Kivalliq-Baffin Connector Project

Horizontal Directional Drilling Engineering Support Program

Environmental Management Plan

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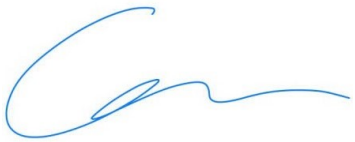

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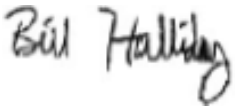

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Disclaimer & Limitations of the Report

The information presented in this document was compiled and interpreted exclusively for the purposes of the Kivalliq-Baffin Connector (KBC) Fibre Optic Cable Project (the KBC Fibre Project). Dynamic Ocean Consulting Ltd. (Dynamic Ocean) provided this report for the Government of Nunavut (GN) Department of Transportation and Infrastructure Nunavut (TIN) solely for the purpose noted above.

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Any questions concerning the information or its interpretation should be directed to Victoria Burdett-Coutts.

Acronyms and Abbreviations

Acronyms/Abbreviation	Definition
AHJ	Authorities Having Jurisdiction
AISR	Aquatic Invasive Species Regulations
AOI	Area of Interest
ATV	Acoustic Televiewer
BMH	Beach Manhole
BMP	Best Management Practices
BSB	Below Seabed
BU	Branching Unit
CCA	Canadian Construction Association
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CEPA	Canadian Environmental Protection Act
CEQG	Canadian Environmental Quality Guidelines
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CMZ	Compliance Monitoring Zone
CPTs	Cone Penetration Tests
CRTC	Canadian Radio-television and Telecommunications Commission
CWPs	Contractor Work Plans
dB	Decibels
DFO	Fisheries and Oceans Canada
DoE	Department of Environment
Dynamic Ocean	Dynamic Ocean Consulting Ltd.
EAUFON	Eastern Arctic Underwater Fibre Optic Network
ECCC	Environmental and Climate Change Canada
EI	Environmental Inspector
EM	Environmental Monitor
EMP	Environmental Management Plan
ERT	Electrical Resistivity Tomography
EZ	Exclusion Zones
FAA	*Fisheries Act* Authorization
FFHPP	Fish and Fish Habitat Protection Program

Acronyms/Abbreviation	Definition
FMO	Fisheries Management Office
GN	Government of Nunavut
HADD	Harmful Alteration Disruption or Destruction
HDD	Horizontal Direction Drilling
HFC	High Frequency Cetaceans
HTO	Hunters and Trappers Organization
HWL	High-Water Line
IBA	Important Bird Area
IBKS	Inuit Bowhead Knowledge Study
IOL	Inuit Owned Land
IQ	Inuit Qaujimajatuqangit
KBC	Kivalliq-Baffin Connector
kHz	Kilohertz
KIA	Kivalliq Inuit Association
km	Kilometer
kPa	Kilopascals
KRG	Kativik Regional Government
LFC	Low Frequency Cetaceans
LFSP	License For Scientific Purpose
LoA	Letter of Advice
LUP	Land Use Permit
m	Meter
MASW	Multi-channel Analysis of Surface Waves
MBES	Multibeam Echosounder
MBS	Migratory Bird Sanctuaries
mm	Millimetres
MMO	Marine Mammal Observer
MMR	Marine Mammal Regulations
NCRI	Nunavut Costal Resources Inventory
NIRB	Nunavut Impact Review Board
NMR	Nunavik Marine Region
NOAA	National Oceanic and Atmospheric Administration
NPC	Nunavut Planning Commission

Acronyms/Abbreviation	Definition
NRI	Nunavut Research Institute
NSA	Nunavut Settlement Area
NTU	Nephelometric Turbidity Units
NuPPAA	*Nunavut Planning and Project Assessment Act*
NWB	Nunavut Water Board
NWHS	Nunavut Wildlife Harvest Study
OTV	Optical Televiewer
OW	Otariids in water
OZ	Observation Zone
Pa	Pascals
PAM	Passive Acoustic Monitoring
PI	Punch-In
PO	Punch-Out
PoE	Pathways of Effects
PPE	Personal Protection Equipment
PW	Phocid pinnipeds
QP	Qualified Professional
QIA	Qikiqtani Inuit Association
RFR	Request for Review
RMS	Root Mean Squared
RNLUP	Recommended Nunavut Land Use Plan
ROV	Remote Operated Vehicle
RoW	Right of Way
SARA	*Species at Rick Act*
SAR	Species at Risk
SBP	Sub-Bottom Profiler
SCOPs	Standards and Codes of Practice
SDR	Screening Decision Report
SDS	Safety Data Sheets
SEL	Sound Exposure Level
SERP	Spill and Emergency Response Plan
SPL	Sound Pressure Level
SPT	Standard Penetration Testing

Acronyms/Abbreviation	Definition
SSS	Side Scan Sonar
SVP	Sound Velocity Profiling
the KBC Project	The Kivalliq-Baffin Connector Fibre Optic Cable Project
The EAUFON Project	The Eastern Arctic Underwater Fibre Optic Network Project
TC	Transport Canada
TIN	Department of Transportation and Infrastructure Nunavut
UAV	Unmanned Aerial Vehicle
VHF	Very High Frequency
Worley Consulting	Worley Canada Services Ltd.
WQG	Water Quality Guidelines

Terms and Definitions

Term	Definition
Beach Manhole (BMH)	A concrete chamber, buried into the beach or road behind the landing point, and is the transition point between marine cable and terrestrial cable.
Branching Unit (BU)	An undersea body serving as a “Y” joint in the cable that allows fiber pairs to be directed away from the main trunk cable for additional connectivity (the “branch”). The branch may be initially installed with a short length of cable called a “stub” which is accessible in the future to reach a landing at a later point in time.
Horizontal Direction Drilling (HDD)	Horizontal Directional Drilling is a trenchless construction technique involving a bore hole drilled in a shallow arc along a predetermined path.
Multibeam Bathymetry	Uses a fan of sound beams to map the seafloor (aka seabed).
Punch-In (PI)	Terrestrial-based entrance point for Horizontal Direction Drilling (HDD).
Punch-Out (PO)	Marine-based exit point for HDD.
Pathways of Effects (PoE)	Developed by Fisheries and Oceans Canada (DFO) as a resource to conceptualize the pathways between human activities and stressors with their effect on fish and fish habitat.
Sub-Bottom Profiler (SBP)	A geophysical survey tool which uses sound waves to map the layers of sediment and geological structures beneath the seafloor (aka seabed).
Screening Decision Report (SDR)	Determines whether a proposed project in Nunavut may proceed as is, requires further environmental and socio-economic review, or should not proceed due to potential impacts.
Side Scan Sonar (SSS)	Uses sound waves to create detailed images of the seafloor (aka seabed) by emitting acoustic pulses.

1 Introduction

1.1 Background

Dynamic Ocean Consulting Ltd. (Dynamic Ocean) has been retained by the Government of Nunavut – Department of Transportation and Infrastructure Nunavut (GN-TIN) as the regulatory specialist to support the permitting for the Kivalliq-Baffin Connector (KBC) Fibre Optic Cable Project (the KBC Fibre Project). The KBC Fibre Project is has four landings as below (depicted in Figure 1-1):

- Three landings on Baffin Island's southern coast (Iqaluit, Kimmirut, Kinngait | Qikiqtani Region).
- One Landing on Southampton Island (Coral Harbour [Salliq]| Kivalliq Region).

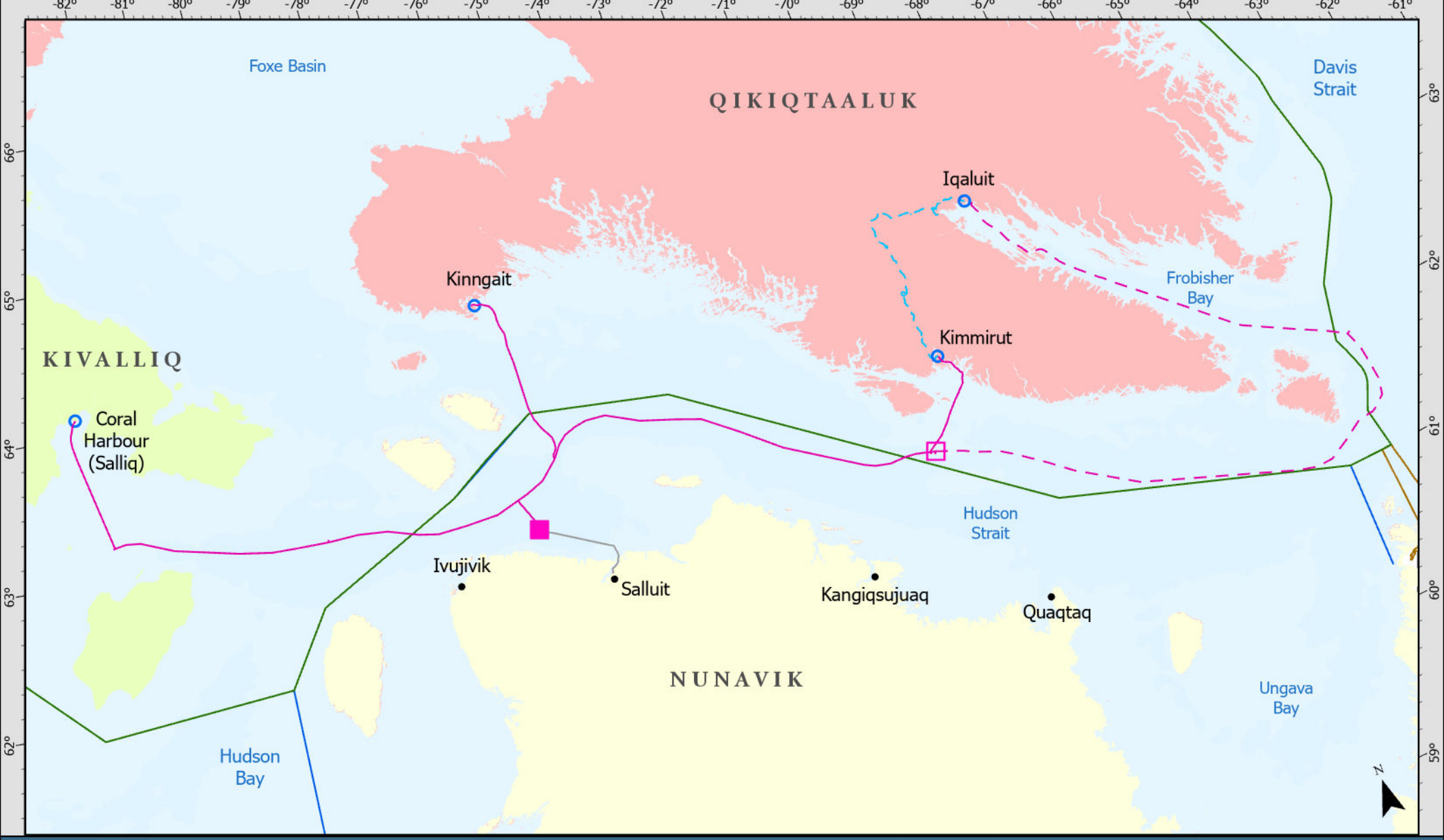
The KBC Fibre Project will connect to a Branching Unit (BU) in Nunavik waters, northwest of Salluit (Nunavik), which was completed as a component of Phase 2 of the Kativik Regional Government (KRG) Eastern Arctic Underwater Fibre Optic Network (EAUFON) Project (EAUFON Project).

Prior to finalization of the detailed design phase of the KBC Fibre Project, a Horizontal Directional Drilling (HDD) Engineering Support Program (the KBC HDD Engineering Support Program) is required at each of the marine landings. The KBC HDD Engineering Support Program will be carried out by Worley Canada Services Ltd (Worley Consulting).

1.2 Introduction and Project Location

The KBC Fibre Project is considered transboundary as it has components in both the Nunavut Settlement Area (NSA) and the Nunavik Marine Region (NMR). The marine component of the cable is composed of 11 segments (excluding Iqaluit, see Figure 1-1), where Segment Nos. 3 to 7 are the transboundary portions that cross from the NSA to the NMR. Segment No. 6 will connect to the existing EAUFON Project BU, currently on the seabed, that was left during the EAUFON Project installation. The EAUFON Project BU is an undersea body serving as a "Y" joint in the cable that allows fibre pairs to be directed away from the main trunk cable for additional connectivity (the "branch"). The EAUFON BU includes a 2 km stub length of cable which will be accessed during the installation phase of the KBC Fibre Project. The number of additional segments required to extend the marine cable lay from Segment No. 2 is under review and will be addressed during the permitting process for the KBC Fibre Project installation.

The requirement for HDD is exclusive to the NSA and will occur in all communities with a marine landing (Coral Harbour (Salliq), Kimmirut and Kinngait). Should Iqaluit be explored as an HDD option, a 2026 field program would be planned.



Legend

Project Components

- Cable Route
- Iqaluit (Option 1, Terrestrial)
- Iqaluit (Option 2, Marine)
- Cable Landing Station
- Branching Unit (BU) (Potential)
- BU (Confirmed)

EAUFON Project

- Existing Cable Route

- Nunavut Settlement Area
- Nunavik Marine Region
- Labrador Inuit Lands

Drawn: CL	Kivalliq-Baffin Connector Project
Edited: AW	Figure1-1
Approved: VBC	**Fibre Optic Cable Route and Jurisdictional Boundaries**

Spatial Reference
GCS: GCS North American 1983
Datum: North American 1983
Projection: Albers
Map Units: Metre

0 20 40 80 km

Scale: 1:4,000,000

Project Location

1.3 Footprint and Study Area

Study Areas have been developed for land- and marine-based areas respective to their footprints (see Appendix A (Figure A-1, Figure A-2, Figure A-3, Figure A-4)). The Study Area will be a 75 m buffer on either side of the alignment (150 m corridor), extending 100 m seaward of the Punch Out (PO), and the terrestrial components (Beach Manhole (BMH)[1], Punch-In (PI)[2]).

The location of the PI and POs is provided in Table 1-1.

[1] A concrete chamber, buried into the beach or road behind the landing point, and is the transition point between marine cable and terrestrial cable

[2] Terrestrial-based entrance point for HDD

Table 1-1: Kivalliq-Baffin Connector Project Marine Landings

Location	Location Description	Punch-Out		Punch-In		Pertinent Water Bodies	Associated Organizations	Figure Reference in Appendix A
		Latitude	Longitude	Latitude	Longitude			
Qikiqtani Region								
Kinngait	Dorset Island on southwest coast of Baffin Island.	64° 14.334'N	76° 32.895'W	64° 14.152'N	76° 32.565'W	Foxe Basin, Hudson Strait.	Aiviq Hunters and Trappers Organization (HTO), Hamlet of Kinngait.	Figure A-1
Kimmirut	Southern Baffin Island.	62° 50.484'N	69° 51.620'W	62° 50.591'N	69° 52.132'W	Glasgow Bay, Hudson Strait.	Mayukalik HTO, Hamlet of Kimmirut.	Figure A-2
Iqaluit	Frobisher Bay on south end of Baffin Island.	63° 42.837'N	68° 27.789’W	63° 43.445'N	68° 26.778’W	Frobisher Bay, Davis Strait.	Amaruq Hunters and Trappers Association (HTA), Hamlet of Iqaluit.	Figure A-3
Kivalliq Region								
Coral Harbour (Salliq)	Southampton Island.	64° 06.286’N	83° 13.678'W	64° 06.846'N	83° 12.551'W	Hudson Bay.	Aiviit HTO, Hamlet of Coral Harbour (Salliq).	Figure A-4

1.4 Document Intention

This document is the Environmental Management Plan (EMP) for the KBC HDD Engineering Support Program and has the following objectives:

- Target mandates of pertinent Authorities Having Jurisdiction (AHJ) and associated legislation to confirm permit approvals and relevant compliance requirements (see Section 1.5).
- Outline mitigation and monitoring measures to be implemented to minimize negative impacts to the physical, biological, and socio-economic environment associated with program activities (Sections 5.3).
- Confirm adherence to relevant Best Management Practices (BMPs) (see Section 5.1).

The EMP is an evolving document and will be updated if any changes to compliance measures occur as a result of adaptive management or if additional measures are added through permit conditions.

1.5 Regulatory Compliance

A summary of compliance and permitting requirements is provided in this section and further described in Table 1-2.

Table 1-2: List of Compliance Requirements for the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Legislation	Authority Having Jurisdiction	Required Authorization/ Permit/Approval	Project Activity	Permit ID	Permit Status
Territorial Requirements					
Nunavut Land Claims Agreement Act, Article 11 *Nunavut Planning and Project Assessment Act* (NuPPAA)	Nunavut Planning Commission (NPC)	Conformity Determination.	Development of land and water resources within the NSA. All aspects of the KBC HDD Engineering Support Program.	150863	Submitted: 17-Jun-25 (Dynamic Ocean, 2025d). Issued: 23-Jul-25 (NPC, 2025).
Nunavut Land Claims Agreement Act, Article 12 NuPPAA	Nunavut Impact Review Board (NIRB)	Screening Decision Report (SDR).	Any development of land and water resources within the NSA as determined by NPC's Conformity Determination. All aspects of the KBC HDD Engineering Support Program.	25YN061	Submitted: 08-Aug-25 (Dynamic Ocean, 2025e). Accepted for screening: 02-Sep-25.
Nunavut Scientists Act	Nunavut Research Institute (NRI)	Research License.	All aspects of the KBC HDD Engineering Support Program.	-	Pending Submission.
Schedule 2 of the Nunavut Water Regulations	Nunavut Water Board (NWB)	Water License.	Freshwater withdrawal will not be required.	-	-
Territorial Lands Act Land Use Territorial Regulations	GN-TIN (Lands Department)	Land Use Permit (LUP) (Kinngait).	May be required due to interaction with Commissioner's Land and Untitled Municipal Land (see Appendix A (Figure A-1)). GN-TIN Lands Department will be engaged to confirm if a LUP is required within its own department.	-	Pending Submission.
		LUP (Kimmirut).	May be required due to interaction with Commissioner's Land (see Appendix A (Figure A-2)). GN-TIN (Lands	-	Pending Submission.

