive species to be introduced onsite. This could impact species composition.	• Disturbance to vegetation will be minimized to the extent practicable. Temporary workspaces will be sited to avoid areas of vegetation and vegetation mats. • All equipment must be clean and free of soil or vegetation debris that could contain weed seeds or propagules.	Magnitude: Low Scale: Site Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**
Potential for wildfires due to the incineration of debris onsite.	Debris will be incinerated in a portable incinerator. Sparse vegetation exists onsite.	• The incineration or burning staging area will be sited away from any dense vegetation patches. • During combustion of debris, a monitor will be available to watch for any sparks or embers. • Fire-fighting equipment will be available onsite.	Magnitude: Negligible - Low Scale: Site Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**

5.8 Fish & Fish Habitat

Table 14 below outlines the potential interactions of the remediation activities and the mitigation measures to reduce the potential interaction to fish and fish habitat in the freshwater (onsite) and marine (adjacent to site) environment.

As discussed in Section 3.5, none of the freshwater features on or near the Site are expected to support fish; however, the possibility that the onsite lakes may support fish either seasonally or year-round could not be ruled out, and therefore this VC is evaluated assuming that the lakes do provide fish habitat and support fish. The Dolphin and Union Strait does support both anadromous and marine fish species, as well as marine mammals, including species at risk. Additionally, SAR have been identified to have potential to overlap with the Site or areas adjacent to the Site (i.e., Dolphin and Union Strait) in both the freshwater and marine environment.

The potential in-water works are limited to culvert replacement near the East Lake. Debris sitting on the shoreline of Bernard Harbour (within 30 m of marine environment) will be removed.

Site access is expected to be at least partially by marine vessel (i.e., marine vessel(s) for transport of materials and waste to/from Site) with the vessel beaching in Bernard Harbour. Beaching impacts will be minimized through careful planning of beaching location and minimizing the number of beachings required. Additionally, remedial works are expected to have a duration that overlap the restricted activity window (restricted activity period August 15 to July 15 for fish communities that spawn in the spring and fall, or when the species have not been identified [i.e., spawning season is unknown]) for the protection of fish and fish habitat. However, mitigations identified below will be implemented to ensure these groups are not adversely impacted by Project-related activities.

Negative residual effects identified in the table below are expected to be short-term to medium-term in nature and will likely be outweighed by the expected positive long-term effects from the proposed Project on this VC. This could include improved onsite water quality through the removal of contamination. As the camp will be located onsite, potable and non-potable water sources are required. It is expected that CIRNAC will obtain Water Licenses for use of the West Lake (located onsite).

Table 14. Potential Fish and Fish Habitat Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Onsite Activities Direct interaction (potential in-water works for culvert replacement) and indirect interaction of onsite equipment/personnel with onsite fish and fish habitat (freshwater features).	Personnel and equipment onsite have the potential to directly impact onsite fish habitat in water through potential in-water works for culvert replacement, and indirectly impact freshwater aquatic features through erosion and surface water run-off or accidental spills from proximate remedial works. Freshwater features onsite and adjacent to the Site are unlikely to be fish bearing, but to be conservative, the two onsite lakes are assumed fish bearing. Impacts could include HADD of fish habitat or death of fish. Fish SAR could be present.	• Avoidance of direct contact with aquatic areas onsite. Minimize disturbance, where possible. 30 m setbacks from top of bank from fish habitat will be implemented. • Any work within 30 m of freshwater sources will utilize appropriate mitigation (e.g. monitoring, sedimentation, and erosion control) • Potential in-water works are limited to culvert replacement a DFO RfR may be sought if required. • Follow DFO's Code of Practice: Culvert Maintenance to prevent HADD. • Development of a spill response plan. Implement spill prevention and response protocols. • Emergency spill kits will be kept with all working machinery during all proposed Project phases. • Plan the locations of temporary workspaces to minimize the need for aquatic area disturbance. • Inform onsite personnel about avoiding and minimizing impacts to the aquatic areas of the Site. • Access frequency to onsite water features (namely two large lakes) should be minimized to avoid cumulative impacts (e.g., erosion, run-off, elevated turbidity). • If fish are observed in onsite water features, a fish salvage may be required if in-water works are planned (e.g., culvert replacement). • If required, TESC measures (i.e., silt fences) will be implemented between the edge of disturbance and any water bodies. The TESC measures will be maintained and inspected daily during the remediation activities to ensure they are properly working. • Use of biodegradable hygiene products only. • Complete any potential in-water work by hand where possible, and with clean equipment. • Maintain clean work sites. • Conduct routine equipment and infrastructure inspections. • Comply with appropriate regulations, guidelines and proposed Project approvals, including treatment of contaminated water to approved discharge limits.	Magnitude: Low Scale: Site and Local Study Area Duration: Short-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**