Legislation	Authority Having Jurisdiction	Required Authorization/ Permit/Approval	Project Activity	Permit ID	Permit Status
			Department) will be engaged to confirm if a LUP is required within its own department.		
Nunavut Agreement	Qikiqtani Inuit Association (QIA)	Right of Way (RoW) (Kimmirut).	Required due to interaction with Inuit Owned Lands (IOL, see Appendix A (Figure A-2)).	-	Pending Submission.
Federal Requirements					
Fisheries Act: • Section 34.4(1). • Section 35(1). Marine Mammal Regulations (MMR) Aquatic Invasive Species Regulations (AISR)	Fisheries and Oceans Canada - Fish and Fish Habitat Protection Program (DFO-FFHPP)	-	A Request for Review (RFR) will not be submitted, because compliance can be met with Qualified Professional (QP) oversight. Negative effects to fish and fish habitat have been addressed in the EMP and will be managed through BMPs, Standards and Codes of Practice (SCOPs), with QP oversight.	-	-
Canadian Navigable Water Act *Canada Shipping Act* Collision Regulations	Transport Canada (TC)	Minor Works Order (no permit required).	Compliance for TC will be met through the Minor Works Order. All pertinent navigation legislation will be followed under the *Canadian Navigable Water Act* and the *Canada Shipping Act*, including adherence to the Collision Regulations while working on the water.	-	-
Fisheries (General) Regulations, Section 52	DFO – Fisheries Management Office (FMO)	License For Scientific Purposes (LFSP).	Required due to potential for incidental catch of benthic invertebrates (Section 52), as defined under the Fisheries (General) Regulations of the *Fisheries Act.*	-	Pending Submission.
Territorial Land Use Regulations	Crown Indigenous Relations and Northern Affairs Canada (CIRNAC)	Class A LUP (Coral Harbour (Salliq)).	A LUP is required for activities that meet the prohibitions outlined in Sections 8 or 9 of the *Territorial Land Use Regulations* and is therefore exclusive to the drilling activity.	-	Submitted: 05-Sep-25 (Dynamic Ocean, 2025a).
		Class A LUP (Kinngait).		-	Submitted: 05-Sep-25 (Dynamic Ocean, 2025c).

Legislation	Authority Having Jurisdiction	Required Authorization/ Permit/Approval	Project Activity	Permit ID	Permit Status
		Class A LUP (Kimmirut).		-	Submitted: 05-Sep-25 (Dynamic Ocean, 2025b).
		Class A LUP (Iqaluit).		-	Pending Submission.

2 Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program Activities Description

2.1 Intention and Activities Description

The intention of the KBC HDD Engineering Support Program is to assess seabed and subsurface (soil, rock, groundwater and permafrost) conditions to support the detailed design phase of the KBC Fibre Project. The requirement for HDD is exclusive to the NSA.

The KBC HDD Engineering Support Program will be composed of a combination of geotechnical, geophysical and biological activities as outlined in Table 2-1 and further described in Section 2.

Table 2-1: Horizontal Directional Drilling Engineering Support Program Components

Activity Name	Location		Interaction		
	Marine	Terrestrial	Ground/Seabed Interaction	Underwater Noise	Air Noise
Geotechnical Program					
Cone Penetration Tests (CPTs)	✓	-	Yes	Yes	Yes
Visual assessment	✓	✓	No	No	No
Drilling (Boreholes)	✓	✓	Yes	Yes	Yes
Thermistors	-	✓	Yes	No	No
Geophysical Program					
Swath bathymetry using a Multibeam Echosounder (MBES)	✓	-	No	Yes	No
Side Scan Sonar (SSS)	✓	-	No	Yes	No
Electrical Resistivity Tomography (ERT)	-	✓	Yes	No	No
Downhole Optical Televiewer (OTV)	✓	✓	Yes	No	No
Acoustic Televiewer (ATV)	✓	✓	Yes	Yes	No
Magnetometer	✓	-	No	No	No
Seismic Reflection & Refraction	✓	✓	Yes	Yes	Yes
Subbottom profiler (SBP)	✓	-	No	Yes	No
Sound Velocity Profiling (SVP)	-	-	No	No	No
Topographic Survey					
LiDAR	✓	✓	No	No	Yes

Activity Name	Location		Interaction		
	Marine	Terrestrial	Ground/Seabed Interaction	Underwater Noise	Air Noise
Aerial Surveys (Drone, Unmanned Aerial Vehicle [UAV], Fixed Wing Aircraft)	✓	✓	No	No	Yes
Biological Program					
Remote Operated Vehicle (ROV), Drop Camera	✓	-	No	No	No
Hydrophone (potential)	✓	-	No	No	No

Table 2-2: Description of Activities

Survey Type	Purpose	Field Methodology	Equipment Required	Transportation Mode	Location		Interactions		
					Marine	Terrestrial	Seabed	Underwater Noise	Air Noise
Geotechnical Program									
CPT	• To support determination of simultaneous laying and burial of the cable.	• A CPT is an instrument placed on the seabed; however, does not collect sediment, so much as measure the resistance to penetration to assess subsurface properties of substrate below the seabed.	• Will interact with the seabed but does not collect sediment.	Vessel.	✓	-	Yes	Yes	Yes
Visual assessment	• Verify observations / finding from Desktop Study (Tetra Tech, 2021) to confirm beach manhole locations and any potential anthropogenic / geological concerns.	• Site walkover at beach manhole locations, general vicinity and shoreline at low tide.	• N/A.	Vessel (marine), on foot (terrestrial).	✓	✓	No	No	No
Drilling (Boreholes)	• Understand the subsurface conditions, including soil and rock properties.	• Offshore drilling (boreholes) will occur every 50 m to 200 m within the Study Area, with distance depending on the community. • Onshore drilling (boreholes) will be at two pre-determined locations within the Study Area at each community. • Drilling (boreholes) will extend 10 m below the proposed HDD alignment (likely 10 to 40 m below ground / seabed surface). • Land and marine based drilling (boreholes) may require drill mud. Subsequent to drilling, excess soil and rock cuttings will be placed back down the hole with excess cuttings spread around the ground surface. No cuttings or drill fluids will be removed from site.	• For offshore drilling (boreholes), an ice auger will be used to create a hole through the ice to allow for extraction of seawater for drilling. • Water for terrestrial drilling (boreholes) will also be extracted from the ocean during open water conditions.	Drill rig on a barge (marine, iced ocean), ground (terrestrial).	✓	✓	Yes	Yes	Yes
Thermistors	• Measure ground temperatures to understand thickness of active layer / depth to permafrost.	• Thermistor strings will be installed in two onshore boreholes. One inch diameter PVC pipe is lowered to base of the borehole Upon completion of drilling and annulus between outer borehole and PVC backfilled with drill cuttings. The	• Thermistor cable and data logger with steel casing protectors.	Installed in onshore boreholes.	-	✓	Yes	No	No

Survey Type	Purpose	Field Methodology	Equipment Required	Transportation Mode	Location		Interactions		
					Marine	Terrestrial	Seabed	Underwater Noise	Air Noise
		thermistor string is then lowered to the base of borehole and attached to a data logger.							
Geophysical Program									
Swath Bathymetry with MBES	• Provide seabed profile along the survey route, which will be corrected for the speed of sound in seawater and recorded in metres.	• Provide dimensional bathymetric mapping of the cable route corridor using multiple beams elongated in the across track direction to cover a fan-shaped sector (or swath). The across track beam is typically 150° to 160° (Crocker & Fratantonio, 2016).	• Hull or pole mounted swathe system that will obtain continuous depth recordings. • Depth resolution and bathymetric accuracy of 1%.	Vessel.	✓	-	No	Yes	No
SSS	• Required to document all natural and anthropogenic seabed features, and specifically those that may cause design concerns. • Aid in identification of seafloor sediment, surficial bedrock outcrops and geomorphology mapping.	• High resolution and detailed two-dimensional imagery of the seabed. • Use of an acoustic beam to obtain an accurate image over a narrow area of seabed to either side of the instrument. • Generate high frequency acoustic pulses. • The intensity of the acoustic reflections from the seafloor is recorded in a series of cross-track images. When stitched together, these form a view of the seafloor within the swath of the beam. • Typically, an angle range of 50 m to 300 m on either side of the instrument.	• Will be integrated with the MBES data. • The minimum operating frequency shall be 300 kHz (buried cable route).	Vessel.	✓	-	No	Yes	No
ERT	• To differentiate surficial geology above bedrock.	• Cales laid onto ground surface and electrodes inserted into ground with cables extending 100 to 200 m, perpendicular to the HDD alignment, to achieve 30 m below ground surface penetration.	• Resistivity meter, cable and electrodes, and portable battery.	On foot.	-	✓	Yes	No	No
OTV and/or ATV	• Assess structural geology and groundwater conditions. Assesses natural defect including orientation and aperture.	• Upon completion of the borehole a borehole caliper / centralizer is lowered to the bottom and the either ATV or OTV is lowered with a winch to complete a complete record of the walls of the borehole.	• Cable and winch, downhole logging system, borehole caliper, OTV and ATV Tool.	On foot.	✓	✓	Yes	Yes	No

Survey Type	Purpose	Field Methodology	Equipment Required	Transportation Mode	Location		Interactions		
					Marine	Terrestrial	Seabed	Underwater Noise	Air Noise
Magnetometer	• Identify anomalies or issues with collection of survey data. • Aid in collecting data to identify existing anthropogenic infrastructure (e.g. existing BU).	• Passive towed sensor used to measure magnetic field strength and to detect variations in the total magnetic field of the underlying seafloor. • Does not transmit any signals to the marine environment.	• Identify any anomalies or issues requiring further investigation that arise during the collection of any survey data along any of the survey lines.	Vessel.	✓	-	No	No	No
Seismic Reflection & Refraction	• To identify depth to bedrock and key structural geological features (faults, highly fractured / sheared zones).	• Cables laid onto seabed / ground surface extending 100 m to 200 m, perpendicular to the HDD alignment, to achieve 50 m below seabed / ground surface penetration.	• Seismograph, cables and geophones, and airgun.	Vessel (marine), on foot (terrestrial).	✓	✓	Yes	Yes	Yes
SBP	• Determine the thickness and nature of substrate conditions below the seabed. • Identify subsurface seabed features, inclusive of type, texture, variability. • Identify nature and density of subsurface seabed for up to 4 m below the seabed. • Investigate the upper layers of the seabed sediments for cable burial potential and installations risk from seabed obstructions (e.g. rock formations).	• Most likely to be towed but can be hull mounted. • Can penetrate the seabed to a range of depths to identify changes in sediment or structures within the sediment. • Generate acoustic signal through impulsive physical processes of electrostatic discharge (e.g. sparkers) or electromagnetically via accelerated water mass (e.g. boomers).	• High-resolution SBP is required to determine the thickness and nature of the sediments. Details and resolution of sediments to 1 m greater than the target depth of burial is critical, but the system must be capable of determining the geology and structure of the underlying seabed. • Utilize equipment that maximizes the identification of obstacles to cable burial.	Vessel.	✓	-	No	Yes	No
SVP	• Required to accurately collect depth measurements and terrain mapping.	• Sound speed profiler is integrated with the MBES data.	• Winch / deployment frame. • Sound velocity, temperature and pressure sensor.	Vessel.	✓	-	No	No	No
Topographic Program									
LiDAR	• Survey to collect ground surface elevation and	• Pre-programmed flight routes to be flown at low tide in each community.	• Drone.	On foot.	-	✓	No	No	Yes

Survey Type	Purpose	Field Methodology	Equipment Required	Transportation Mode	Location		Interactions		
					Marine	Terrestrial	Seabed	Underwater Noise	Air Noise
Aerial Surveys (Drone, UAV, Fixed Wing Aircraft)	anthropogenic features in each community, particularly at beach manhole locations.				-	✓	No	No	Yes
Biological Program									
ROV / or Drop Camera	• Visual observation of seabed conditions to support regulatory and environmental requirements.	• A device with a camera attached by a tether to a laptop to view video in real time. • Can be submerged in depths up to 300 m. • Pre-determined transect locations along the HDD alignment will be observed.	• ROV / drop camera, tether.	Vessel.	✓	-	No	No	No
Passive acoustic hydrophones	• A stationary autonomous system to assess for noise (anthropogenic) and sound (marine mammals).	• A hydrophone array towed behind the vessel or on a stationary anchored system on an acoustic release. • Autonomous system with a long-term recorder, allowing for the hydrophone to record the soundscape continuously while the KBC HDD Engineering Support Program is underway. • Minimum sample rate up of 96 kHz.	• Hydrophone, acoustic release, weights, polypropylene line.	Vessel.	✓	-	No	No	No

2.2 Schedule

The KBC HDD Engineering Support Program will likely be supported by several consultants who are supporting Worley Consulting to complete the activities. There may be three to five field programs performed in each community which would be carried out between the open water season of 2025 to the spring of 2027. Collectively, this will be up to 30 days in each community.

2.3 Equipment

Equipment expected to be required for the KBC HDD Engineering Support Program are summarized in Table 2-3. Exact specifications of equipment will be a contractor led decision, but the types of equipment used is not expected to change potential environmental effects outlined in Section 4.

Table 2-3: Equipment Requirements for the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Activity Name	Equipment Required	Quantity	Size & Dimensions	Proposed Use
Geotechnical Program				
CPT	CPT	1	2.5 m x 1.5 m	To support determination of simultaneous laying and burial of the cable.
Visual assessment	-	-	-	Visual observation to confirm beach manhole location and any potential anthropogenic / geological concerns.
Drilling (Boreholes)	Mounted drill (CME45/55)	1	2.5 m x 5.5 m x 3 m	Geotechnical drill rig for onshore and marine drilling (boreholes).
Thermistors	Thermistor Strings	2	10 m x 5 cm	Measure ground temperature to understand depth of active layer above permafrost.
Geophysical Program				
MBES	MBES	1	1 m x 50 cm	Bathymetry with an approximately 200 m wide survey corridor along HDD alignment.
SSS	SSS	1	2 m x 50 cm	Seabed type / conditions along and perpendicular to HDD alignment.
ERT	Electrodes and Cables	2	100 m x 5 cm	Differentiate surficial geology above the bedrock.
Downhole OTV and ATV	OTV / ATV Probe	1	2 m x 5 cm	Assess structural geology and groundwater conditions.

Activity Name	Equipment Required	Quantity	Size & Dimensions	Proposed Use
	Borehole Caliper	1	To be confirmed	Records borehole diameter and combined with the OTV / ATV probe, assesses the structural geology and groundwater conditions.
	Winch	1	To be confirmed	Used to lower the OTV / ATV probe.
Magnetometer	Magnetometer	1	2 m x 50 cm	Combined with SSS to assess seabed morphology and submerged objects.
Seismic Reflection & Refraction	Airgun	1	90 cm x 9 m	Seismic source for seismic refraction and Multi-channel Analysis of Surface Waves (MASW).
SBP	SBP	1	1 m x 1 m	Ground conditions below seabed with an approximately 200 m wide survey corridor along HDD alignment.
SVP	SVP	1	8 cm x 27 cm	To measure the speed of sound at different water column depths.
Topographic Survey				
LiDAR, Aerial Surveys	Drone, UAV, Fixed Wing Aircraft	1	To be confirmed	Drone, UAV and/or Fixed Wing Aircraft to conduct LiDAR and aerial surveys.
Biological Program				
ROV, Drop Camera	ROV	1	72 cm x 24 cm x 44 cm	Visual observations of seabed conditions along and perpendicular to the HDD alignments.
	Drop Camera	1	2.5 m x 1.5 m	
Hydrophone (potential)	Hydrophone	1	530 mm long x 60 mm diameter	Assess for noise (anthropogenic) and sound (marine mammals).

3 Existing Conditions: Fish, Marine Mammals, Migratory Birds and Their Habitats

Existing conditions for fish, marine mammals and their habitats were assessed through desktop review.

Important Inuit Qaujimajatuqangit (IQ) desktop resources that contributed to the understanding of existing conditions are listed below:

- Recommended Nunavut Land Use Plan (RNLUP) (NPC, 2023a) and Interactive Maps (NPC, 2023b).
- Nunavut Coastal Resources Inventory (NCRI) for Coral Harbour (Salliq), Iqaluit, Kimmirut, and Kinngait (GN, 2009, 2012a, 2018).
- Nunavut Wildlife Harvest Study (NWHS) (Priest & Usher, 2004).
- Inuit Bowhead Knowledge Study (IBKS) (NWMB, 2000).
- Important Bird Area (IBA) Database (IBA Canada, 2011)

3.1 Aquatic Species

Focal marine fish, marine mammals and marine and migratory birds were selected based on desktop study with the selection criteria as summarized below and defined in Table 3-1.

- Importance to Inuit for subsistence and food security.
- Geographic ranges, which includes the potential to occur in the KBC HDD Engineering Support Program footprint.
- Representative role in food chain dynamics.

Focal species for the KBC HDD Engineering Support Program with their species description are listed in Appendix B (Table B-1).

Table 3-1: Arctic Species Spatial Categories and Descriptions

Category	Definition
Resident	Species that occupy in the same general area throughout the year.
Migratory	Species that predictably reside within the Arctic region for a portion of the year (seasonal, annual), most typically the open-water season. Typically triggered by local climate, food availability or for mating reasons.
Anadromous	The movement of fish between freshwater and marine environments for the purpose of feeding in one environment and spawning in the other[1].

Note:
1. Only applicable to fish

3.1.1 Designated Species

Species At Risk (SAR) were categorized by international, federal, and territorial designations, and were selected as those having the potential to overlap within the KBC HDD Engineering Support Program Study Areas for various life history stages (e.g., breeding, nursery, resident, migration, and feeding). See

Appendix B (Table B-2) for a full list of species with designations that have the potential to be present during the KBC HDD Engineering Support Program.

3.1.2 Aquatic Invasive Species

Risk of introducing invasive species in the NSA due to the KBC HDD Engineering Support Program is not expected. Vessels and equipment performing the KBC HDD Engineering Support Program will be in compliance with pertinent regulations to prevent importing, releasing, introducing, possessing, or transporting aquatic invasive species.

3.2 Fish Habitat

3.2.1 Designated Habitats

The KBC HDD Engineering Support Program will be in proximity to several designated habitats as summarized in Table 3-2. The location of these designated habitats is provided in Appendix A (Figure A-5, Figure A-6, Figure A- 7).

Table 3-2: Designated Areas Within or in Proximity to the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Designated Area	Description	Community in Proximity	Distance and Direction from the KBC HDD Engineering Support Program
Southampton Island Area of Interest (AOI)	The Southampton Island AOI, approximately 93,000 km^2, was established in 2019 due to numerous colonies of seabirds, the presence of Atlantic walrus (*Odobenus rosmarus ssp. rosmarus*) haul-out sites, polar bear (*Ursus maritimus*) dens, and as the region is an important migratory pathway for marine mammals (DFO, 2015, 2022). Fisheries and Oceans Canada is working with the Kivalliq Inuit Association (KIA) to designate the South Hampton Island AOI as a Marine Protected Area (MPA) (DFO, 2022). It would be the first MPA within Hudson Bay. Coral Harbour (Salliq) is located on Southampton Island within the AOI.	Coral Harbour (Salliq)	The Coral Harbour (Salliq) Study Area is within the Southampton Island AOI.
Western Hudson Strait (WHS)	The WHS Ecologically and Biologically Significant Area (EBSA) was established for its uniqueness to a migration corridor for the Western and Eastern Hudson Bay beluga whale (*Delphinapterus leucas*), overwintering for bowhead whales (*Balaena mysticetus*), and Atlantic walrus haul-out sites. Aggregations of seabird colonies (murres: *Uria* spp.), sea duck nesting (eiders: *Somateria* spp.), epibenthic habitat, and sponge (*Porifera* sp) beds are other reasons for its designation (DFO, 2011).	Kinngait, Salluit	The Kinngait and Salluit Study Area are within the WHS.
Qaqsauqtuuq Migratory Bird Sanctuaries (MBS)	On Southampton Island (ECCC, 2025c), species known to breed in the Qaqsauqtuuq MBS (formerly known as the East Bay MBS) include lesser snow goose (*Chen caerulescens*), Atlantic brant (*Branta bernicla hrota*), cackling goose (*Branta hutchinsii*), king eider (*Somateria spectabilis*), long-tail duck (*Clangula hyemalis*) and tundra swan (*Cygnus columbianus*), along with over a dozen other species of loon (*Gavia spp.*), gull (*Larus spp.*), plover (*Pluvianus spp.*) and jaeger (*Stercorarius spp.*). The Qaqsauqtuuq MBS is part of the East Bay/ Native Bay IBA.	Coral Harbour (Salliq)	The East Bay MBS is adjacent to the Coral Harbour (Salliq) Study Area, approximately 35 km east.
Ikkattuaq MBS	On Southampton Island, the Ikkattuaq MBS (formerly known as the Harry Gibbons MBS) was designated due to its importance as nesting habitat for the lesser snow goose (ECCC, 2025a). The MBS is also utilized for nesting by over a dozen other migratory bird species.	Coral Harbour (Salliq)	The Ikkattuaq MBS is adjacent to the Coral Harbour (Salliq) Study Area, approximately 110 km west.

Designated Area	Description	Community in Proximity	Distance and Direction from the KBC HDD Engineering Support Program
East Bay / Native Bay IBA[3]	On Southampton Island, the East Bay/Native Bay IBA is key breeding species include thousands of common eiders (*Somateria mollissima borealis*), lesser snow geese, Atlantic brant, cackling goose, and black guillemot (*Cepphus grille*), and red phalarope (*Phalaropus fulicarius*). The site's diverse habitats, including rocky flats, tundra ponds, and limestone outcrops, provides critical nesting and staging grounds for waterfowl and seabirds (Birds Canada, 2017).	Coral Harbour (Salliq)	The East Bay/Native Bay IBA is adjacent to the Coral Harbour (Salliq) Study Area, approximately 10 km east.

Note: See Appendix A (Figure A-6, Figure A- 7) for graphical representation of KBC HDD Engineering Support Program relative to designated areas

[3] The East Bay/ Native Bay IBA location depiction is available in this URL: https://www.ibacanada.com/maps/sites/NU023.pdf

3.2.2 Critical Habitats

For all designated species, the *Species at Risk Act* (SARA) defines critical habitat as "the habitat that is necessary for the survival or recovery of listed extirpated, endangered, or threatened species, and that is identified as critical habitat in a recovery strategy or action plan" (DFO, 2020a). Further to this, a Critical Habitat Order provides legal protection to the critical habitats of listed species through the application of the prohibition in subsection 58(1) of SARA.

There are no SARA-defined or critical habitats being considered in proximity to the KBC HDD Engineering Support Program.

3.2.3 Important Habitats Defined by the Recommended Nunavut Land Use Plan

Several important habitats defined in the RNLUP that may be in close to the KBC HDD Engineering Support Program are presented in Appendix A (Figure A-5, Marine Mammals | Figure A-6, Migratory Birds).

Based on the schedule of the KBC HDD Engineering Support Program (see Section 2.2), seasonal interactions with the following species areas may be encountered:

- Bowhead whale calving area.
- Atlantic walrus terrestrial haul outs.
- Polar bear denning.
- Polynyas.

Mitigation measures to protect these important habitats have been incorporated into this EMP.

4 Potential Environmental Effects

Potential negative environmental effects due to the HDD Engineering Support Program are summarized in Table 4-1. There are no residual environmental effects, after the implementation of environmental management as outlined in Section 5.

Table 4-1: Potential Effects Due to the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Effect	Section
Disturbance, injury, or mortality to fish and marine mammals due to underwater noise	4.1
Disturance, injury, or mortality to marine and migratory birds due to air noise	4.2
Sediment and water quality degradation	4.3
Physical damage to marine organisms (crushing, burial, or mortality)	4.4
Modification and destruction of fish habitat	4.5
Important marine habitats	4.6
Waste production and Accidental Spills	4.7
Terrestrial And Wildlife Disturbance	4.8

4.1 Disturbance or Injury to Fish or Marine Mammals Due to Underwater Noise

Some equipment required to implement the KBC HDD Engineering Support Program can contribute to anthropogenic noise in the marine environment. These effects can be managed through implementation of Exclusion Zones (EZ) and hydroacoustic monitoring.

There are currently no federal noise disturbance criteria in Canada; however, marine mammal noise threshold guidance is provided by the National Oceanic and Atmospheric Administration (NOAA) (NMFS, 2024a) and by DFO-FFHPP through LoAs and *Fisheries Act* Authorization (FAA) which have consistently been providing underwater acoustic metrics and distance radii for EZs relevant to fish and marine mammals. Anthropogenic noise in water are categorized as impulsive or continuous signals (TC, 2020). Impulsive signals include impact pile driving, air guns, explosions and sonar pings. Continuous signals on the other hand include activities such as vibratory pile driving, drilling rigs, and ship engines. There is the potential for some of the KBC HDD Engineering Support Program equipment to contribute to both continuous and impulsive anthropogenic noise (see Table 4-2) in the marine environment. The SSS, MBES, SBP, and Seismic Reflection & Refraction will generate impulsive signals, and the CPT and Drilling (boreholes) will generate continuous signals (see maximum source Sound Pressure Level [SPL] in Table 4-2 (NMFS, 2024b)).

Marine mammals can be categorized into different hearing groups, which reflect major taxonomic groups including baleen whales (Low Frequency Cetaceans [LFC]), odontocete whales (high and very High Frequency Cetaceans [HFC]), phocid pinnipeds (in water [PW]), and Otariids and other non-phocid marine carnivores (in water [OW]), among others. These taxonomic groups reflect the species groups regularly found in Study Area and were selected as focal species when assessing disturbance of underwater noise. Fish were also be considered when assessing the impacts of underwater noise using a single hearing group for Arctic fish. The hearing ranges of these groups are provided in Table 4-3, along with auditory thresholds (see hearing range) for injury and behavioural disturbance from NOAA (NMFS,

2024a). This can be compared to the minimum and maximum frequency range of the equipment (Table 4-2) to consider 'an overlap' for the audible range of marine species. Therefore, noise generated due to the MBES and SSS is not likely to negatively impact marine mammals as it operates at a higher frequency than the audible range of the focal marine mammals. However, remaining components of the Geophysical (SBP, Seismic Reflection & Refraction) and the Geotechnical (CPT, Drilling [Boreholes]) do operate within marine mammal audible ranges.

Exclusion Zones will be in place during the components of the KBC HDD Engineering Support Program that occur in the open water season to mitigate injury from underwater noise.

Table 4-2: Specifications of Acoustic Sources[3]

Equipment Type	Frequency Range		Noise Type	Impulse Duration (ms)	Maximum Source SPL[1] (dB)		Reference
	Minimum	Maximum			Minimum	Maximum	
Geotechnical Program							
CPT	28 Hz		Continuous	N/A	118	145	BOEM (2012); ERGRID PLC (2014)
Drilling (Boreholes)	20 Hz	200 Hz	Continuous	N/A	142	160	Erbe and McPherson (2017)
Geophysical Program							
MBES	200 kHz	700 kHz	Impulsive	0.05 - 10	210	245	BEIS (2020); Crocker and Fratantonio (2016); Danson (2005); DECC (2011); Hopkins (2023); Lurton (2016); Lurton and DeRuiter (2011)
SSS	300 kHz	900 kHz	Impulsive	0.4 - 1.0	200	240	BEIS (2020); Crocker (2016); Crocker and Fratantonio (2016)
Seismic Reflection & Refraction	30 Hz	250 Hz	Impulsive	5 - 15	193	193	Frontier Geosciences Inc. (2025)
SBP[2]	2 kHz	16 kHz	Impulsive	5 - 40	185	215	Crocker and Fratantonio (2016); Hartley Anderson (2020)

Note:

1. Measurement applies for 1 µPa at 1 m
2. Source levels for all equipment and frequency ranges for SBPs derived from Crocker and Fratantonio (2016) and Hartley Anderson (2020). Parametric SBP operates with two differences sources simultaneously and thus has two frequency ranges/ source levels
3. Note, any equipment not listed here is not considered sound producing

Table 4-3: National Oceanic and Atmospheric Administration Acoustic Injury and Behavioural Disturbance Thresholds

Hearing Group	Hearing Range	Applicable Species	Impulsive Source (0-pk, re 1 µPa)			Continuous Source (root mean square [RMS], re 1 µPa)		
			Auditory Injury	Temporary Threshold Shift	Behavioural Disturbance	Auditory Injury	Temporary Threshold Shift	Behavioural Disturbance
LFC	7 Hz – 36 kHz	Bowhead Whale	222 decibels (dB)	216 dB	160 dB	197 dB	177 dB	120 dB
HFC	150 Hz – 160 kHz	Beluga, Narwhal, Killer whale	230 dB	224 dB		201 dB	181 dB	
PW	40 Hz – 90 kHz	Ringed Seal (*Pusa hispida*), Bearded Seal (*Erignathus barbatus*)	223 dB	217 dB		195 dB	175 dB	
OW	60 Hz – 68 kHz	Atlantic walrus	230 dB	224 dB		199 dB	179 dB	
Fish	-	Arctic Cod (*Boreogadus saida*), Arctic Char (*Salvelinus alpinus*)	206 dB	-	150 dB	-	-	-

Source: Hearing range from Table 1 in NMFS (2024b)

Note: Sound Pressure Levels provided in table are flat weighted. Fish in NOAA (NMFS, 2024a) are divided into two groups; <2 g and >2 g with differing Sound Exposure Level (SEL) thresholds, but were simplified into single category for this table since peak injury and behavioural disturbance thresholds were the same between group

4.2 Disturbance or Injury to Marine or Migratory Birds Due to Air Noise

Some activities, similar to those described in Section 4.1 (marine mammals) have the potential to cause disturbance to marine and migratory birds. Nesting seasons and important habitats (MBS, IBA, RNLUP Bird Classes (see Section 3.2.1) pertinent to marine and migratory birds) are provided in Appendix A (Figure A-6). Figure 4-1 depicts the nesting seasons for the areas pertinent to the HDD Engineering Support Program; the nesting seasons for each of the four communities are:

- Coral Harbour (Salliq): N9 (adjacent to N8): Mid May to Mid August.
- Kinngait, Kimmirut, Iqaluit: N10: Late May to Mid August.

There is the potential for disturbance to marine and migratory birds, due to 'air noise' producing activities. However, the spatial areas (see Study Areas in Appendix A (Figure A-1, Figure A-2, Figure A-3, Figure A-4) are not located in areas that have the potential for 'high aggregation' of birds. Air noise-producing activities will also not be occurring during the peak nesting season, and the scale of the surveys is considered very localized in terms of potential for effects.

Measures to be followed during Aerial Surveys are provided in Section 5.4.6.

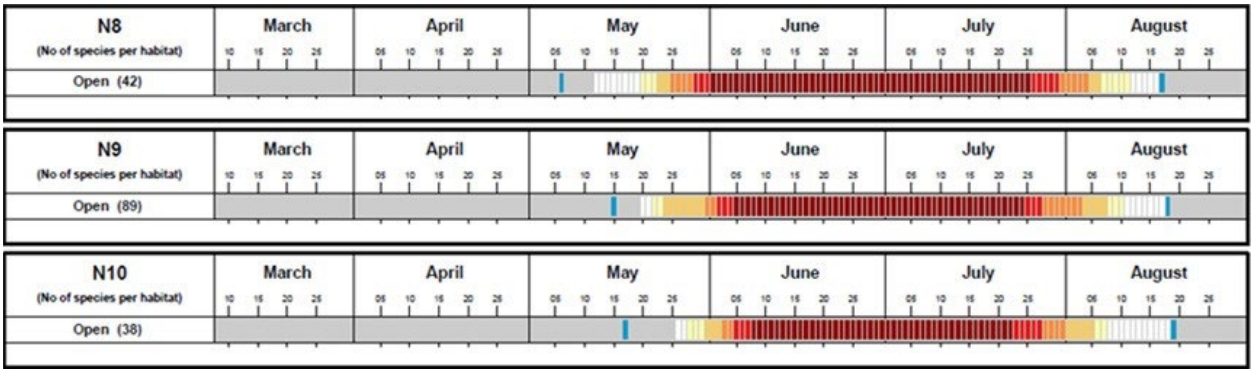


Figure 4-1: Nesting Windows for Marine and Migratory Birds in the Vicinity of the Horizontal Directional Drilling Engineering Support Program

Source: ECCC (2025b)

4.3 Sediment and Water Quality Degradation

Short-term degradation of marine water quality has the potential to occur during the KBC HDD Engineering Support Program as a result of accidental spills, or due to turbidity from the activities that interact with the seabed.

Negative effects on water quality are expected to be minimal and will be managed through appropriate BMPs and mitigation measures (see Sections 5.1, 5.3). A spill prevention and response procedure will be implemented to ensure the appropriate spill response equipment is on site should a spill occur (described in Section 5.3.12), as well as follow the Spill Planning and Reporting Regulations in Nunavut (Section 5.3.12.1). The potential environmental effects and responses are further described in Section 4.7.

Seafloor disturbance during sediment sampling is expected to be minimal as the footprint of the drill head (diameter of 150 millimetres (mm)) is considered relatively small in comparison to the extent of available seabed. Turbidity is not anticipated to exceed the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines (WQG) (CCME, 2002), and turbidity beyond a compliance monitoring zone (generally 30 m from source) is not expected to occur. Worley Consulting has performed environmental monitoring for a multitude of drilling studies in southern locations with open water conditions and compliance monitoring as per CCME WQG (CCME, 2002) has never been required. Turbidity monitoring during an iced ocean program is not practical, but due to the small size of the drill head and QP experience, negative effects to fish and fish habitat are not expected. Sediment and water quality mitigation measures are summarized in Section 5.3.3.

4.4 Physical Damage to Marine Organisms (Crushing, Burial or Desiccation)

Physical damage to marine organisms is not expected to occur and direct mortality to fish is improbably given the small footprint of the drill heads and the mitigation measures in place for underwater noise.

4.5 Modification and Destruction of Fish Habitat

The impacts to the seabed during the KBC HDD Engineering Support Program, as summarized in Section 4.3, will be minimal and temporary in nature should it occur. There are no activities that will cause permanent damage to fish habitat.

4.6 Important Marine Habitats

There will be no impact to the important marine habitats as described in Section 3.2.1. Mitigation and monitoring measures that are described in Section 5.3 and 5.4, such as those for spill response, will be in place throughout the KBC HDD Engineering Support Program.

4.7 Waste Production and Accidental Spills

The KBC HDD Engineering Support Program waste generation will be reduced when possible and disposed of appropriately as outlined in the Waste Management mitigation measures (Section 5.3.11).