Potential Interactions	Description	Mitigation Measures	Residual Impacts
		• Comply with fuel storage and handling guidelines and best practices, including personnel training, storage setbacks, secondary containment, and regular storage inspection. • Restriction of all fueling, servicing and staging of machines to designated areas. • Conduct regular inspections of all machinery to reduce the risk of a spill by identifying and correcting potential equipment failures. Respect the fish and fish habitat Restricted Activity Period. Restricted Activity Periods refer to windows of time where certain species groups are more vulnerable due to seasonal behaviours, and in which mitigation measures should be implemented to ensure these groups are not adversely impacted by Project-related activities. • Spring spawning fish: May 1 to July 15 • Fall spawning fish: August 15 to June 30 • Spring and fall spawning or unknown species: August 15 to July 15	
Onsite Activities Indirect interaction of onsite equipment/personnel with the marine environment adjacent to the Site. Dolphin and Union Strait is a marine environment that supports fish populations, including SAR species.	Personnel and equipment onsite may cause onsite erosion, leading to sedimentation, and/or introduction of a deleterious substance to the marine environment of the Dolphin and Union Strait, with potential impacts to water quality, fish and their habitat.	• For water quality mitigation measures, see above potential interaction. • Avoidance of direct contact with aquatic areas offsite. Minimize disturbance, where possible. 30 m setbacks from top of bank from fish habitat will be implemented. • Any work within 30 m of marine environment will utilize appropriate mitigation (e.g. monitoring and TESC measures) Respect the fish and fish habitat Restricted Activity Period. Restricted Activity Periods refer to windows of time where certain species groups are more vulnerable due to seasonal behaviours, and in which mitigation measures should be implemented to ensure these groups are not adversely impacted by Project-related activities. • Spring spawning fish: May 1 to July 15 • Fall spawning fish: August 15 to June 30 • Spring and fall spawning or unknown species: August 15 to July 15	Magnitude: Low Scale: Site and Local Study Area Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**

Potential Interactions	Description	Mitigation Measures	Residual Impacts

Marine Vessel Traffic
Interaction of vessel traffic (e.g., skiff or sealift and tug) with sea ice.
Interaction of vessel traffic (e.g., sealift) with marine fish and fish habitat during transport to/from Site.
Interaction of moored/beached vessel traffic (e.g., sealift) with marine fish and fish habitat onsite.
	Vessel(s) interaction with fish (vessel strike, noise, accidental spills, and contaminant release).
	
	Vessel(s) interaction (beaching, anchoring) with shoreline and aquatic benthic habitat and aquatic biota (disturbance and/or compaction of substrate, physical disturbance of aquatic biota, noise, accidental spills, contaminant release).
		• Use of vessels outside of critical windows for fish when possible (Arctic Char fall spawning).
		  ○ Fish and fish habitat Restricted Activity Period.
		  ▪ Spring spawning fish: May 1 to July 15
		  ▪ Fall spawning fish: August 15 to June 30
		  ▪ Spring and fall spawning or unknown species: August 15 to July 15
		• Use of vessels inside critical windows for fish will institute BMPs:
		  ○ Vessels operated at low speed.
		  ○ Use of best practice for fueling vessels on or near water
		  ○ Use of best practice for operating motorized/non-motorized marine vessels
		  ○ Development of a spill response plan
		  ○ Advanced planning of vessel beach/anchor locations and minimize re-positioning events.
			Magnitude: Low
			Scale: Proposed Project Area
			Duration: Medium-term
			Frequency: Frequent
			Reversibility: Reversible
			Likelihood: Low
			
			Significant: No

Offsite Water Source Potable and non-potable water source required for the temporary onsite camp and Project related activities.	It is the intention that the “West Lake” (north of the Site) will serve as a water source for both potable and non-potable water for the camp. Water use will need to be managed so as not to impact the lake ecological services including fish and fish habitat	• CIRNAC will obtain Water Licenses • Consult DFO best practice resource for end of pipe screen size, to avoid fish entrainment at in-take. • Consult DFO measures to protect fish and fish habitat.	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**

5.9 Marine Mammals

Table 15 below outlines the potential interactions of the remediation activities and the mitigation measures to reduce the potential interaction to marine mammals in the marine environment adjacent to the proposed Project.

The Dolphin and Union Strait has the potential to support a variety of marine mammals, including SAR. As the proposed Project is expected to utilize ocean access to the Site, marine mammals have the potential to be impacted during transport, mobilization and demobilization procedures.

Offsite indirect marine environment impacts due to onsite erosion or surface run-off have a very low likelihood of occurrence as the onsite materials are predominantly greater than gravel size (i.e., not easily mobilized), the topography of the Site is relatively flat, and any work within 30 m of water sources will utilize appropriate mitigation (e.g. monitoring and TESC measures).The majority of onsite works are expected to occur with a 30 m setback from the marine shoreline (with the exception of marine vessel beaching and surface debris removal in the Beach Area and along the shore of East Lake). The restricted activity window for marine mammals is year-round and mitigation measures listed below will be adhered to.

Although the connectivity of the project site to the marine environment is not well known at this time, by implementing avoidance and mitigation measures and seeking a DFO RfR for the culvert replacement if required, any potential impacts to the marine environment can be avoided. HADD of fish (by definition includes marine mammals) habitat or death of fish due to any proposed Project activities is not expected to occur.

Negative residual effects identified in the table below are expected to be short-term to medium-term in nature and will likely be outweighed by the expected positive long-term effects from the proposed Project on this VC.