While accidental spills may occur, there will be BMPs in place to minimize the potential for spills to occur. If spills do occur, there will be appropriate spill response equipment on site (see Section 5.3.12). The KBC HDD Engineering Support Program will be in compliance with the Spill Planning and Reporting Regulations in Nunavut. Spill response measures will be designed to be implemented for the prevention and management of spills to a worst-case scenario size that could occur as a result of the KBC HDD Engineering Support Program (further described in Section 5.3.12.1).

4.8 Terrestrial and Wildlife Disturbance

There will be minimal impacts to terrestrial habitats and wildlife. The KBC HDD Engineering Support Program will be undertaken in a well-trafficked, disturbed area. A wildlife monitor will be present during all aspects of the KBC HDD Engineering Support Program. Personnel will undergo wildlife training and any wastes generated will be appropriately stored so as not to attract wildlife.

5 Environmental Management

5.1 Guidelines and Best Management Practices

The following guidelines and BMPs are relevant to the KBC HDD Engineering Support Program.

- DFO: Fish and Fish Habitat Protection Policy statement (DFO, 2019).
- DFO: Measures to Protect Fish and Fish Habitat (DFO, 2025b).
- DFO: Interim code of practice: End-of-pip fish protection screens for small water intakes in freshwater (DFO, 2020b).
- DFO: Pathways of Effects (PoE) (DFO, 2024a).
- NPC: RNLUP (NPC, 2023a).
- NOAA: 2024 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0) (NMFS, 2024a).
- Government of Canada: Guidelines for Spill Contingency Planning (INAC, 2013).
- Government of Canada: National Oil Spill Preparedness and Response Regime (TC, 2019).
- Canadian Construction Association (CCA): 81 – 2001: A Best Practices Guide to Solid Waste Reduction (Canadian Construction Association, 2001).
- GN: Non-native and invasive species in Nunavut (GN & ECCC, 2022).
- GN: Contingency Planning and Spill Reporting in Nunavut. A Guide to the New Regulations (GN, 2022).
- GN-Department of Environment (DoE): Environmental Guideline for the General Management of Hazard Waste (GN, 1999).
- Canadian Environmental Quality Guidelines (CEQG) (CCME, 2024).
- Environment and Climate Change Canada (ECCC): Guidelines to Avoid Harm to Migratory Birds (ECCC, 2024).

5.2 Roles and Responsibilities

The requirements to meet regulatory commitments will be undertaken by the GN-TIN, the marine regulatory permitting specialists, and Seaforth's team. The roles and responsibilities for each team with respect to management of environmental performance on the KBC HDD Engineering Support Program are described below. The responsibility for the application of this EMP encompasses all personnel.

5.2.1 Government of Nunavut

The GN-TIN will undertake the following responsibilities to manage regulatory compliance:

- Communicating with AHJs on matters related to permitting and regulatory compliance.
- Continued consultation with the communities and Hamlets.
- Coordination with the contractor to manage and communicate on compliance issues.

- Transmitting monitoring reports and incident notices to AHJs, community members and groups, as necessary.

5.2.2 Regulatory Permitting Specialists – Dynamic Ocean Consulting Ltd.

Dynamic Ocean will support GN-TIN as the Environmental Inspector (EI) as described below:

- Support to the GN-TIN responsibilities summarized above.
- Acquisition of GN-TIN permits to support the implementation of the KBC HDD Engineering Support Program.
- Monitor that the contractor's activities comply with contractual requirements and the approved design, including environmental requirements, regulations and relevant permits and approvals.
- Support GN-TIN to confirm the contractor's environmental QP is appropriately qualified and understands the compliance requirements outlined in this EMP and all associated permits issued by AHJs.

5.2.3 Worley Canada Services Ltd.

The work shall be overseen by the Worley Consulting Field Lead and may be supported by several consulting firms. Local helpers will be used to support as a wildlife, fish, and Marine Mammal Observer (MMO). A communication protocol (e.g. mobile phones, Very High Frequency (VHF) radio) must be established between the local helper, the Worley Consulting Team and their supporting consultants to enable effective regulatory compliance procedures.

5.3 Mitigation Measures

Mitigation measures to be implemented to minimize negative effects are provided in this section. The categories of considered impacts were developed during the NIRB permitting process, and while assigned to one category, may be applicable to others. These measures, combined with AHJ approvals constitute the regulatory compliance program.

Additional measures that are required through conditions issued by NIRB, the NWB and CIRNAC pertinent to the KBC HDD Engineering Support Program must also be followed.

5.3.1 General

Table 5-1: General Mitigation

ID	Mitigation Measure
G1	A qualified Environmental Monitor (EM) / MMO will be available the duration of the KBC HDD Engineering Support Program and will be responsible for the implementation of measures as outlined in this EMP, and as detailed in permit conditions from pertinent AHJs.
G2	The GN-TIN shall ensure that all personnel, staff and contractors are adequately trained prior to commencement of all activities, and shall be made aware of all operational plans, management plans, guidelines.
G3	Sufficient planning should be undertaken to limit the duration of in-water (or over water) works, undertakings and activities (conducting operations) so as to not diminish the ability of fish to carry out one or more of their life processes (e.g., spawning, rearing, feeding,

ID	Mitigation Measure
	migrating).
G4	The contractor will suspend all activities should any dead fish or wildlife (both marine and terrestrial), or any injured wildlife be observed during any works or activities around Study Areas. Activities may only be resumed on the recommendation of the authorizing agencies.
G5	Appropriate stop-work and non-compliance reporting will be implemented as applicable. See Section 5.8.
G6	Routine inspections of the support equipment (survey equipment and those used for transportation (e.g. vessels, trucks, all-terrain vehicles), as required to ensure regulatory compliance.
G7	The GN's EI or the Worley Consulting Field Lead will complete all AHJ communications as summarized in Section 5.2.3.

5.3.2 Project Permit and Approval Compliance

Mitigation measures associated with project permit and approval compliance are described in Table 5-2.

Table 5-2: Project Permit and Approval Compliance

ID	Mitigation Measure
PPAC1	The GN-TIN and their contractor will operate in compliance with applicable Acts, Regulations and BMPs (see Section 5.1). This includes permits, approvals and authorizations received after issuance of this EMP.
PPAC2	GN-TIN and the contractor will provide each other copies all permits they respectively obtained in advance of mobilization. The contractor will maintain copies of Project permits, approvals and authorizations issued by AHJs at the site at all times.
PPAC3	A copy of each permit, license, or other authorization issued for the Project will be submitted to NPC and the NIRB as per S 137(4) of the NuPPAA. The GN-TIN will be responsible for the submission of permits on behalf of the contractor.
PPAC4	The contractor's EM will conduct a 'tail-gate' meeting prior to the start of the KBC HDD Engineering Support Program to confirm that all personnel are aware of regulatory compliance requirements and understand their responsibilities (e.g. during spill response).
PPAC5	The GN-TIN will provide pertinent AHJs with copies of all permits issues for the KBC HDD Engineering Support Program in advance of field program mobilization.

5.3.3 Sediment and Water Quality

Mitigation measures for sediment and water quality are described in Table 5-3.

Table 5-3: Sediment and Water Quality

ID	Mitigation Measure
SWQ1	For activities with seabed interactions that occur in open-ocean conditions the EM will confirm that the KBC HDD Engineering Support Program will not result in exceedances outside the Compliance Monitoring Zone (CMZ), following the CCME Approved WQG. Monitoring and compliance thresholds are outlined in Section 5.3.3.
SWQ2	Machinery and equipment will be maintained in good working order to minimize emissions.
SWQ3	The Contractor will not deposit any deleterious substances (e.g., fuel, chemicals, waste) into the marine environment. Should such activities occur, appropriate measures for response and reporting must be adhered to as outlined in Section 5.3.12.1.
SWQ4	Drill muds, additives, and other products shall be non-toxic and environmentally friendly.
SWQ5	Measures designed to minimize disturbance to seabed sediments, benthic communities, and marine wildlife will be implemented when carrying out activities within the marine environment.

5.3.4 Fish and Fish Habitat (Including Marine Mammals)

Mitigation measures for fish, fish habitat, and marine mammals are described in Table 5-4.

Table 5-4: Fish and Fish Habitat (Including Marine Mammals)

ID	Mitigation Measure
FMM1	Visual monitoring will be undertaken as described in Section 5.4.2. All aquatic works will cease in the event of fish kill/injury or stress to aquatic wildlife is observed until the EM can provide guidance for the continuation of program activities.
FMM2	The vessel captain (or operator) will maintain vigilance for marine mammals. Minimum approach distances and best practices as outlined in the MMR must be adhered to, and protected areas as outlined within the most recent Notice to Mariners published by the Canadian Coast Guard (CCG) at the time of the KBC HDD Engineering Support Program will be followed.
FMM3	An MMO will be available for the duration of the KBC HDD Engineering Support Program to monitor for the presence of marine mammals and document species observations. The EZ will be set and maintained as described in Section 5.4.4.
FMM4	Activities shall cease if there is risk of physical harm to a marine mammal from direct contact. Activities shall only resume once there is no longer a risk of injury to marine mammals from direct contact. Monitoring is described in Section 5.4.2.
FMM5	Should monitoring of the EZ occur in low light or dark conditions, the EM/MMO will utilize appropriate techniques to allow for appropriate management of the EZ in low light

ID	Mitigation Measure
	conditions. Minimum requirements for the management of the EZ are described in Section 5.4.4.
FMM6	Activities shall cease if there is risk of physical harm to a marine mammal from direct contact. Activities shall only resume once there is no longer a risk of injury to marine mammals from direct contact. Monitoring is described in Section 5.4.2.
FMM7	The minimum gear power required to achieve survey objectives will be employed to minimize the impact on marine wildlife. A ramp up procedure will be established when feasible for the equipment type with a gradual increase of power to allow undetected marine wildlife to exit the vicinity before source levels reach thresholds for injury.
FMM8	Water will not be extracted from any fish-bearing waterbody unless undertaken in compliance with NWB and DFO-FFHPP legislative requirements. If salt water extraction is required for desalination for fresh water, water intake must be in compliance with DFO-FFHPP's SCOPs for end of pipe fish protection screens (DFO, 2024b).
FMM9	The Contractor shall implement measures designed to minimize disturbance to seabed sediments and benthic communities and marine wildlife when carrying out activities within the marine environment.
FMM10	Drilling activity will be ceased if there is a risk of physical harm to any seals from direct contact. Activity will only resume once there is no longer risk of injury to seals from direct contact.

5.3.5 Wildlife and Migratory Bird Management

Mitigation measures for wildlife management are described in Table 5-5.

Table 5-5: Wildlife Management

ID	Mitigation Measure
WLMB1	A wildlife monitor/MMO will be present at all stages of the KBC HDD Engineering Support Program.
WLMB2	All project personnel will participate in wildlife safety training, including bear safety training. This will be carried out during the site orientation.
WLMB3	Waste material bins to prevent scavenging by wildlife and feral animals, as well as to control odour.
WLMB4	All site personnel will be instructed that the feeding of terrestrial or marine wildlife is prohibited.
WLMB5	The contractor shall confirm that their personnel are aware of the measures to protect wildlife and are provided with training and/or advice on how to implement these measures.
WLMB6	The Contractor shall carry out all phases of the KBC HDD Engineering Support Program in a manner that protects migratory birds and avoids harming, killing or disturbing migratory birds or destroying, disturbing or taking their nests or eggs.

ID	Mitigation Measure
WLMB7	No substantial alteration, damage or destruction to any wildlife habitat will occur when conducting this operation unless otherwise authorized by the appropriate authorizing agencies.
WLMB8	If a nest containing a migratory bird or egg is discovered, disruptive activities will cease until a buffer zone is established. The distance of the buffer zone will be based on appropriate setback for the species as confirmed by a QP. The buffer zone will remain in place until the young have naturally and permanently left the vicinity of the nest.
WLMB9	Any flight surveys (drone, UAV, fixed wing) will be performed as outlined in Section 5.4.6.

5.3.6 Species at Risk

Mitigation measures for SAR are described in Table 5-6.

Table 5-6: Species at Risk

ID	Mitigation Measure
SAR1	If SAR are reported or observed, the EM will record, document, and monitor their presence (including time, date, location, activity, and proximity to vessel) and determine potential impacts to SAR, as well as any modification to program activities that may be required to protect SAR.
SAR2	Should SAR species be observed, reporting to pertinent AHJs will be performed as summarized in Section 5.8.3).

5.3.7 Local Support and Harvesting

Mitigation measures for local support and Inuit harvesting are detailed in Table 5-7.

Table 5-7: Local Support and Harvesting

ID	Mitigation Measure
LSH1	The GN-TIN and their contractors should consult with local residents regarding their activities in the area and solicit available IQ and information that can inform KBC HDD Engineering Support Program activities.
LSH2	The GN-TIN and their contractors shall ensure that KBC HDD Engineering Support Program activities do not interfere with Inuit wildlife harvesting or traditional land use activities.
LSH3	The GN-TIN and their contractors shall, to the extent possible, hire local people and access local services where possible.

5.3.8 Air Quality

Mitigation measures for air quality are described in Table 5-8.

Table 5-8: Air Quality

ID	Mitigation Measure
AQ1	There will be no unnecessary idling of equipment or vehicles.
AQ2	Machinery and equipment will be maintained in good working order to minimize emissions.

5.3.9 Communication

Mitigations outlined in Table 5-9 pertain to communication with AHJs, stakeholders, the respective Hamlets, HTO/HTAs, and community members.

Table 5-9: Communication

ID	Mitigation Measure
COM1	Appropriate communication and documentation measures will be in place for reportable incidents (Section 5.8.3), non-compliances (Section 5.8.2) and adaptive management measures implemented (Section 5.5).
COM2	Communication requirements as required by permit conditions to pertinent AHJs will be completed as required. Parties responsible for AHJ communications is addressed in Section 5.2.
COM3	The contractor will include the GN-TIN representative on communications with AHJs, stakeholders or other community groups related to Project activities.
COM4	Communication protocols will be established to notify the community of marine activities, including ongoing consultation with the community and HTA.
COM5	An appropriate communication plan will be provided to the GN-TIN and their EI in advance of mobilization for the KBC HDD Engineering Support Program confirm that the EM and MMO have clear communication protocols with the contractor's site supervisor/foreman should shut down or other activities be required to be quickly communicated during program activities.

5.3.10 Fuelling and Chemical Storage

Near or over water re-fuelling is required due to the nature of the KBC HDD Engineering Support Program and because it is standard practice for marine-based studies. Measures are in place to minimize negative effects to the marine environment. These measures have been developed using BMPs and industry standard measures to minimize or prevent spills to the marine environment.

Table 5-10: Fuel and Chemical Storage

ID	Mitigation Measure
FCS1	Fuelling of equipment that may occur over and near water; the contractor will verify the use of secondary containment, drip trays, and fuel line check valves during fuelling, and have spill kits readily accessible.
FCS2	The Contractor shall ensure that re-fuelling of all equipment occurs in accordance with marine emission and air pollution standards (International Maritime Organization and International Maritime Dangerous Goods Code) and as required by the appropriate authorizing agencies.
FCS3	All fuel storage containers examined for leaks a minimum of once every day and all leaks repaired immediately. Further they will be covered to keep out rainwater and snow.
FCS4	Procedures and methods will be in place to prevent spillage of deleterious substances or debris falling into the marine environment including measures to minimize the spread to surrounding lands or into water.
FCS5	The contractor will maintain an inspection record for equipment used that requires hydraulic, fuel, and lubrication systems.
FCS6	The contractor will provide a list of all chemicals and expected volumes which are planned to be mobilized to site and stored for use. The plan will also include a description of how chemicals will be stored on site.
FCS7	The contractor shall ensure that wildlife deterrent systems are utilized at the time of a spill incident in order to avoid wildlife (terrestrial or marine) and migratory birds from being contaminated.
FCS8	All stationary petroleum products storage facilities shall be marked with flags, posts or similar devices so that they are at all times plainly visible.
FCS9	Routine inspection of storage areas, secondary containment, and containers for leaks, and addressing leaks or containers found in poor condition or improperly sealed.
FCS10	The Contractor will confirm during onboarding and tailgate meetings that all construction personnel that will be responsible in all aspects of management of storing, handling, transportation and use of petroleum products are appropriately trained to understand these responsibilities. The Contractor will maintain a training manifest to document safe procedures to minimize accidental spills are understood.

5.3.11 Waste Management

Mitigation measures for waste management are described in Table 5-11.

Table 5-11: Waste Management

ID	Mitigation Measure
WM1	Storage and handling procedures designed to prevent harm to personnel and the environment from hazardous materials, as per the Safety Data Sheets (SDS), shall be implemented. SDS will be kept on site.
WM2	Procedures and methods in place during the KBC HDD Engineering Support Program that prevents waste material from entering the environment. This will include plans on how food, food waste, and other attractants will be handled, stored, and disposed of safely to avoid attracting and habituating animals.
WM3	All garbage and debris shall be kept in a covered metal container until disposed of. All wastes shall be kept inaccessible to wildlife at all times.
WM4	All waste shall be properly sealed and transported to the appropriate disposal facilities if required. Records of disposal shall be maintained and available upon request.
WM5	Engine oils and lubricants will be stored in separate leak-proof containers.
WM6	Storage tanks used for mixing muds and storing fluids for the quarry drilling will be within a self -contained closed loop system to allow for reusing and minimization of waste.
WM7	Routine inspection of worksites, equipment, as required to ensure regulatory compliance and spill prevention.
WM8	All drill fluids used will be bio-degradable gum xanthan and have minimal impact on the environment.
WM9	All fluids used for drilling activities will be properly contained and labelled. Secondary containment will be provided.
WM10	Waste will be stored in labelled containers and appropriately segregated based on material.
WM11	Disposal of drill wastes shall be undertaken in a way that does not cause harm to the environment.

5.3.12 Spill Prevention and Emergency Response

Steps and measures to be taken in the event of an accidental spill are summarized in Section 5.3.12.1. The Schedule B Spill Contingency Planning and Reporting Regulations are provided in Appendix A.

Table 5-12: Emergency Spill Response

ID	Mitigation Measure
SERP1	Emergency response kits and spill kits will be onsite and will be appropriate to the type and amount of hazardous materials associated with the KBC HDD Engineering Support Program. Spill kits will contain materials appropriate for the potential products to be spilled, taking

ID	Mitigation Measure
	into consideration the surrounding environment and seasonal conditions (e.g. iced ocean). The emergency response kits will include appropriate Personal Protection Equipment (PPE) such as gloves and goggles.
SERP2	All personnel will be instructed on proper storage and handling of petroleum products.
SERP3	All personnel will be instructed on their role and responsibility in the event of spill response requirements and made aware of the location of spill response equipment in advance of the start of the KBC HDD Engineering Support Program.
SERP4	The Contractor will have on hand, emergency response kits and spill kits to manage spills of a predictable size for their operations. All contractor personnel will be aware of the location of the spill response materials, and they will be in a location that is easily accessible in the event of a spill.
SERP5	In the event a spill occurs, spill response will be carried out as outlined in Section 5.3.12.1 and notifications to AHJ and the GN-TIN as indicated in Section 5.8.3 will be undertaken.
SERP6	The Contractor will provide a list of accidental discharges and of corrective actions taken to the Worley Consulting Field Supervisor.

5.3.12.1 Spill Response Protocol

Accidental releases of deleterious substances, such as hydrocarbons, can affect soils, freshwater fish and aquatic life, terrestrial wildlife, birds, or marine mammals or fish in the area. Whether the spill is on land, water, or snow/ice, a Spill and Emergency Response Plan (SERP), as outlined below, will be implemented if a spill occurs during the KBC HDD Engineering Support Program:

- In the event of a spill, activities will be immediately suspended, and emergency response procedures will be initiated.
- Stop the spill or leak, where practical and safe to do so.
- Identify, if possible, the substance involved and review applicable SDS prior to attempting further mitigation. Obtain safety equipment as necessary before proceeding.
- Obtain and use spill control equipment to contain the spill.
- Contain any spill to water bodies by installing berms or aquatic containment (e.g., floating oil booms) appropriate for the type and size of spill.
- Contain the spill on land with as required (e.g. sandbags, spill pads).
- Contain any spill on snow or ice and prevent spilled liquids from moving towards waterways using absorbent materials or a snow dike.
- Determine if external support, such as local authorities, should be called to assist.
- Determine if the spill is reportable by consult per the Reportable Threshold Table (http://www.enr.gov.nt.ca/programs/hazardous-materials-spills/reporting-spills).

- Divert potential runoff away from the spill area, if possible.
- Store and/or dispose of contaminated materials resulting from the spill appropriately.
- Determine the extent of the spill, volume, area affected, and equipment required to conduct remediation works.
- Plan and implement remediation works.
- Complete an incident report.

5.3.13 Reclamation

Reclamation is not required given the location that the KBC HDD Engineering Support Program is being undertaken. However, the drill and test pit footprints will be left in the same condition they were in prior to the respective activities.

Table 5-13: Reclamation Requirements

ID	Mitigation Measure
RC1	After the KBC HDD Engineering Support Program is complete, the area will be cleaned and restored. This includes the removal of all equipment; the plugging and capping of drill holes and waste clean-up.
RC2	All equipment used to conduct the studies will be removed and transported offsite.
RC3	Any spills will be cleaned-up and the area remediated and restored prior to completion of the KBC HDD Engineering Support Program.
RC4	Drill holes will be appropriately filled and capped.
RC5	Drill cuttings shall be discharged to their marine or terrestrial origin within a small footprint.

5.4 Monitoring Measures

Monitoring measures, completed by the EM to meet compliance requirements, are described in this section. The EM will be responsible for appropriate documentation of activities and for environmental monitoring to confirm measures are tracked for reporting.

5.4.1 General

Primary responsibilities of the EM will be to:

- Conduct regular monitoring for the duration of the KBC HDD Engineering Support Program.
- Visual monitoring as outlined in Section 5.4.2.
- Monitor and adaptively manage work procedures as necessary to limit environmental effects.
- Monitor for presence of marine mammals, and document behaviors and distance from marine vessel, as outlined in Section 5.4.2.
- Monitor and document presence of SAR, as outlined in Section 5.3.6.
- Monitor large congregations of seabirds and communicate with personnel to avoid those areas while the birds are present.

- Routinely check to verify that equipment in use for the KBC HDD Engineering Support Program is in good working condition.
- Routinely check to determine that the required emergency response materials, including the spill kits, are on site and appropriately stocked during KBC HDD Engineering Support Program.
- Confirm site personnel are aware of and trained in emergency procedures outlined in the SERP (Section 5.3.12).
- Confirm that mitigations outlined within Section 5.3 are strictly adhered to.
- Report any non-compliance or unplanned events as outlined in Section 5.7.
- Reporting requirements as described in Section 5.8.

5.4.2 Visual Monitoring

Visual monitoring during the KBC HDD Engineering Support Program will be ongoing and will include:

- Monitoring of stressors on aquatic species, fish kills, any fish spawning/migration activity.
- Incidental SAR occurrences.
- Observe for the presence of marine mammals to avoid physical interaction and maintain an EZ (see Section 5.4.4).

Details of sightings including species, number, and behaviour of wildlife observed will be included in the end of program report (see Section 5.8.1).

5.4.3 Turbidity

Turbidity plumes are not expected to occur during the KBC HDD Engineering Support Program (activities that interact with the seabed only) due to the relatively small size of the sampling equipment and the probability of dilution in the marine environment. During surveys that occur in open-water conditions, the EM will be vigilant to monitor for the presence of turbidity plumes, and undertake compliance monitoring to confirm compliance with Federal CCME WQG (CCME, 1999). The compliance monitoring will be performed if a turbidity plume is detected beyond a 30 m CMZ as per the thresholds summarized in Table 5-14.

Table 5-14: Project Turbidity Thresholds

Flow State	Turbidity Threshold
Clear flow water	• Maximum increase of 8 Nephelometric Turbidity Units (NTUs) from background levels for short-term exposure (e.g., 24-hour period). • Maximum average increase of 2 NTUs from background levels for a longer-term exposure (e.g., 30-day period).
High flow or turbid water	• Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. • Should not increase more than 10% of background levels when background is > 80 NTUs.

Source: CCME (1999)

5.4.4 Exclusion Zones and Marine Mammal Observation

5.4.4.1 Open Water

The MMO will be equipped to detect presence of marine mammals using a combination of strategies, including binoculars for daytime monitoring, night-vision goggles for low light or nighttime monitoring, and through Passive Acoustic Monitoring (PAM) to detect presence of marine mammals through vocalizations.

The MMO will monitor two different zones (EZ and Observation Zone [OZ]) of different radii and purpose depending on the KBC HDD Engineering Support Program activity. A Survey Zone will also be monitored specific to narwhal sighting in the Southampton AOI. Descriptions of the monitoring zones are provided in Table 5-15, with the specific radii for the EZ and OZ outlined in Table 5-16.

Table 5-15: Marine Mammal Monitoring Zones

Term	Definition
EZ	The MMO will issue stop work procedures when a marine mammal enters the EZ.
OZ	The MMO will monitor and document species that enter the OZ, but no action will be required. The purpose of the OZ is to provide the MMO and contractor advanced notification regarding the presence of marine mammals in the activity area and forewarning of potential activity shut down should the marine mammal enter the EZ.
Survey Zone	The Survey Zone is spatially (Southampton AOI) and species (narwhal) specific sightings. If a narwhal is observed, regardless of its distance from the source of the activity, stop work procedures will be implemented.

The MMO will monitor for stress related behaviours to marine mammals within the monitoring zones. If observed, adaptive management will be implemented or, if necessary, stop-work procedures will be implemented until effective mitigation measures are in place. The MMO monitoring will be performed as follows:

- A 30-minute pre-observation period will occur prior to the start of any noise producing activities (SPB, vibracore, CPT).

- The MMO will document:
  - Behaviours of marine mammals which will be able to demonstrate whether marine mammals are responding to the survey activities.
  - How the MMO requirements have been managed (if any).
  - Any additional requirements due to adaptive management (if needed).

Table 5-16: Minimum Marine Mammal Exclusion Zones during the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Activity Aspect	Zones	
	EZ	OZ
Vessel when in transit	100 m (200 m if they are resting or with a calf)	500 m
Geophysics Program when SBP or Seismic Reflection & Refraction is in use (alone or with other equipment) Vessel during activities that have the potential to result in underwater noise contributions (see Section 4.1 (Table 4-2))	500 m	1,000 m
Geophysics Program activities when SBP or Seismic Reflection & Refraction is not in operation	EZs as described for vessel when in transit	
Geotechnical Program (CPT, Drilling)	500 m	1,000 m

Note: Stop work procedures cannot likely be implemented during activities like vibracore and CPT, however, they are fast in duration (less than a few minutes)

5.4.4.2 Iced Ocean

An MMO will be responsible for managing a 500 m EZ to monitor for evidence of pinnipeds. Drones may be deployed to visually and thermally monitor seal presence.

5.4.5 Underwater Noise

5.4.5.1 Open Water

An Underwater Noise Monitoring Program will be undertaken during the KBC HDD Engineering Support Program for activities that are noise generating and overlap with hearing frequencies of Arctic marine mammals (see Section 4.1 (Table 4-2, Table 4-3)). Underwater noise thresholds that will be followed are provided in Table 5-17, which are based on NOAA recommendations (NMFS, 2024a).

The Underwater Noise Monitoring Program will follow these steps:

- The hydroacoustic technician will make a field decision on whether full time or confirmatory monitoring is required based on how close measured noise is to the thresholds.

- The hydrophone used to perform underwater sound monitoring will be capable of recording 'real time' acoustics for SEL, and Peak RMS measurements in order to immediately confirm compliance with acoustic thresholds.
- The hydroacoustic technician will keep a detailed record of measured noise, inclusive of raw data, maximum readings and any documented noise exceedances.

Table 5-17: Acoustic Thresholds for Marine Mammals and Fish

Type	Threshold
Marine Mammal	160 dB re 1µPa rms at the EZ boundary.
Fish	206 dB re1 µPa Peak SPL at 10 m.

5.4.5.2 Iced Ocean

The drilling program that occurs below the High-Water Line (HWL) will be over water during the iced season. This is because of the practical limitations of barge availability in Nunavut. Therefore, in-air and underwater noise monitoring may be performed during the drilling program, as summarized below:

- In-air monitoring maybe measured, and presence of pinnipeds monitored on the ice:
  - In-air acoustic threshold for non-harbour seal pinnipeds of 100 dB re 20µPa rms, with a 500 m EZ, is adopted.
  - Drilling activity will be suspended if seals are exposed to sound levels above the threshold.
- If logistically feasible (e.g. ability to drill and maintain a hole), confirmatory hydroacoustic monitoring will be performed as outlined in Table 5-17.

There may be practical limitations to the ability to implement a 'reactive' air noise monitoring program, and therefore at a minimum two or three monitoring stations will be set up for a 500 m radius (over water areas only) around the drill. Confirmatory air noise measurements will be taken through the drilling program for a continuous 15-minute recording. This will be performed a minimum of five times in each monitoring location.

5.4.6 Aerial Surveys

Aerial surveys (described in Section 2 (Table 2-2)) may be conducted to support data collection of ground conditions in and around the HDD Study Areas. This data may be used for environmental purposes to assess vegetation and assessment of habitat for wildlife.

The following measures will be in place prior to and during the flights to confirm minimization of impacts to wildlife, and marine and migratory birds.

- Any flight surveys (drone, UAV, fixed wing) will avoid nesting windows (see Section 4.2 (Figure 4-1), Appendix A (Figure A-6).
- Flight surveys performed will be low noise and follow preprogrammed routes that avoid bird aggregations and marine mammal haul outs.

- Aerial survey will not be closer than the distances as outlined below depending on flight type, when flying in close proximity to the marine environment:
    - Fixed Wing: 500 m.
    - Unmanned Aerial Vehicle: 100 m.
    - Drone: 50 m.
- A preflight assessment will be undertaken by a QP to map known colonies, rookeries, staging, and nesting areas using ECCC data and other publicly available wildlife studies.
- A preflight observation will be performed in advance of flight take off to confirm no wildlife (inclusive of marine mammals) are in proximity to the take off area. If wildlife are observed, the minimum distances (described above) will be adhered, and there will be no circling, hovering, repeat passes or rapid elevation changes.
- If wildlife concentrations are observed, or if wildlife exhibit agitation or avoidance behaviour, flight operations will be delayed, temporarily relocated, suspended until the area is confirmed clear.

5.5 Adaptive Management

During the KBC HDD Engineering Support Program, it may be necessary to modify methodology and address site conditions not foreseen in this EMP. For communication measures, see Section 5.3.9 (Table 5-9) to confirm how engagement between the EM, the contractor, and the GN-TIN are carried out to accept any changes. The EM will then evaluate any additional potential environmental effects or regulatory requirements. Mitigation measures will be updated, if required, and documented within the contractor's EMP. Adaptive management reporting will be detailed within the monitoring reports in accordance with Section 5.8.1.

5.6 Stop-Work

Stop-work procedures will be implemented, when necessary, based on specific conditions. A clear communication strategy must be described by the contractor prior to mobilization for the KBC HDD Engineering Support Program. See 5.3.9 (Table 5-9) to outline how EM/MMO can notify the Field Supervisor when this is necessary.

5.7 Non-Compliance

In the event of a non-compliance or a potential non-compliance with this EMP and/or applicable environmental permits, the EM/MMO has the authority to suspend survey activities and/or implement adaptive mitigation strategies (see Section 5.3.4) to re-instate KBC HDD Engineering Support Program compliance.

The contractor will maintain and retain records associated with, or produced by, actions or activities undertaken to achieve compliance or that indicate non-compliance with the KBC HDD Engineering Support Program permit conditions. These records must be made available upon request and must be documented in the KBC HDD Engineering Support Program Annual Report (see 5.8.1). Non-compliances must be reported to GN-TIN immediately (before end of the program). Non-compliance reporting protocol to pertinent AHJs will be determined by GN-TIN and communicated to the contractor prior to the start of KBC HDD Engineering Support Program.

5.8 Reporting

5.8.1 Regulatory Authority Annual Reporting

Annual reports will be required to be submitted to CIRNAC, and NRI, and can be provided to any AHJ upon request.

5.8.2 Non-Compliance

In the event of non-compliance or potential non-compliance with this compliance document and applicable environmental permits, the MMO has the authority to suspend construction activities until the appropriate mitigation measure can be implemented. Non-compliances will be reported to pertinent AHJ as required.

5.8.3 Incident Reporting

Incident reporting is required to pertinent AHJ as described in this section. The GN-TIN (and their EI representative) and Worley Consulting must all be notified by the Contractor when a reportable incident has occurred.

Program adaptive management measures, stop work procedures, and non-compliances must be reported as summarized in Sections 5.5, 5.6 and 5.7 respectively.

Minimum reporting requirements for the information required are provided in Table 5-18 for spills and harm/mortality events observed for marine mammals, marine or migratory birds, wildlife, fish, and inclusive of SAR (identified in Appendix B (Table B-2).

All incidents must be reported within 24 hours of the occurrence. Contact information for notifications is provided in Table 5-19. Reporting will be the responsibility of the GN-TIN EI representative. However, the contractor or consultant responsible for program oversight will be responsible for the collection of information.

Table 5-18: Minimum Reporting Requirements for Reportable Incidents

Spills[1]	Observations of Injury / Mortality Marine Mammals, Marine or Migratory Birds, Wildlife, Fish, and Inclusive of SAR[2]
• Date and time of call. • Location, date and time of spill. • Direction spill is moving. • Name and contact details for a person close to the location of the spill. • Type of contaminant and quantity spilled. • Cause of the spill. • Whether the spill is continuous or has been contained. • Evacuation procedure (if required). • Spill response actions taken prior to reporting. • Name owner or person in charge, management or control of contaminants spilled. • Assistance required for successfully containing and cleaning the spill or release.	• Species name. • Location, date and time of incident. • Type of incident. • Number of individuals involved. • Condition and behaviour of the individuals involved. • Habitat condition.

Note:

1. Incident reporting will be the responsibility of the Contractor and will at a minimum consist of the following, which is taken from the Spill Contingency Planning and Reporting Regulations S.11(1)
2. In the event of any potential disturbance to fish, fish habitat, SAR, migratory birds, and marine mammals occurs during the HDD Program, monitoring reports will be submitted to pertinent AHJs, including ECCC-Canadian Wildlife Services (CWS), DFO, and GN-DoE

Table 5-19: Authorities Having Jurisdiction Reporting Information

Authority Having Jurisdiction	Summary	Contact
GN DoE	• Currently the Spill Contingency Planning and Reporting Regulations outline reporting requirements based on specific volumes. Reporting requirements for spill magnitudes of individual contaminants are provided in Schedule B of the Regulations (R-068-93) (see Appendix C).	GN-DoE 24-hour spill report line (1-867-920-8130) and through their fillable form[4] which can be submitted via email (spills@gov.nt.ca).
	• Any interactions and incidents involving the potential disturbance of SAR under GN's lead management responsibility will be reported to GN-DoE.	environment@gov.nu.ca.
DFO-FFHPP	• Any activities that have the potential to violate the *Fisheries Act*, including Harmful Alteration Disruption or Destruction (HADD) of fish habitat, and death of fish.	DFO-FFHPP Arctic Region 24-hour reporting hotline at 1-855-777-7500.
	• Any interactions and incidents involving the potential disturbance of marine mammals or SAR under DFO's lead management responsibility will be reported to DFO.	1-867-979-8000.
ECCC-CWS	• Any harm, destruction, or disturbance to terrestrial SAR species (plants and animals), as well as birds, nests, or eggs are afforded protection under the *Migratory Bird Convention Act* (MBCA) will be considered reportable. Such events result in immediate notification to the CWS branch of ECCC.	Toll-free 24-hour reporting hotline at 1-800-668-6767 or through email (cwsnorth-scfnord@ec.gc.ca).
ECCC	• Deposit of deleterious substances are prohibited under Section 36(3) of the *Fisheries Act*, unless specifically authorized under a *Fisheries Act* regulation or by a regulation under other federal legislation. Any deposit whether made directly into water frequented by fish or indirectly must be immediately reported to ECCC's environmental notification system.	24-hour telephone number for the Nunavut region (Spill: 1-867-979-526, IqaNordreg@innav.gc.ca, Environmental Emergency: 1-867-920-8130) (ECCC, 2019).