Table 15. Potential Marine Mammal Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Onsite Activities Indirect interaction of onsite equipment/personnel with the marine environment adjacent to the Site. The Dolphin and Union Strait is a marine environment that supports marine mammals, including SAR species.	Personnel and equipment onsite may cause onsite erosion, leading to sedimentation, and/or introduction of a deleterious substance to the marine environment of Bernard Harbour, with potential impacts to water quality, marine mammals and their habitat.	• For water quality mitigation measures, see above potential interaction. • Any onsite work within 30 m of marine water sources will utilize appropriate mitigation (e.g. monitoring and TESC measures)	Magnitude: Low Scale: Site and Local Study Area Duration: Medium-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low **Significant: No**

Marine Vessel Traffic
Interaction of vessel traffic (e.g., skiff or sealift and tug) with sea ice.
Interaction of vessel traffic (e.g., sealift) with marine fish and fish habitat during transport to/from Site.
Interaction of moored/beached vessel traffic (e.g., sealift) with marine mammal habitat onsite.
	Vessel(s) interaction with marine mammals, (vessel strike, noise, accidental spills, and contaminant release).
	
	Vessel(s) interaction (beaching, anchoring) with shoreline and aquatic benthic habitat and aquatic biota (disturbance and/or compaction of substrate, physical disturbance of aquatic biota, noise, accidental spills, contaminant release).
		• Marine mammals approach distances: January 1 to December 31.
		  ○ 100 m for whale, dolphin and porpoise
		  ○ 100 m for walrus
		  ○ 300 m for walrus on the shore (June 1 to October 31)
		  ○ 200 m for killer whale
		• Vessels operated at low speed.
		• Use of marine mammal spotter while vessel(s) in motion.
		• Use of best practice for fueling vessels on or near water
		• Use of best practice for operating motorized/non-motorized marine vessels
		• Development of a spill response plan
		• Advanced planning of vessel beach/anchor locations and minimize re-positioning events.
			Magnitude: Low
			Scale: Proposed Project Area
			Duration: Medium-term
			Frequency: Infrequent
			Reversibility: Reversible
			Likelihood: Low
			
			Significant: No

5.10 Wildlife

Table 16 below outlines the potential interactions of the remediation activities and outlines the mitigation measures to reduce the potential interaction to wildlife, including birds and land-based mammals. SAR (terrestrial mammals and birds) have been identified to have potential to overlap with the Site or areas adjacent to the Site.

Negative residual effects identified in the table below are expected to be short-term to medium-term in duration and are expected to be outweighed by positive long-term effects from the proposed Project on this VC. For wildlife, this could include improved Site-use conditions.

Table 16. Potential Wildlife Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Remediation activities will occur within the migratory bird nesting period.	Remediation activities may disturb nesting migratory birds or destroy nests and/or mortality of migratory birds. The migratory bird nesting period is from late May to mid August (ECCC 2018).	If remediation activities will occur during the migratory bird nesting period, it is recommended that a migratory bird sweep be designed and overseen by a qualified biologist. The sweep should include all structures and areas where remediation will take place, ensuring compliance prior to the start of activities. If migratory bird nests are identified, mitigations including a setback will be developed by the qualified biologist and will be implemented. • All overflying aircraft: • when birds are present, are to maintain a minimum vertical setback of 1.1 km in area where concentration of birds are present. • if seabird colonies are present, a 3 km lateral setback on the seaward side of the colonies. • lateral setback of 3 km from flocks of coastal waterfowl and seaducks. • when concentration of birds are present in bird breeding colonies and molting areas, are to maintain a minimum lateral aerial setback of 1.5 km. • Marine setback of 500 m from colonies and concentrations • A terrestrial setback of 300 m from concentrations of birds for land-based activities (ECCC 2016).	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Once Reversibility: Reversible Likelihood: Low **Significant: No**
Direct disturbance, disruption, visual and noise, during remediation activities from equipment and onsite personnel	Remediation activities (i.e., equipment and personnel) will introduce a level of noise to the Site where human activities are usually minimal. This increase in noise may cause habitat change, corridor impairment, habitat fragmentation and habitat disruption on wildlife (individually and socially) from the periodic usage of the Site and Site access	In the event wildlife frequent the Local Study Area during the remediation activities, consultation with a qualified biologist should be conducted to determine appropriate mitigation. If wildlife are visibly disturbed by Project activities, work will be stopped until the animal(s) has/have left the Local Study Area. Human-wildlife interactions should be minimized, as advised by a qualified biologist, through: Wildlife monitor conducting wildlife/nest sweeps prior to work commencing.	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**

Potential Interactions	Description	Mitigation Measures	Residual Impacts
	until completion of the proposed Project. This will be temporary disturbance during the remediation activities. The remediation activities (i.e., equipment and personnel) and the use of aircraft for mobilization to and from site, has the potential to disrupt local wildlife and wildlife habitat. Wildlife, both aquatic and terrestrial, may alter their routes, change their habitat-use during the remediation activities. In the long run, the Site will be remediated and the contaminates cleaned up and the wildlife habitat is anticipated to be improved.	• Providing training and briefings for onsite personnel. • Prohibiting the feeding and harassment of wildlife. • Not allowing pets or dogs on proposed Project workspace. • Storing waste in wildlife-proof bins. • Regularly removing all waste from Site which has potential to attract wildlife. • Caribou monitoring by a wildlife monitor will occur around the Project area during the calving period (May 1 – July 15), and if caribou are sighted, they will be monitored for signs of stress (e.g. fleeing, watching the disturbance as opposed to feeding or nursing young). During the calving period, if caribou are present onsite before the work has started for the day, work should not proceed until the caribou have moved off at least 1 km, or 500 m if monitored for signs of stress. If work is ongoing and caribou arrive and get close, work may continue, as the disturbance is existing and the caribou choose to approach.	
Potential change in species composition and distribution, and any impacts to endangered and special species	The remediation activities (i.e., equipment and personnel) have the potential to temporarily change the species, including endangered and special species, using the Site. The physical disruption and sounds from the equipment and personnel may cause wildlife to avoid the area during remediation activities.	If remediation activities will occur during the migratory bird nesting period, it is recommended that a migratory bird sweep be designed and overseen by a qualified biologist. The sweep should include all structures and areas where remediation will take place, ensuring compliance prior to the start of activities	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Moderate **Significant: No**
Potential habitat change / loss of wildlife habitat due to the removal of onsite structures which will be removed during the remediation activities.	Species may use the onsite structures as nesting habitat.	The removal of onsite structures should be completed prior to the bird migrating and nesting period to prevent birds from nesting on the structures. A wildlife and migratory bird sweep should be conducted prior to the removal of the structures to ensure no wildlife species is currently inhabiting the structures.	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Infrequent Reversibility: Reversible Likelihood: Moderate **Significant: No**
Potential SAR wildlife encounters during remediation activities.	There is potential for SAR aquatic and terrestrial wildlife, including Polar Bears, encounters during the remediation activities. SAR that overlap the proposed Project or are found in Dolphin and Union	If SAR are observed onsite while mobilizing to site, the helicopter will wait to land at Site until the species has moved along. The exception is if a Polar Bear (or Grizzly Bear, though not SAR) is present onsite, the helicopter will be used to encourage the animal away from Site for the safety of the crew.	Magnitude: Low Scale: Local Study Area Duration: Medium-term Frequency: Infrequent Reversibility: Reversible Likelihood: Low

Potential Interactions	Description	Mitigation Measures	Residual Impacts
	Strait are listed in Section 2.6.	A wildlife monitor will be present onsite, and the presence of wildlife will be monitored and communicated to proposed Project Site personnel. Minimize human-wildlife interactions through: • Scheduling work to occur outside of all applicable wildlife restricted activity periods (where possible); • Conducting wildlife sweeps prior to work commencing; • Providing training and briefings for onsite personnel; • Prohibiting the feeding and harassment of wildlife; • Not allowing pets or dogs on proposed Project workspaces; • Preventing littering; • Not approaching any wildlife; • Storing waste in wildlife-proof bins; and • Removing all waste with potential to attract wildlife from Site. • If a SAR is identified at Site during the remediation activities (with exception of Polar Bear as noted above): • Work activities will cease if there is potential to disrupt the species or work activities will be modified to minimize disturbance to the species. • The species will be allowed to leave the Site without interference or action by the onsite personnel. • The species must be reported to the region's conservation office. • Follow applicable Nunavut Harvester Safety Guide (Government of Nunavut 2024) including: • Promptly report the sighting of a bear onsite to the region's conservation office and local trappers' and hunters' organization. • Do not approach a bear. • If carcasses are found on the Site during remediation activities, remove the carcasses as soon as possible. • Waste will be stored in bear-proof waste bins. • Only qualified personnel will be involved in the effort to scare a bear away.	**Significant: No**

5.11 Ecological Integrity

Table 17 below outlines the potential interactions of the remediation activities with ecological integrity, identifies the mitigation measures to reduce the potential interaction to the VC, and states the residual negative impacts.

The Site is situated on the Nunavut mainland on the shore of Bernard Harbour, within the Dolphin and Union Strait. The Site footprint is approximately 3.3 km^2 including two onsite lakes (approximately 2.2 km^2 excluding the lakes). Ecologically, the Site is located within the Northern Arctic Ecozone, and, more specifically, within the Amundsen Gulf Lowlands Ecoregion (Agriculture and Agri-Food Canada and Environment Canada 1999). This ecoregion is among the coldest and driest of Canada's landscapes (Environment Canada 1999).

Plant life in the Northern Arctic Ecozone is generally sparse with a low species richness. Positive effects from the proposed Project could include improved growing conditions for native vegetation, on account of removal of contaminants that may be impeding onsite native flora growth (through physical or chemical impacts).

There are a number of valued fish species in Nunavut, including Arctic Char, Arctic Cod and Capelin, and Dolphin and Union Strait supports a number of marine and anadromous fish as well as marine mammals, including some species of particular ecological importance. The proposed Project is expected to have limited potential to negatively impact these VCs. It is unlikely that the freshwater features onsite or adjacent to Site provide habitat to freshwater or anadromous fish species, due to ice-off season being short (approximately a couple months) and there currently being no surface connectivity to the marine environment. For these reasons it is highly unlikely that the proposed Project would negatively impact this VC.

The extreme cold climate, harsh conditions, and limited plant communities of the Northern Arctic are reflected in the relatively low diversity and low abundance of wildlife. Still, there are a number of birds and land-based mammals identified in the region, including SAR. While negative residual effects are identified, they are expected to be short-term to medium-term in duration and are expected to be outweighed by positive long-term effects from the proposed Project on this VC. For wildlife, this could include improved Site-use conditions.