[4] Nunavut fillable spill report form available at: https://www.gov.nu.ca/environment/documents/nt-nu-spill-report-form-pdf

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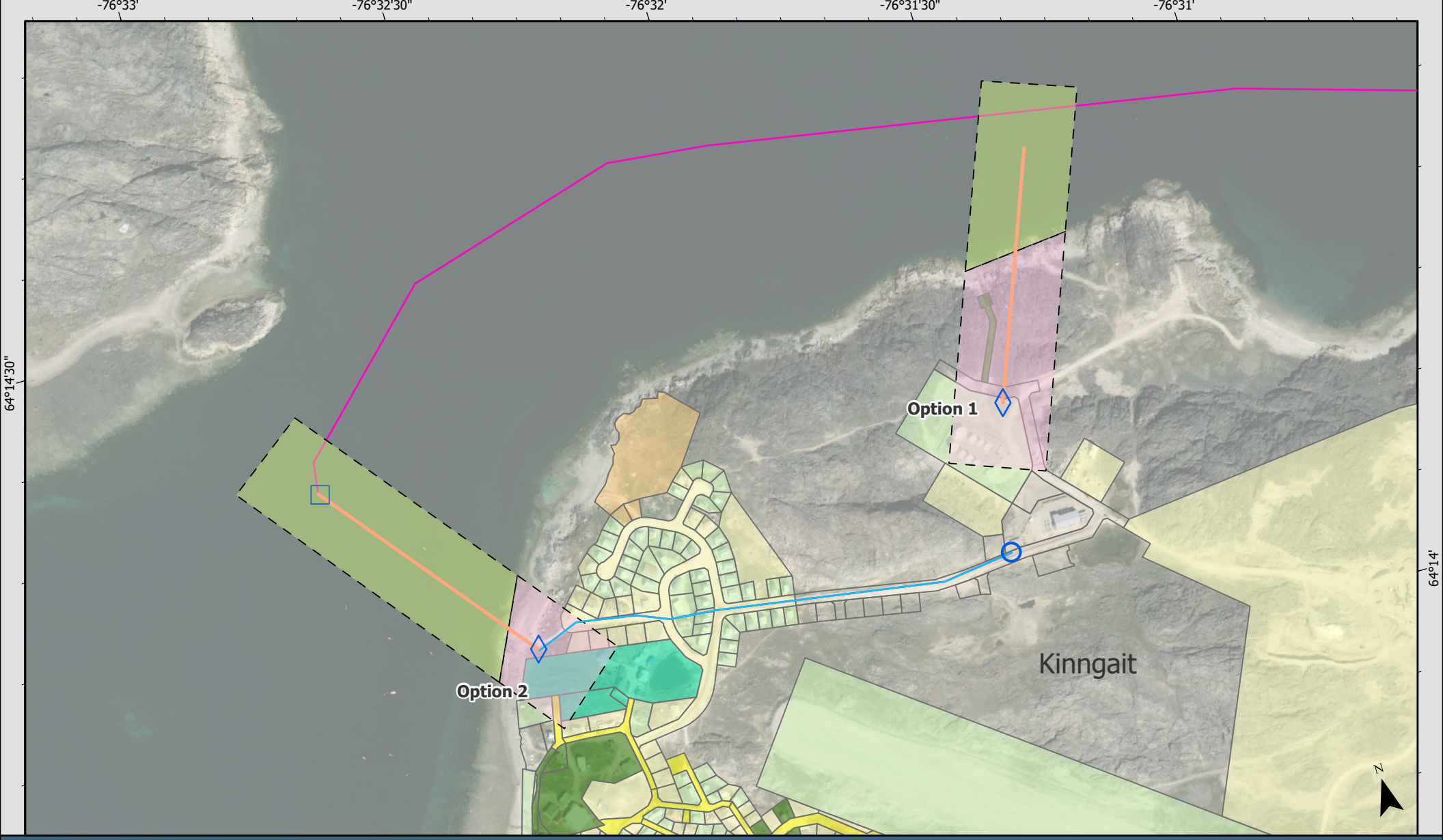
Appendix A: Supporting Figures

Dynamic Ocean Consulting Ltd.



Legend

Study Area

- Marine Activities
- Terrestrial Activities

Project Components

- Marine Cable
- Terrestrial Cable
- HDD to BMH Cable
- Cable Landing Station
- HDD Punch-out Point
- Beach Manhole

Land Tenure

Interaction

- Municipal
- Untitled Municipal
- Commissioner's Land
- Federal

No Interaction

- Inuit Owned Land
- Untitled Commissioner's Land

Drawn: BB	Kivalliq-Baffin Connector Project
Edited: CL	**KBC Horizontal Directional Drilling Engineering Support Program Study Area (Kinngait)**
Approved: VBC	Figure A-1

Dynamic Ocean Consulting

Nunavut

Spatial Reference
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Datum: North American 1983
Projection: Lambert Conformal Conic
Map Units: Metre

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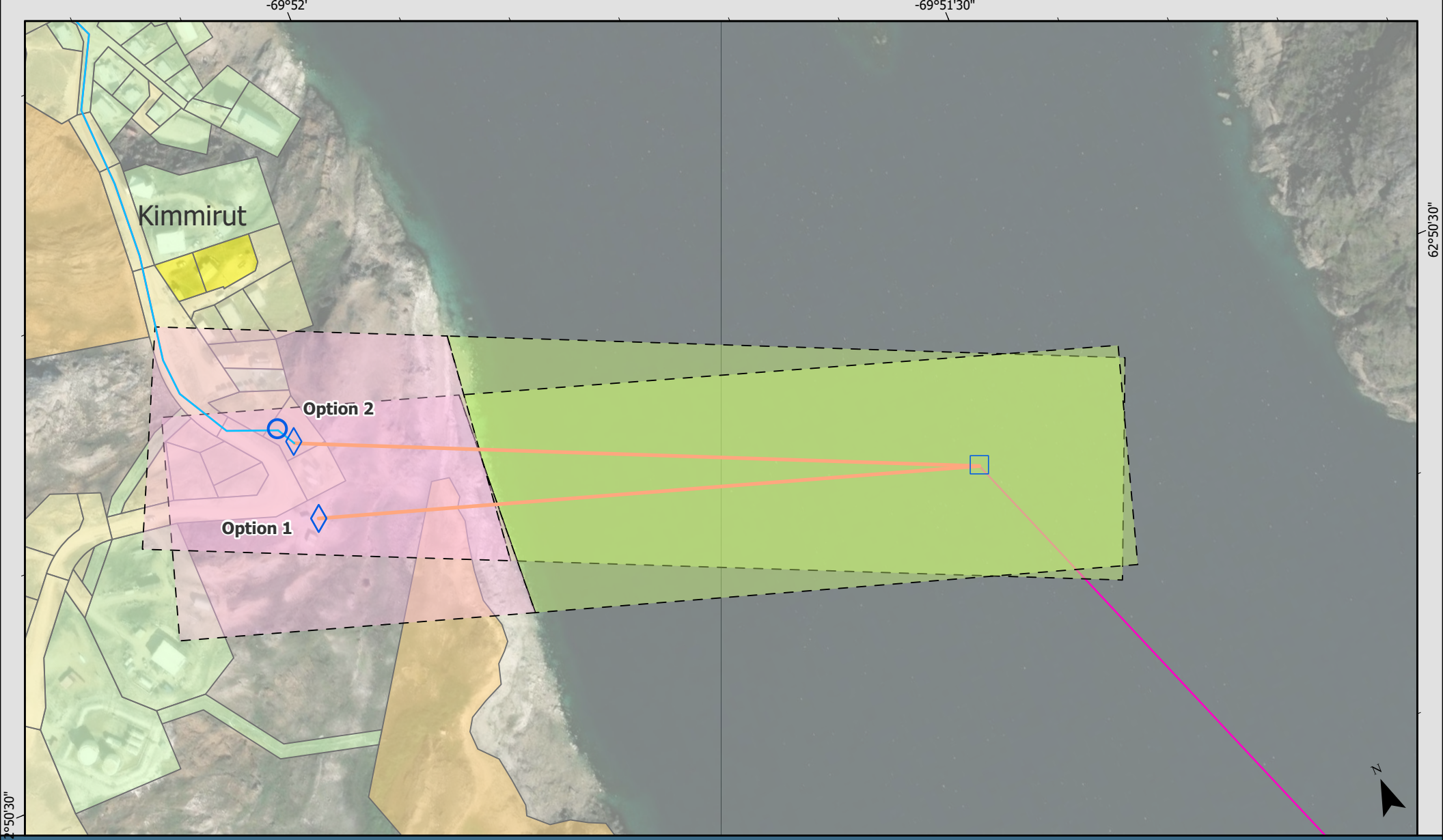
m

Scale: 1:8,000

Project Location



Legend

Study Area
- Marine Activities
- Terrestrial Activities

Project Components
- Marine Cable
- Terrestrial Cable
- HDD to BMH Cable
- Cable Landing Station
- HDD Punch-out Point
- Beach Manhole

Land Tenure

Interaction
- Municipal
- Inuit Owned Land
- Commissioner's Land

No Interaction
- Untitled Municipal

Drawn: BB	Kivalliq-Baffin Connector Project
Edited: CL	**KBC Horizontal Directional Drilling Engineering Support Program Study Area (Kimmirut)**
Approved: VBC	Figure A-2

Dynamic Ocean Consulting

Nunavut

Spatial Reference
GCS: GCS North American 1983
Datum: North American 1983
Projection: Lambert Conformal Conic
Map Units: Metre

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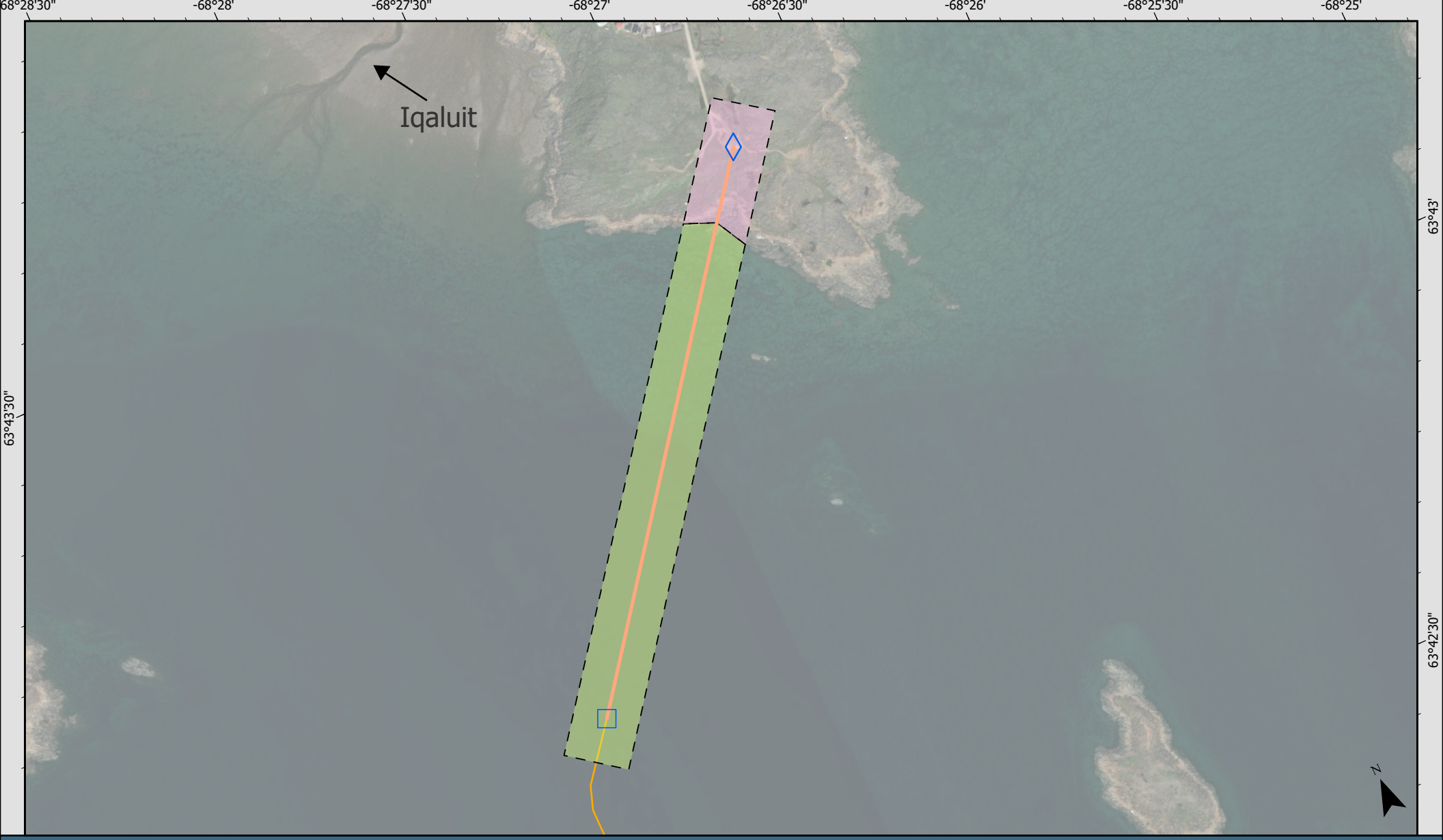
m

Scale: 1:3,500

Project Location



Legend

Study Area

- Marine Activities
- Terrestrial Activities

Project Components

- Marine Cable Route
- Terrestrial Route
- HDD Punch-out Point
- Beach Manhole

Drawn: CL	Kivalliq-Baffin Connector Project
Edited: CL	**KBC Horizontal Directional Drilling Engineering Support Program Study Area (Iqaluit)**
Approved: VBC	Figure A-3

Dynamic Ocean Consulting

Nunavut

Spatial Reference
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Datum: North American 1983
Projection: Lambert Conformal Conic
Map Units: Metre

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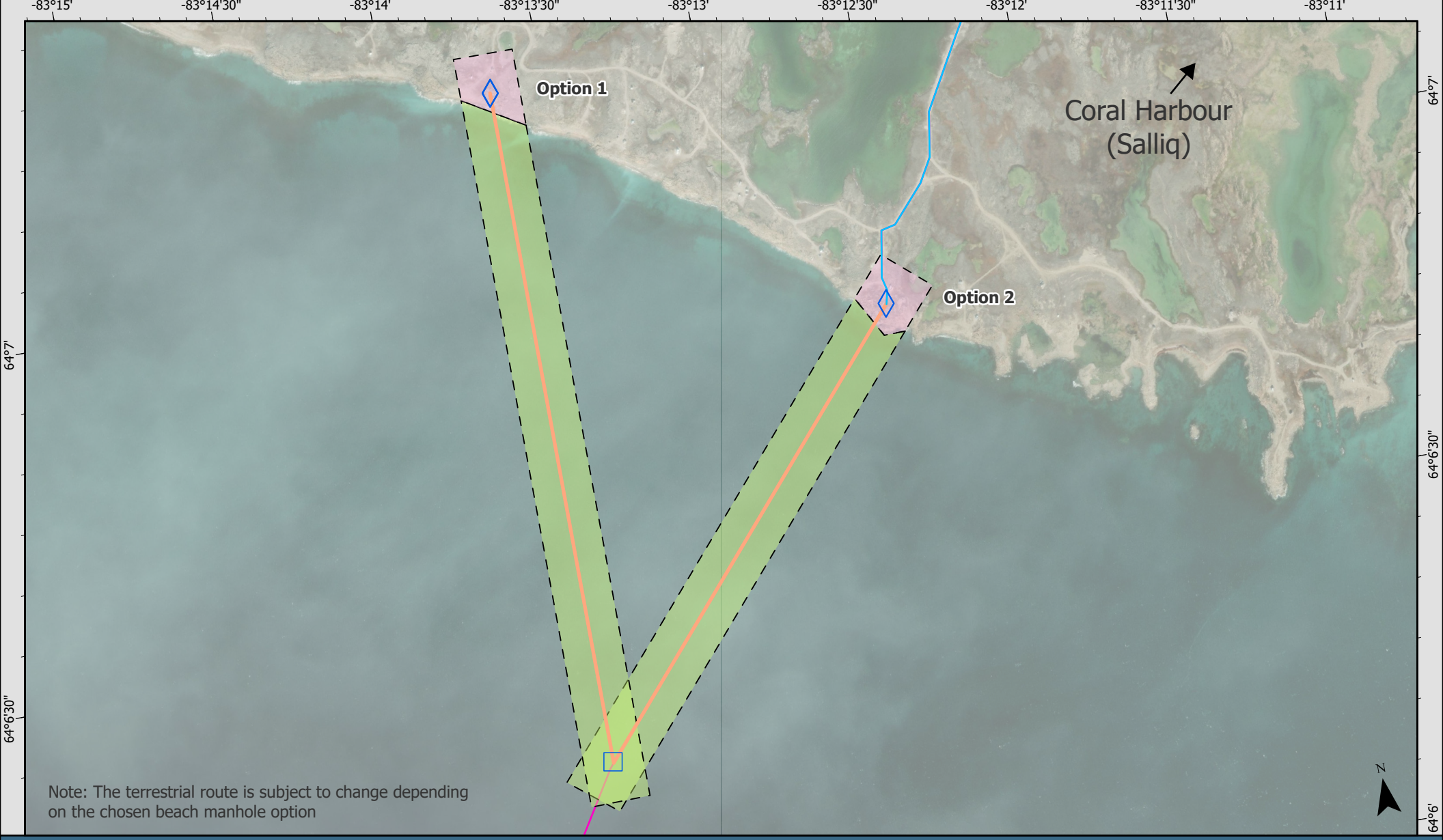
Scale: 1:12,000