Taken together, it is expected that the ecological integrity of the site, and local study area may be temporarily negatively impacted but expect that the long-term effects to ecological integrity will be positive.

Table 17. Potential Ecological Integrity Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Potential changes in species composition or community structure, effects on rare, endangered or special resource species. This could occur for species on and off-site.	There are potential temporary impacts to ecological integrity through fauna avoidance of the Site or region due to the proposed Project.	• See Vegetation, Fish and Fish Habitat, Marine Mammal, and Wildlife VCs	Magnitude: Low Scale: Site, Local Study Area, Regional Duration: Medium-term Frequency: Frequent Reversibility: Reversible Likelihood: Low **Significant: No**

5.12 Socio-economic Resources

The proposed Project involves several socio-economic considerations. Ensuring human health and safety is a primary focus, addressed through a detailed Health and Safety Plan (H&SP) which will outline protocols for accident management and injury prevention. There are no anticipated displacements of residents, but potential impacts on traditional land use by hunters and trappers will be managed through effective communication and respect for these practices. Any necessary disruptions to these activities will be minimized and considered only if essential for health and safety.

Economically, the Project is expected to offer significant benefits to the Hamlet of Kugluktuk by creating job and business opportunities. This may include local hiring and contracting and a contribution to local economic growth. Table 18 provides a summary of potential interactions between the Project and socio-economic factors, along with corresponding mitigation measures. While some minor disruptions to community services may occur, they are anticipated to be outweighed by the overall positive impacts on the local economy and the development of marketable skills.

Table 18. Potential Socio-Economic Interactions with Proposed Project

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Human Health and Safety	Health and safety for proposed Project crew during work	• Implementing a H&SP detailing risk assessment, safety protocols, training for crew members, and emergency response procedures	Magnitude: Low Scale: Proposed Project Site Duration: Short-term Frequency: Frequent Monitoring Reversibility: Reversible Likelihood: Low Significance: Not Significant
Displacement of People and Community Disruptions	No residents are anticipated to be displaced because there are no persons living at the Site. Possible displacement of traditional land use activities	• Establishing proactive communication channels with local community • Developing a contingency plan for temporary displacement of activities (if any) onsite if health and safety concerns arise	Magnitude: Low Scale: Local Area Duration: Short-term Frequency: Frequent Reversibility: Reversible Likelihood: Low Significance: Not Significant
Employment and Economic Effects	Potential local employment opportunities Economic benefits through use of local business and services	• Developing local hiring strategy • Offering capacity building programs to build local skillsets. • Establishing contracts with local businesses for supplies and services, where possible	Magnitude: High Scale: Regional Area Duration: Medium/Long-term Frequency: Infrequent (during proposed Project) Reversibility: Non-Reversible (positive impact) Likelihood: High Significance: Significant (positive)
Impact on Community Services	Proposed Project activities may draw workers and businesses away from local communities, impacting services	• Coordinating with local community leaders to ensure services are not overwhelmed. • Investing in community infrastructure if required	Magnitude: Medium Scale: Local Area Duration: Medium-term Frequency: Infrequent (during proposed Project)) Reversibility: Reversible Likelihood: Moderate Significance: Not Significant

Potential Interactions	Description	Mitigation Measures	Residual Impacts
Overall Socio-economic Impacts	Expected economic influx, improved land use post proposed Project, employment benefits, and skill acquisition	• Targeted community engagement at proposed Project milestones • Conducting economic impact assessments and strategic development planning	Magnitude: Medium Scale: Regional Area Duration: Medium/Long-term Frequency: Frequent Monitoring Reversibility: Non-Reversible (positive impact) Likelihood: High Significance: Significant (positive)

5.13 Residual Effects Summary

Onsite and offsite negative residual effects to VCs are expected to be short to medium-term (i.e., proposed Project duration) with no long-term negative impacts identified; however, the proposed Project is expected to have a positive impact on many VCs in the long-term. By removing contaminated soils/substrate, structures, and debris the proposed Project will improve environmental, social, economic and cultural components both on and off the Site.

As summarized in Table 19, there are no anticipated significant negative residual effects to VCs after implementation of the recommended mitigation and avoidance measures for the remediation activities. As discussed in Section 5.1, 'significance' of an effect was determined through professional judgement guided by environmental standards.

Table 19. Valued Component Potential Impacts Summary

VC	Potential Impacts	Significance of Residual Effects post mitigation
Climate	The use of aircraft and sealift for mobilization of people, equipment, materials, and debris to and from site has the potential to impact air quality in the local area and along the flight/shipping paths.	Not significant
	The transport of debris and/or contaminated materials offsite by sealift has the potential to impact air quality in the region.	Not significant
	The use of motorized equipment, vehicles and ATVs onsite to conduct Project-related work has the potential to impact air quality in the local area.	Not significant
Geology, Landforms and Permafrost	Remediation will include the cleanup of debris and contaminated soils; **yielding an overall improvement of geological conditions.**	**Significant (Positive)**
	Remediation activities may cause physical changes, erosion potential, soil compaction, changes in soil structure and organic matter content.	Not significant
	There is a potential for additions of pollutants (anthropogenic and natural) to soil.	Not significant
	Potential impacts to permafrost (incineration)	Not significant
	Potential impacts to permafrost (excavation)	Not significant
Topography & Aesthetics	As part of the proposed Project, topography and aesthetics of the Site will be brought into a more natural physical setting, in keeping with the surrounding region **yielding an overall improvement of topographic and aesthetics conditions.**	**Significant (Positive)**

VC	Potential Impacts	Significance of Residual Effects post mitigation
Hydrology and Physical Marine Environment	Potable and non-potable water source required for the temporary onsite camp and Project related activities.	Not significant
	There is potential for interactions between onsite equipment/personnel with freshwater and marine features on, or adjacent to, the Site.	Not significant
	Direct interaction of marine vessels with the physical marine environment adjacent to the Site and along shipping route.	Not significant
	Culvert replacement may alter Site hydrology.	Not significant
Vegetation	Direct disturbance to or removal of local vegetation.	Not significant
	Potential changes in species composition or community structure, effects on rare, endangered or special resource species.	Not significant
	Potential for wildfires due to the incineration of debris onsite.	Not significant
Fish and Fish Habitat	Direct (potential in-water works for culvert replacement) and indirect interaction of onsite equipment/personnel with onsite fish and fish habitat (freshwater features).	Not significant
	Indirect interaction of onsite equipment/personnel with the marine environment adjacent to the Site. The Dolphin and Union Strait is a marine environment that supports marine mammals and fish populations, including SAR species.	Not significant
	Interaction of vessel traffic (e.g., skiff or sealift and tug) with sea ice. Interaction of vessel traffic (e.g., sealift) with marine fish and fish habitat during transport to/from Site. Interaction of moored/beached vessel traffic (e.g., sealift) with marine fish and fish habitat onsite.	Not significant
	Potable and non-potable water source required for the temporary onsite camp.	Not significant
Marine Mammals	Indirect interaction of onsite equipment/personnel with the marine environment adjacent to the Site. The Dolphin and Union Strait is a marine environment that supports marine mammals and fish populations, including SAR species.	Not significant
	Interaction of vessel traffic (e.g., sealift) with sea ice or marine mammals during transit in Dolphin and Union Strait to/from Site. Interaction of moored/beached vessel traffic with marine mammals onsite/in Bernard Harbour.	Not significant
Wildlife (including birds and terrestrial mammals)	Remediation activities may occur within the migratory bird nesting period.	Not significant
	Direct disturbance, disruption, visual and noise, during remediation activities from equipment and onsite personnel.	Not significant

VC	Potential Impacts	Significance of Residual Effects post mitigation
	Potential change in species composition and distribution, and any impacts to endangered and special species.	Not significant
	Potential habitat change / loss of wildlife habitat due to the removal of onsite structures which will be removed during the remediation activities.	Not significant
	Potential SAR wildlife encounters during remediation activities.	Not significant
Ecological Integrity	Potential changes in species composition or community structure, effects on rare, endangered or special resource species. This could occur for species on and off site.	Not significant
Socio-economic Resources	Potential direct effects to local traditional land use.	Not significant
	Potential direct and indirect effects on local and/or regional businesses, other agencies and their services.	**Significant (Positive)**
	Potential public health or safety issues related to carrying out this proposed Project.	Not significant
	Potential loss or alteration of previously undiscovered heritage resources or culturally important areas as a result of the proposed Project.	Not significant.

6. Cumulative Effects

Cumulative effects are the combined environmental impacts (positive or negative) that accumulate over time and space as a result of a series of similar or related actions or activities associated with the proposed Project. To evaluate the cumulative effects from the proposed Project on VCs, cumulative effects criteria were considered on a proposed Project-specific basis, with outcomes presented in Table 20.

The purpose of the proposed Project is to protect environmental and human health by removing contaminated soil and debris from the Site. This removal will also prevent the contamination and debris from spreading offsite. The proposed Project is also expected to have positive aesthetic effects onsite. As the proposed Project is a remediation project, it is expected that short-term negative environmental effects associated with remediation activities (short to medium-term) will be offset by the positive long-term environmental effects associated with the remediated Site. It is anticipated there will be no negative cumulative effects, but that some positive cumulative effects will be realized.

No significant potential cumulative effects are anticipated for work conducted during this proposed Project; therefore, no mitigation measures are required. However, if residual effects of the proposed Project are later considered to be contributing to cumulative effects, monitoring and adaptive management will be applied. These initiatives would be coordinated with regulators and potentially affected communities, as applicable.

Table 20. Cumulative Effects

Criteria	Description
Possibility of improved Site ecological conditions, leading to increased wildlife activity at the Site	While there may be short-term disruptions to wildlife Site use, post-construction it is anticipated that the Site will provide improved habitat to the local ecology, via debris removal and improved soils/vegetation conditions. A more natural setting may attract wildlife.
Traditional Land and Resource Use: Possible interruptions to hunting, trapping and other traditional harvesting activities in proximity to the Site and surrounding area.	While there may be short-term disruptions to traditional land and resources use, these effects are predicted to be non-significant, with a promised improvement to land use post Site remediation. Due to the remoteness of the location, potential cumulative effects to areas of concern are expected to be not significant.
Aesthetic effects onsite	Positive aesthetic changes are expected onsite post-remediation, enhancing the visual appeal and environmental quality, contributing to long-term environmental benefits.
Economic impacts through employment and business opportunities for area residents	Positive socio-economic effects are predicted. Employment and business opportunities are expected to create long term positive significance.
Social impacts	Short-term interruptions to hunting, trapping, and other traditional harvesting activities may occur. These impacts are expected to be short-term and not significant, with traditional activities resuming post-Project completion.