Project Location



Legend

Study Area

- Marine Activities
- Terrestrial Activities

Project Components

- Marine Cable
- Terrestrial Cable
- HDD to BMH Cable
- HDD Punch-out Point
- Beach Manhole

Drawn: BB	Kivalliq-Baffin Connector Project
Edited: CL	**KBC Horizontal Directional Drilling Engineering Support Program Study Area (Coral Harbour)** — Figure A-4
Approved: VBC	

Dynamic Ocean Consulting

Nunavut

Spatial Reference
GCS: GCS North American 1983
Datum: North American 1983
Projection: Lambert Conformal Conic
Map Units: Metre

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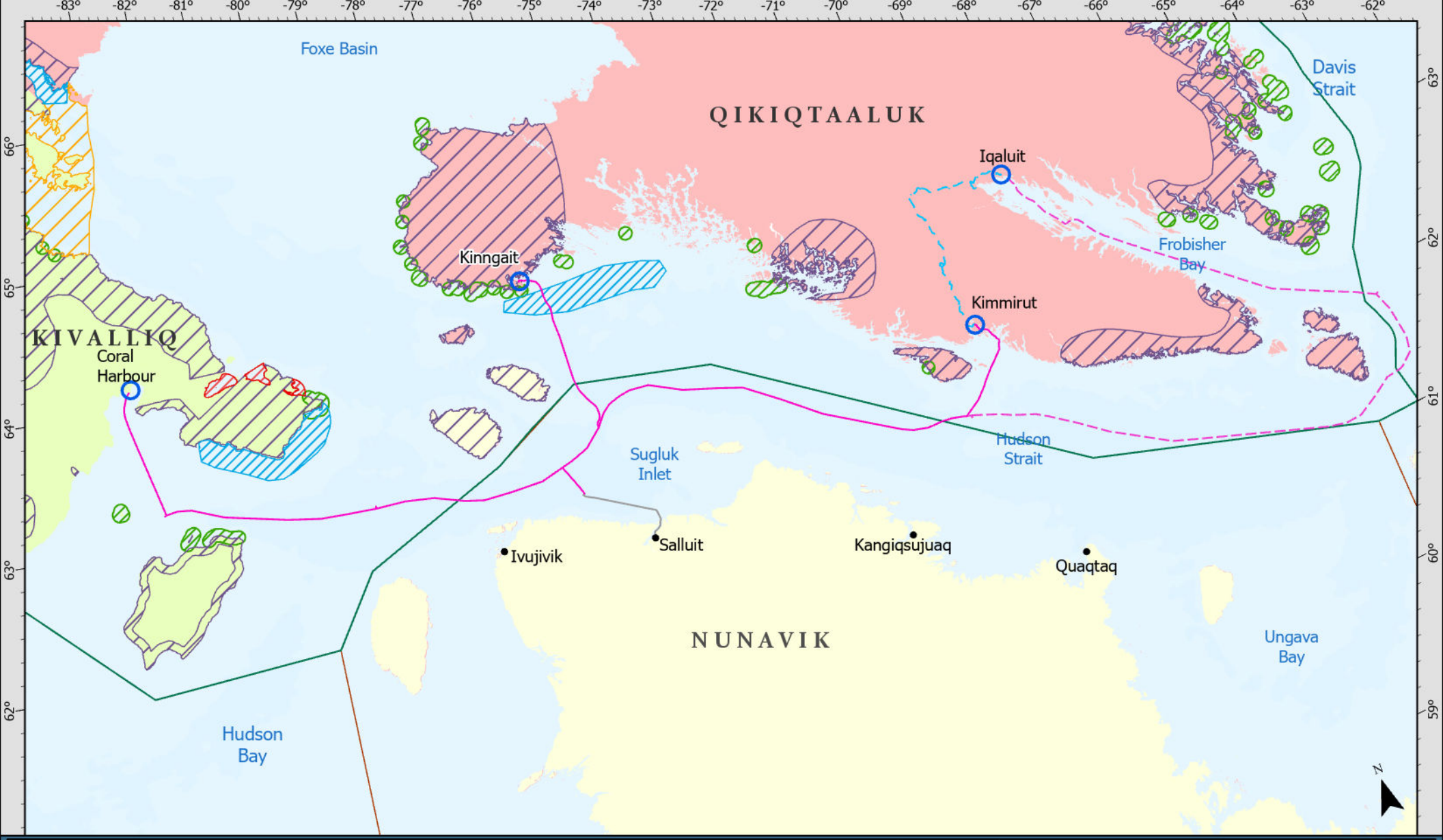
Scale: 1:13,000

Project Location



Legend

Project Components
- Cable Route
- Iqaluit (Option 1, Terrestrial)
- Iqaluit (Option 2, Marine)
- Cable Landing Station
- Nunavut Settlement Area
- Nunavik Marine Region

Potential for Seasonal Interaction
- Atlantic Walrus Terrestrial Haul-Outs
- Bowhead Calving
- Polar Bear Denning

EUAFON Project
- Existing Cable Route

No potential for Spatial Interaction
- Narwhal Calving
- Beluga Calving

Drawn: BB	Kivalliq-Baffin Connector Project
Edited: AW	Figure A-5
Approved: VBC	**KBC Project Cable Route with Recommended Nunavut Land Use Plan Important Marine Mammal Habitats (All Season)**

Spatial Reference
GCS: GCS North American 1983
Datum: North American 1983
Projection: Lambert Conformal Conic
Map Units: Metre

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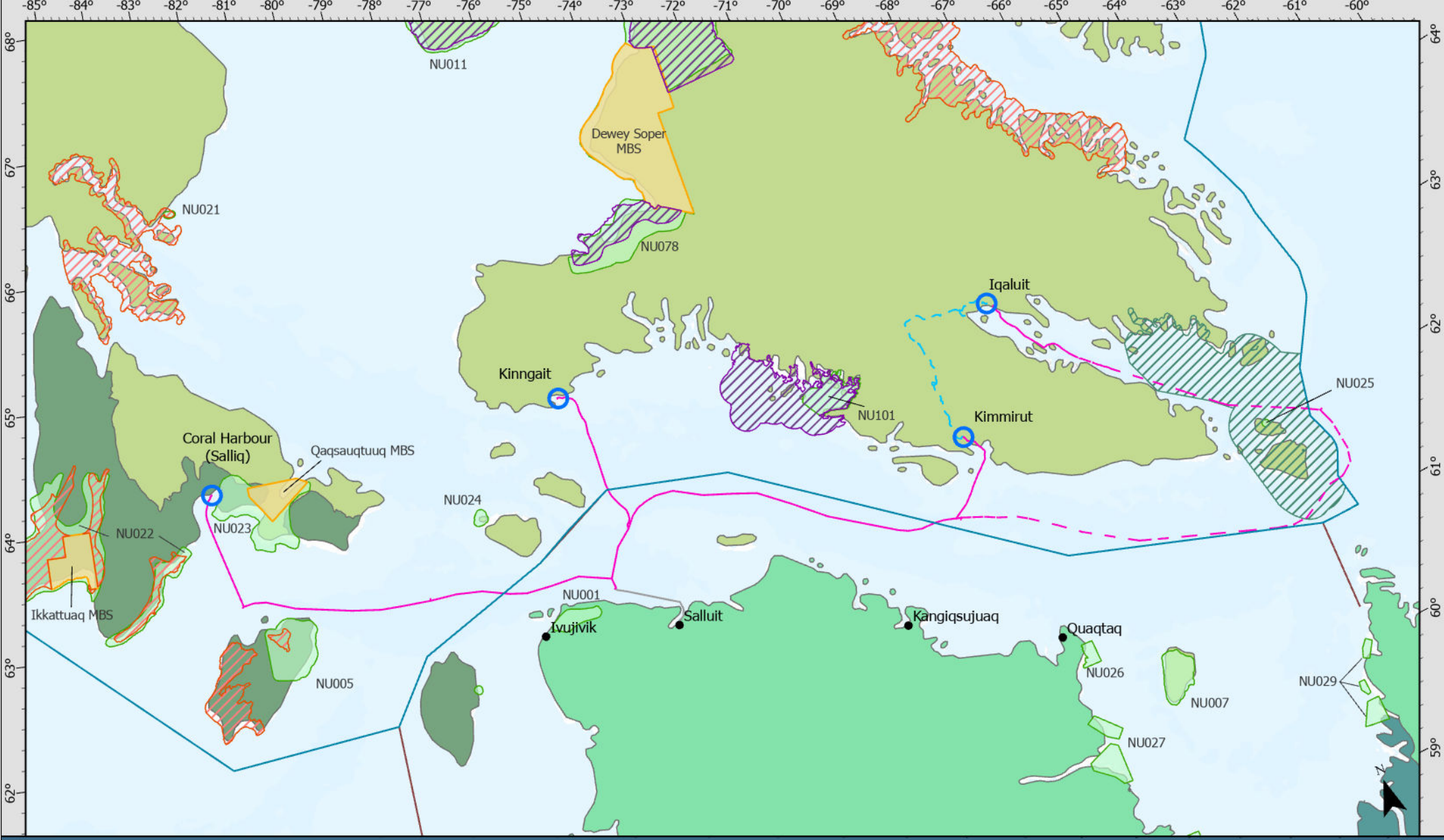
Scale: 1:4,000,000

Project Location



Legend

Project Components

- Cable Route
- Iqaluit (Terrestrial Route)
- Iqaluit (Marine Route)
- Cable Landing Station

EAUFON Project

- Existing Cable Route

Nesting Zones

Potential for Interaction

- N9 (Mid May - Mid Aug)
- N10 (Late May - Mid Aug)

No Potential for Interaction

- D7 (Early May - Mid Aug)
- N8 (Mid May - Mid Aug)

Key Migratory Bird Habitat Sites

Potential for Interaction

- Class 2

No Potential for Interaction

- Class 1
- Class 3

- Migratory Bird Sanctuary
- Important Bird Area
- Nunavut Settlement Area
- Nunavik Marine Region

Drawn: CL
Edited: AW
Approved: VBC

Kivalliq-Baffin Fibre Project

Figure A-6

Designated Areas and Nesting Zones for Migratory Birds

Spatial Reference
GCS: GCS North American 1983
Datum: North American 1983
Projection: Lambert Conformal Conic
Map Units: Metre

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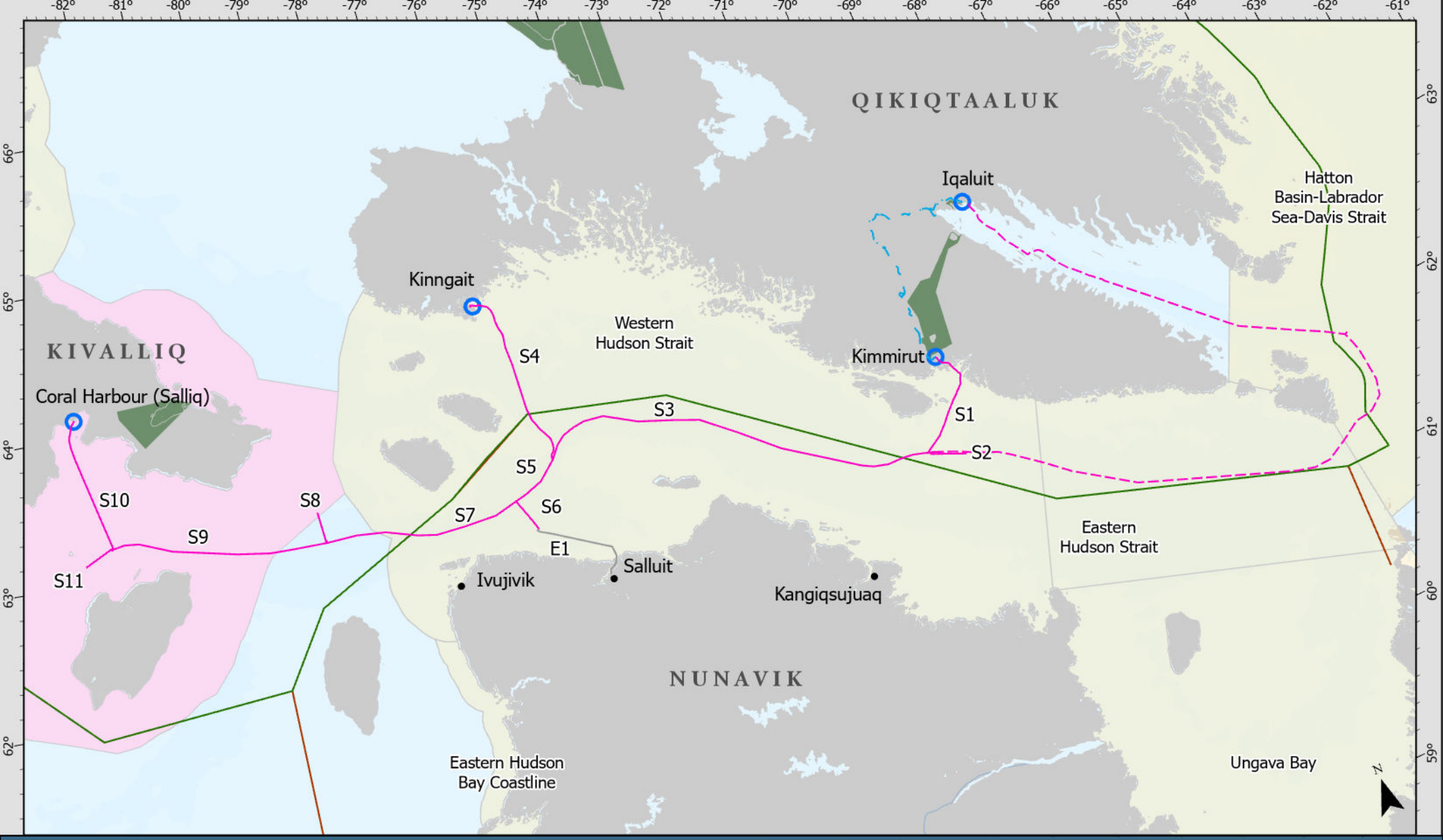
Scale: 1:4,500,000

Project Location



Legend

Project Components

- Cable Route
- Iqaluit (Option 1, Terrestrial)
- Iqaluit (Option 2, Marine)
- Cable Landing Station

EUAFON Project

- Existing Cable Route

- Protected and Conserved Areas
- Ecologically and Biologically Significant Areas
- Southampton Island Area of Interest
- Nunavut Settlement Area
- Nunavik Marine Region

Drawn: BB	Kivalliq-Baffin Connector Project
Edited: AW	Figure A-7
Approved: VBC	**Kivalliq-Baffin Connector Project Cable Route & Designated Habitats**

Spatial Reference
GCS: GCS North American 1983
Datum: North American 1983
Projection: Albers
Map Units: Metre

0 20 40 80 km

Scale: 1:4,000,000

Project Location

Appendix B: Supporting Tables

Dynamic Ocean Consulting Ltd.