7. Knowledge Deficiencies

Table 21 summarizes the data gaps and how these deficiencies will be addressed.

Table 21. Knowledge Deficiencies and Resolutions.

Data Gap	Plan to Resolve
The 2022 field work did not include a biologist or in-depth ecological assessment.	A desktop review of information on the terrestrial and aquatic environment of the region was used in this PPR.
There is limited information on the hydrology of the Site, particularly whether the onsite freshwater features are hydrologically connected.	Mitigation measures presented in this PPR will be implemented to ensure the freshwater quality onsite is maintained.

8. Public Concerns

A community-level RAP working meeting was held in Kugluktuk on February 28, 2023, at the Kugluktuk Community Complex. Approximately 60 members of the community attended to discuss various remedial options for the Site and provide input on preferred technical recommendations. Based on the presentation and feedback received, the options were deemed acceptable to the community. Community engagement will continue throughout the Project, and any concerns raised during ongoing engagement will be addressed.

9. Summary and Conclusions

AECOM Canada Ltd. (AECOM) was retained by Public Services and Procurement Canada (PSPC), on behalf of Crown Indigenous Relations and Northern Affairs Canada (CIRNAC), to prepare a Project Proposal Report (PPR) for the PIN-C, Bernard Harbour (Inuit: Nulahugiuq) former intermediate Distant Early Warning (DEW) Line site (the Site) remediation project (the proposed Project). The purpose of the proposed Project is to protect environmental and human health by removing, treating, or isolating impacted soil, debris, and building materials.

The objective of this Project Proposal Report was to assess the environmental, social, economic, and cultural effects of the proposed Project and develop mitigation measures for identified impacts where necessary. VCs identified and assessed for potential interaction, positively or negatively, with the proposed Project. Those with an interaction were carried forward into the Effects Assessment which applied residual effects assessment criteria to ultimately determine if a residual effect was 'significant'.

The effects assessment found that onsite and offsite negative residual effects to VCs are expected to be short to medium-term (i.e., proposed Project duration) with no long-term negative impacts identified. Importantly, **there are no anticipated significant negative residual effects** nor are there any negative cumulative effects from the proposed Project on any VCs after implementation of avoidance and mitigation measures.

The proposed Project is expected to have a positive impact on many VCs in the long-term by removing contaminated soils/substrate and debris to improve environmental, social, economic and cultural components both on and off the Site. VCs with significant positive effects from the proposed Project include topography and aesthetics, geology, landforms and permafrost, ecological integrity, and socio-economics.

Community engagement is ongoing for the proposed Project and any concerns or comments will be addressed.

10. References

AECOM Canada Ltd. 2022. *Phase III Environmental Site Assessment: PIN-C, Bernard Harbour Intermediate DEW Line Site*.

AECOM Canada Ltd. 2023. *Remedial Action Plan: PIN-C, Bernard Harbour Intermediate DEW Line Site*.

Agriculture and Agri-Food Canada and Environment Canada. 1999. Terrestrial Ecozones, Ecoregions and Ecodistricts of the Yukon, Northwest Territories and Nunavut. Available at: https://sis.agr.gc.ca/cansis/publications/maps/eco/all/districts/eco_all_districts_4m_north.jpg\

Canatec Associates International Ltd. 2014. Polynyas in the Canadian Arctic. Available at: https://apiwwfarcticse.cdn.triggerfish.cloud/uploads/2022/04/08165253/research_polynya_report.pdf

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2003. Assessment and Update Status Report on the Fourhorn Sculpin *Myoxocephalus quadricornis*: Freshwater form in Canada. Available at: https://wildlife-species.az.ec.gc.ca/species-risk-registry/virtual_sara/files//cosewic/sr_fourhorn_sculpin_e.pdf

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2014. Assessment and Status Report on the Wolverine (*Gulo gulo*) in Canada. Available online at: https://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Wolverine_2014_e.pdf

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2018. COSEWIC assessment and status report on the Polar Bear *Ursus maritimus* in Canada. Available at: https://wildlife-species.az.ec.gc.ca/species-risk-registry/virtual_sara/files//cosewic/OursBlancPolarBear-2019-Eng.pdf

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2021. COSEWIC assessment and update status report on the Short-eared Owl *Asio flammeus* in Canada. Available at: https://wildlife-species.az.ec.gc.ca/species-risk-registry/virtual_sara/files//cosewic/sr%20Short-eared%20Owl%202021_e.pdf

Environment and Climate Change Canada (ECCC). 2016. Key Habitat Sites for Migratory Birds in the Nunavut Settlement Area. Available at: file:///C:/Users/GrishaberE/Downloads/2016-05-31%20ECCC%20Key%20habitat%20sites%20for%20migratory%20birds%20in%20the%20NSA%20(1).pdf

Environment and Climate Change Canada (ECCC). 2016. Range Map extents – Species at Risk – Canada. Available online at: https://open.canada.ca/data/en/dataset/d00f8e8c-40c4-435a-b790-980339ce3121

Environment and Climate Change Canada. 2017. Management Plan for the Barren-ground Caribou *(Rangifer tarandus groenlandicus*), Dolphin and Union population, in Canada: Adoption of the Management Plan for the Dolphin and Union Caribou (*Rangifer tarandus groenlandicus x pearyi*) in the Northwest Territories and Nunavut [Proposed]. Species at Risk Act Management Plan Series. Environment and Climate Change Canada, Ottawa. 2 parts, 3 pp. + 102 pp.