Table B-1: Description of Focal Fish and Marine Mammals for the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Species (Common Name)	Species (Latin Name)	Inuktitut Name	Species Spatial Category	Type	Seasonal Occurrence	Species Description
Fish						
Arctic char	*Salvelinus alpinus*	Ikaliviit, Ivitaruk	Anadromous	Pelagic fish	Open-water season	Arctic char are ecologically and socio-economically important. Runs of arctic char are either anadromous or strictly freshwater (landlocked). Anadromous populations are found commonly throughout Nunavut (GN, 2012a, Figure 10). In the marine environment arctic char have better foraging opportunities but will migrate along coastlines to return to their natal spawning grounds in freshwater habitats (Moller *et al.*, 2018; Moore *et al.*, 2016; Moore, 1975). Arctic char are fished for Inuit subsistence and commercial fisheries across the Arctic (DFO, 2025a; NWMB & DFO, 2020) (Galappaththi et al., 2022; Roux et al., 2011).
Arctic cod	*Boreogadus saida*	Ugak	Migratory	Pelagic fish	Open-water season	Arctic cod are an ecologically important prey species occurring throughout the Arctic (Froese & Pauly, 2000). Arctic cod are fast growing and short lived with high fecundity (DFO, 2016; Lawson et al., 1998). Arctic cod are harvested for subsistence in Nunavut but are not considered of high value (Hurtubise, 2016; p43, pers comm July 13 2015). There are no commercial fisheries for arctic cod in the Arctic; however, there is interest in exploring future opportunities (CBC, 2015; Nunatsiaq News, 2016).
Sculpin	*Myoxocephalus Scorpius (shorthorn)* *Gymnocanthus tricuspis* *(Arctic staghorn)*	Kanayuk, Kanajuq	Resident	Bottom dwelling fish	Year-round	Sculpin include fourteen marine species found across Nunavut (Moller *et al.*, 2018). The most common species in the KBC HDD Engineering Support Program region are the Shorthorn sculpin, Arctic staghorn sculpin and Arctic sculpin (GN, 2009, 2012b). All sculpin in the region are generalist feeders (Landry et al., 2018), and documented predators of the focal sculpin species include harp seals, bearded seals, black guillemots, Brunnich's murres, thick-billed murres, Arctic cod, and Arctic char (Moller *et al.*, 2018). There are no commercial fisheries for Arctic sculpin in Nunavut; however, it is considered a subsistence fishery species (GN, 2009, 2012b; QIA, 2018b).
Marine Mammals						
Atlantic walrus	*Odobenus rosmarus ssp. rosmarus*	Akvik	Resident	Pinniped	Summer, Fall	The Atlantic walrus are the largest pinnipeds in the Northern Hemisphere. They spend up to two-thirds of their time at sea, with the other third spent hauled-out on sea ice and land to moult, rest, and rear pups (Godwin, 1990). While at sea, walrus forage primarily on the seafloor for invertebrates, but have also been known to prey on squid, birds, and seals (Bluhm & Gradinger, 2008). They are a gregarious species, that are often found in large groups while hauled-out (Lowry, 2016). Walrus are present in the Hudson Strait and Hudson Bay region year-round, and are an important harvested species for local Inuit communities (Lowry, 2016).
Bearded seal	*Erignathus barbatus ssp. barbatus*	Ukalik, Qilalugaq	Resident	Pinniped	Summer, Fall, Other seasons indicated by harvest data	Bearded seals are usually solitary and occasionally appear in small groups. Bearded seals are generally found in areas with moving pack-ice and open-water such as polynyas (Kovacs, 2018). They are primarily benthic foragers that feed on invertebrates, however they have also been known to prey on forage fish (Bluhm & Gradinger, 2008). Bearded seals are an important harvested species for local Inuit communities throughout Nunavut, including in the Hudson Bay and Hudson Strait where they are harvested year-round.
Beluga whale	*Delphinapterus leucas*	Kilalugak	Resident	Cetacean	Spring, Summer, Fall	Beluga whales are migratory and usually move in large social groups between their wintering and summering grounds. Their distribution is strongly influenced by ice cover and prey availability (Ellis, 1980). Their diet covers a diverse array of pelagic and benthic fish and invertebrates (Bluhm & Gradinger, 2008). In the Hudson Strait and Hudson Bay region, there are three distinct populations of beluga whale; the West Hudson Bay population, the East Hudson Bay population, and the James Bay population (Committee on the Status of Endangered Wildlife in Canada [COSEWIC], 2016b). The East and West Hudson Bay populations migrate through the Hudson Strait in the late-spring to their respective summering grounds and return as ice freezes up in the fall, with many overwintering in the Hudson Strait (COSEWIC, 2020a). The beluga whale is a highly important harvested species for Inuit communities who hunt them

Species (Common Name)	Species (Latin Name)	Inuktitut Name	Species Spatial Category	Type	Seasonal Occurrence	Species Description
						when open-water conditions allow beluga whales to come close to communities during seasonal migrations (Oceans North Conservation Society et al., 2018).
Bowhead whale	*Balaena mysticetus*	Arviq	Resident	Cetacean	Summer	Bowhead whales are the only baleen whale endemic to the Arctic. Bowhead whales in the Hudson Bay and Hudson Strait region are part of the Eastern Canada-West Greenland population, one of four global subpopulations. Their seasonal migrations follow the break-up of sea ice in the spring into productive Arctic waters and move to overwintering habitats as the ice freezes in the fall (COSEWIC, 2009). The Hudson Strait is one such overwintering area, while Western Hudson Bay and Foxe Basin are known to be summering areas for bowhead whales. (COSEWIC, 2009). Bowhead whales are filter feeders and prey on copepods and other aggregations of small zooplankton (Bluhm & Gradinger, 2008). Bowhead whales have traditionally been an important harvested species for Inuit; however, the population was decimated by commercial whaling, resulting in restricted catches (COSEWIC, 2009). Subsistence hunts have been allowed since 1991 but are strictly controlled, monitored, and managed hunt by DFO (NWMB, 2000).
Harp seal	*Pagophilus groenlandicus*	Qairulik	Visitor	Pinniped	Summer, Fall, Other seasons indicated by harvest data	Harp seals are the most abundant marine mammal in the Northern Hemisphere, with a stable population of 7.5 million (Stenson, 2015). Harp seals visit the Arctic during the open-water season from their winter breeding areas off Newfoundland and Labrador. They breed on sea-ice and are almost never seen on land. Harp seals are mainly piscivorous, feeding on capelin, Arctic and Atlantic cod, herring, as well as many other fishes (Bluhm & Gradinger, 2008). Harp seals are highly social and can be found in large groups throughout their range (Godwin, 1990). They can be found in the Hudson Strait near Kinngait and Kimmirut during the open-water season. The primary migratory pathway of harp seals is on the East Coast of Baffin Island (DFO, 2005). Harp seals are harvested by Inuit in this area with most being harvested between June and November (Advisian, 2020).
Killer whale	*Orcinus orca*	Aarluk	Visitor	Cetacean	Spring, Summer, Fall	Killer whales are one of the oceans top predators and are a seasonal visitor to the Arctic. The species is experiencing a range expansion as their presence in the Arctic has been increasing substantially over the last few decades (Higdon et al., 2012; Lefort et al., 2020). Killer whales are present in the Arctic during the open-water season with most sightings occurring in August and September, while they hunt a wide variety of marine mammals including ringed and bearded seals, beluga whales, narwhals, and bowhead whales (COSEWIC, 2023). Killer whales do spend time in the Hudson Strait and Northern Hudson Bay; however, sightings in this region are less common than in other areas of the Arctic (Lefort et al., 2020). Inuit generally do not harvest killer whales but they sometimes co-hunt with the whales as they drive narwhals and beluga whales toward shore. Calls to manage the population have increased because of concerns that killer whales are a threat to the populations of more locally important harvested marine mammal species (Lefort et al., 2020).
Narwhal	*Monodon monoceros*	Allanguaq, Tuugaalik	Resident	Cetacean	Summer	Narwhals are the most northerly of all cetaceans, and show a strong affinity for dense pack-ice for most of the year (Ellis, 1980). There are five subpopulations of narwhal in the East Canadian Arctic; narwhal that occur around the Hudson Bay and Hudson Strait are from the Northern Hudson Bay subpopulation. This population is relatively small at approximately 3,500 individuals (COSEWIC, 2024). Narwhals are capable of diving down to 1,200 metres to hunt for prey, and their diet consists of benthic and pelagic fish, squid, and crustaceans (Bluhm & Gradinger, 2008). Narwhals are a very important harvested species for Inuit across Nunavut, as they are prized for their tusks and maktaaq (skin); however, they are not commonly harvested in Kinngait or Kimmurut (Priest & Usher, 2004).
Polar bear	*Ursus maritimus*	Nanuit, Nanuk	Resident	Ursid/Fissiped	Spring, Summer, Fall	Polar bears are found throughout the Arctic, preferring coastal areas with shallow, ice-covered seas (Wiig et al., 2015). Polar bears primarily prey on bearded, harp, and ringed seals in these regions. Like most bears, polar bears show a high degree of opportunistic dietary flexibility, and have been seen preying on beluga whales, walrus, narwhals, marine birds, and caribou (Bluhm & Gradinger, 2008). Polar bears are harvested under the Nunavut Polar

Species (Common Name)	Species (Latin Name)	Inuktitut Name	Species Spatial Category	Type	Seasonal Occurrence	Species Description
						Bear Co-Management Plan, allowing only Inuit to hunt them. In Kinngait and Kimmirut, polar bear harvests usually occur between October and April (Advisian, 2020).
Ringed seal	*Pusa hispida ssp. hispida*	Natinat, Natsiq	Resident	Pinniped	Year-round	The ringed seal is the most common marine mammal in Arctic waters and is found throughout the Canadian Arctic with an estimated population of 2.3 million (COSEWIC, 2019). Migration patterns are not well understood for ringed seals. The species has been documented as travelling as far as 2,500 km; although, ringed seals are thought to have a limited range (Canadian Geographic, 2014). Ringed seals feed upon a variety of planktonic, nektonic, and benthic prey with considerable regional and seasonal variability (Bluhm & Gradinger, 2008). Ringed seals are a very important harvested species for local Inuit communities across Nunavut, including in the Hudson Bay and Hudson Strait where they are harvested year-round.

Note: Inuktitut translations were sourced from Priest and Usher (2004), Moller *et al.* (2018), Rapinski *et al.* (2018), and QIA (2018a)

Table B-2: Species at Risk with the Potential to be Present during the Kivalliq-Baffin Connector Horizontal Directional Drilling Engineering Support Program

Species	Latin Name	Inuktitut		IUCN Status	COSEWIC Status	SARA Status	Nunavut Rank	Likelihood of Occurrence	Species Summary
		Syllabics	Transliteration						
Fish									
Thorny Skate	*Amblyraja radiata*	Not available	Isaruliit Iqarmiutaq	Vulnerable	Special Concern	Not Listed	NR	Possible	In the western Atlantic it ranges from western Greenland, Davis Strait, Hudson Strait and Hudson Bay. This species occurs over a wide range of depths (18 m to 1200 m), but is most abundant below 110 m in temperatures between 2 to 10 C (DFO, 2018). Nunavut range not north of Baffin Island, depth range > 18 m. A distribution map is available in Figure 3a[5] of (COSEWIC, 2012b).
Marine Mammals									
Atlantic Walrus (central/low Arctic population)	*Odobenus rosmarus*	ᐊᐃᓵᑦ	Akvik[1]	Near Threatened	Special Concern	Not Listed	S3	Possible	See Appendix B (Table B-1).
Beluga whale (Eastern Hudson Bay)	*Delphinapterus leucas*	ᖃᐅᔨᑦ ᖁᓪᓗᒡᑦ	Kilalugak[1], Qilalugak[2]	Least concern	Threatened	Not Listed	NR	Unlikely	See Appendix B (Table B-1).
Bowhead whale (Eastern Canada-Western Greenland population)	*Balaena mysticetus*	ᐊᖏᕐᒃ	Arviq[3]	Least Concern	Special Concern	Not Listed	NR	Possible	See Appendix B (Table B-1).
Killer whale (Northwest Atlantic/Eastern Arctic population)	*Orcinus orca*	Not available	Aarluk[2]	Data Deficient	Special Concern	Not Listed	NR	Unlikely	See Appendix B (Table B-1).
Polar bear	*Ursus maritimus*	ᐊᓂᐊᑦᖢ	Nanuit[1], Nanuk[2]	Vulnerable	Special Concern	Special Concern	S3	Possible	See Appendix B (Table B-1).
Ringed seal	*Pusa hispida*	ᓇᖅᑐᑦ	Natinat[1], Natsiq[2]	Least Concern	Special Concern	Not Listed	NR	Likely	See Appendix B (Table B-1).
Migratory Birds									
Buff-breasted sandpiper	*Calidris subruficollis*	Not available	Satqarillak[1], Sitjariaq[2]	Near Threatened	Special Concern	Special Concern	S3	Unlikely	As shown in Figure 2[6] of (COSEWIC, 2012a), the KBC HDD Engineering Support Program will occur outside of the breeding range of buff-breasted sandpiper. However, there is the potential for occurrence during migration. Migrations occur in the spring and fall, and 'migratory habitats' while unknown are thought to be open terrestrial habitats.
Ivory gull	*Pagophila eburnea*	ᖃᐅᔨᓕᒃ	Naujat[3]	Near Threatened	Endangered	Endangered	S1	Unlikely	The breeding distribution of this species is in the high Arctic between southern Ellesmere Island and Northern Baffin Island (COSEWIC, 2006), therefore there will not be an interaction during this life history stage with the KBC HDD Engineering Support Program. The wintering location for this

[5] COSEWIC Assessment and Status Report (Thorny Skate) (sr_raie_epineuse_thorny_skate_1012_e.pdf (SECURED))
[6] COSEWIC Assessment and Status Report on the Buff-breasted Sandpiper (sr_becasseau_roussatre_buffbreasted_sandpiper_1012_e.pdf (SECURED))

Species	Latin Name	Inuktitut		IUCN Status	COSEWIC Status	SARA Status	Nunavut Rank	Likelihood of Occurrence	Species Summary
		Syllabics	Transliteration						
									species is also around Davis Strait and the Labrador Sea, so there is not likely to be a migration interaction (Spencer *et al.*, 2014).
Peregrine falcon	*Falco peregrinus*	ᑭᓚᖏᐊᖅᓱᒃ	Kiggarviarjuk[1]	Least Concern	Not at Risk	Special Concern	S4	Likely	Peck *et al.* (2018) conducted a modelling study to predict breeding distribution and habitat selection of this species, which identified some previously known potential habitats of occurrence. Based on Figures 1 and 2[7] of this article, there is a potential for interaction with this species. There is the potential for interaction with breeding and migratory habitats with this species (COSEWIC, 2017).
Red knot	*Calidris canutus*	ᓯᐊᓕᐊᖅ	Sijjariaq[3]	Near Threatened	Endangered	Endangered	S2	Likely	Particularly on the approach to Southampton Island (Coral Harbour) there is a high potential for interaction with this species. See Figure 3[8] in (COSEWIC, 2020b).
Red-necked phalarope	*Phalaropus lobatus*	ᓴᐅᖏᖅ	Saurraaq[1]	Least Concern	Special Concern	Special Concern	S3	Likely	Species is likely to occur and breed within the Study Area (COSEWIC, 2014b). However the peak breeding season (Jun/July), is likely to be before the program would occur, with migration (Aug to Oct) a more likely temporary interaction. See Figure 2[9] in COSEWIC (2014b).
Ross's gull	*Rhodostethia rosea*	ᓇᐅᔭᑦ	Naujat[3]	Least Concern	Endangered	Threatened	S1	Possible	This species is most commonly found around the High Arctic islands in the Queens Channel, Nunavut, on small sparsely vegetated gravel islands adjacent to marine open-water polynyas. Historically, there were nests in marshy Low Arctic floodplain habitat near Churchill, Manitoba, which has not been observed since 2005 (COSEWIC, 2021).
Terrestrial Wildlife									
Barren-ground Caribou	*Rangifer tarandus*	ᑐᖅᑐᐃᑦ	Tuktut[1]	Vulnerable	Threatened	Under Consideration for addition	S3S4	Unlikely	This population is most likely to occur in tundra habitats near Coral Harbour, Kinngait, and Kimmirut, where seasonal migrations bring herds to calving and summer foraging areas. However, the Study Area is not considered within the core range and habitat for barren-ground caribou. Historical use of these regions for migration and calving has been documented, though herd distribution and abundance have declined significantly in recent decades (COSEWIC, 2016a).
Wolverine	*Gulo gulo*	ᖃᖏᓐᓇᖅᓱᒃ	Qavvigaarjuk[1]	Least Concern	Special Concern	Special Concern	S3	Unlikely	Species is most commonly found in remote tundra and mountainous regions with high prey availability. However, the Study Area is not considered within the core range and habitat for wolverine. Historical observations indicate a wide distribution across the territory, though sightings remain infrequent (COSEWIC, 2014a).

Source: For status; IUCN in IUCN (2025), COSEWIC and SARA in Government of Canada (2024), Nunavut Rank in Canadian Endangered Species Conservation Council [CESCC (2022, 2025). Status checked on 05 November 2025
Source: For Inuktitut names: 1. Priest and Usher (2004); 2. Rapinski et al. (2018); 3. QIA (2018a). Inuktitut transliterations provided by various online resources

[7]Nesting habitat selection and distribution of an avian top predator in the Canadian Arctic (Nesting habitat selection and distribution of an avian top predator in the Canadian Arctic)

[8] Red Knot: COSEWIC Assessment and Status Report 0220 (Red Knot (Calidris canutus): COSEWIC assessment and status report 2020 - Canada.ca)

[9] Red-necked phalarope: COSEWIC assessment and status report 2014 (Red-necked phalarope (Phalaropus lobatus): COSEWIC assessment and status report 2014 - Canada.ca)

Appendix C: Spill Contingency Planning and Reporting Regulations Schedule B

Dynamic Ocean Consulting Ltd.

SCHEDULE B

(Section 9)

Item No.	*TDGA Class*	*Description of Contaminant*	*Amount Spoiled*
1.	1	Explosives	Any amount
2.	2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 l.
3.	2.2	Compressed gas (non-corrosive, non flammable)	Any amount of gas from containers with a capacity greater than 100 l.
4.	2.3	Compressed gas (toxic)	Any amount
5.	2.4	Compressed gas (corrosive)	Any amount
6.	3.1, 3.2, 3.3	Flammable liquid	100 l
7.	4.1	Flammable solid	25 kg
8.	4.2	Spontaneously combustible solids	25 kg
9.	4.3	Water reactant solids	25 kg
10.	5.1	Oxidizing substances	50 l or 50 kg
11.	5.2	Organic Peroxides	1 l or 1 kg
12.	6.1	Poisonous substances	5 l or 5 kg
13.	6.2	Infectious substances	Any amount
14.	7	Radioactive	Any amount
15.	8	Corrosive substances	5 l or 5 kg
16.	9.1 (in part)	Miscellaneous products or substances, excluding PCB mixtures	50 l or 50 kg
17.	9.2	Environmentally hazardous	1 l or 1 kg
18.	9.3	Dangerous wastes	5 l or 5 kg
19.	9.1 (in part)	PCB mixtures of 5 or more parts per million	0.5 l or 0.5 kg
20.	None	Other contaminants	100 l or 100 kg

Appendix D: Spill Report Form

Dynamic Ocean Consulting Ltd.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC

SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN

FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			