Environment and Climate Change Canada (ECCC). 2018. General Nesting Periods of Migratory Birds in Canada. Available at: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods.html

Environmental Sciences Group (ESG). 1992. DEW Line Cleanup: Scientific and Engineering Summary Report.

Fisheries and Oceans Canada (DFO). 2013. Nunavut Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat. Available at: https://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/nu-eng.html

Fisheries and Oceans Canada (DFO). 2022. Aquatic species at risk map. Available at: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Fisheries and Oceans Canada (DFO). 2023. Canadian Hydrographic Service – NONNA. Available at: https://data.chs-shc.ca/dashboard/map

Government of Canada. 1999. Ecological Framework of Canada. Available at: http://www.ecozones.ca/

Government of Canada. 2010. COSEWIC assessment and status report on the Atlantic Cod *Gadus morhua* in Canada -2010. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/atlantic-cod-gadus-morhua-2010.htmlGovernment of Canada. 2021. Beluga Whale (*Delphinapterus leucas*): COSEWIC assessment and status report 2020. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/beluga-whale-2020.html

Government of Canada. 2022. Species at Risk in Nunavut 2021. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre/species-risk-nunavut-2021.html#toc8. Accessed December 2023.

Government of Canada. 2023a. Canadian Climate Normals: 1991-2020 Climate Normals and Averages. Available at: https://climate.weather.gc.ca/climate_normals/index_e.html

Government of Canada. 2023b. Species at risk public registry. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.htmlGovernment of Nunavut. 2024. Wildlife Management Resources, Nunavut Harvester Safety Guide. Available at: https://www.gov.nu.ca/en/environment-and-wildlife/wildlife-resources Government of Nunavut. 2023. Nunavut Polar Bear Co-Management Plan. Available at: https://www.gov.nu.ca/sites/default/files/publications/2022-01/nwmb_approved_polar_bear_comanagement_plan_sept_2019_eng.pdf

Government of Nunavut. 2010. Environmental Guideline of the General Management of Hazardous Waste. Available at: https://www.gov.nu.ca/sites/default/files/publications/2022-01/Guideline%20-%20General%20Management%20of%20Hazardous%20Waste%20%28revised%20Oct%202010%29_0.pdf

Government of Nunavut. 2012. Environmental Guideline for the Burning and Incineration of Solid Waste. Available at: https://www.gov.nu.ca/sites/default/files/publications/2022-01/guideline_-_burning_and_incineration_of_solid_waste_2012.pdf

Government of Nunavut. 2023. Nunavut Polar Bear Co-Management Plan. Available at: https://www.gov.nu.ca/sites/default/files/publications/2022-01/nwmb_approved_polar_bear_comanagement_plan_sept_2019_eng.pdf

Government of Nunavut. 2024. Wildlife Management Resources, Nunavut Harvester Safety Guide. Available at: https://www.gov.nu.ca/en/environment-and-wildlife/wildlife-resources

Holtz, A. Canada Environmental Protection, Western and Northern Region. 1986. *Removal of contaminants from Distant Early Warning sites in Canada's Arctic*.

James, T.S., Robin, C., Henton, J.A., and Craymer, M. 2021. Relative sea-level projections for Canada based on the IPCC Fifth Assessment Report and the NAD83v70VG national crustal velocity model. Geological Survey of Canada, Open File 8764. Available at: https://geoscan.nrcan.gc.ca/text/geoscan/fulltext/of_8764.pdf

Oceans North Conservation Society, World Wildlife Fund Canada, and Ducks Unlimited Canada. (2018). Canada's Arctic Marine Atlas. Ottawa, Ontario: Oceans North Conservation Society. Available at: en-06-canadas-arctic-marine-atlas-chapter-six-marine-mammals.pdf (oceansnorth.org)

Public Service and Procurement Canada. 2022. Terms of Reference for Cape Krusenstern, Nunavut. Northern Contaminated Sites Group. Prepared for Crown-Indigenous Relations and Northern Affairs Canada.

Royal Roads Military College (RRMC) Environmental Sciences Group (ESG). 1993. *Five Intermediate Sites from the Western and Central Arctic*.

Seligman, M (2018): PERMA and the building blocks of well-being, The Journal of Positive Psychology, DOI: 10.1080/17439760.2018.1437466. https://ppc.sas.upenn.edu/sites/default/files/permawellbeing.pdf

UNEP. 2002. Environmental impact assessment training resource manual. Available at: Environmental impact assessment training resource manual / (un.org)

WESA Inc (WESA). March 2012. *Limited Environmental Investigation WK150 Bernard Harbour, PIN-C.*

aecom.com

aecom.com