




Baseline Studies for Qikiqtarjuaq Marine Infrastructure Project Proposal to NIRB



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1 Introduction

CBCL Limited (CBCL) has been retained by Government of Nunavut (GN) to provide architectural and engineering services for a deep-water port facility in Qikiqtarjuaq, Nunavut. To support the design, CBCL along with their sub-consultants propose to carry out baseline field studies and traditional knowledge or Inuit Qaujimajatuqangit (IQ) gathering in the spring and summer of 2024 to assess the proposed port area and quarry locations. The information obtained will be used to design the deep-water port facility, to evaluate the environmental risks, and to obtain the necessary permits to construct the port.

The field studies planned for spring and summer 2024 in Qikiqtarjuaq include the following:

- ▶ Geotechnical investigation
- ▶ Terrestrial surveys (wildlife, vegetation, topographic)
- ▶ Marine surveys (marine fish and habitat, marine mammals, water and sediment quality, bathymetry, tides)
- ▶ Archaeological assessment
- ▶ IQ gathering

This project proposal document provides the information on the baseline field studies and IQ gathering to determine conformity with existing land use plans and determine whether the proposed activities require screening by the Nunavut Impact Review Board (NIRB).

1.1 Project Name

Baseline Studies for Qikiqtarjuaq Marine Infrastructure

1.2 Project Type

The baseline field studies and IQ gathering are research activities that will be undertaken for the purpose of informing the design and construction of the future deep-water port facility in Qikiqtarjuaq.

1.3 Proponent and Representative Details

| Role | Details |
|---------------------------|--|
| Proponent | Government of Nunavut |
| Proponent Contact | Justin McDonnell 3rd Floor, W.G. Brown Building Iqaluit, Nunavut X0A 0H0 Phone: 867-975-5441 Email: jmcdonell@gov.nu.ca |
| Consultant Representative | CBCL Limited |
| Consultant Contact | Loretta Hardwick, M.Sc. Suite 400, 112 Kent Street Ottawa, Ontario K1P 5P2 Phone: 343-552-2235 Email: lhawdwick@cbcl.ca |

1.4 Project Location

The baseline field studies will be carried out in Qikiqtarjuaq, primarily in the area planned for the future marine infrastructure. The Study Area includes a Marine Study Area in Broughton Channel surrounding the future marine infrastructure, an Upland Study Area, and three potential quarry locations. Figure 1 provides a map of the proposed Study Area.

1.5 Purpose and Need

The purpose of the baseline field studies and IQ gathering is to collect baseline information to support the design and permitting of the Qikiqtarjuaq Marine Infrastructure project. The geotechnical drilling program is needed to evaluate the ocean bottom sediments in the proposed port area, obtain sediment samples for physical and chemical analysis, and obtain bedrock core. The environmental baseline field program, archaeological assessment and IQ gathering will be done to gather background knowledge about the study area, determine the potential impacts of the Qikiqtarjuaq infrastructure project, and develop appropriate mitigation and monitoring plans.



2 Project Description

2.1 Project Activities

During all field investigations wildlife monitors will be employed to monitor for the presence or proximity of wildlife, in particular Polar Bears and marine mammals, for the safety of the crew and the wildlife.

2.1.1 Geotechnical Investigation

A spring geotechnical investigation will be carried out on the ice in the Marine Study Area and Quarry Study Area 1 (Figure 1) using a diamond rotary drill mobilized specifically for this project. Drilling will be conducted onshore and nearshore, working atop the established ice-sheet in the Marine Study Area, as outlined below. Ice thickness will be assessed and working procedures will be in accordance with best practices and carried out safely at all times while drilling the near-shore borehole locations.

The purpose of the nearshore boreholes is to properly evaluate the thickness of the ocean bottom sediments, compactness/consistency of overburden, presence of problematic boulders, obtain sediment samples for physical and chemical analysis, and obtain bedrock core (if encountered) within the depth of interest nearshore. Each nearshore borehole will be advanced to 12 to 33 m below the ground surface or 3 m into sound bedrock.

The program will also include upland drilling for bedrock quarry sources (estimated at 10 boreholes). The onshore boreholes will be advanced to a depth of 2 m to characterize soil in the active layer (above permafrost) and install monitoring wells in two of the boreholes. The inland boreholes will be advanced to a depth of 5 to 10 m below ground surface, depending on findings of quarry sources.

Figure 2 shows potential locations of the boreholes in the Marine Study Area and the Quarry Study Area 1/Upland Study Area. Twenty-two potential marine borehole and 12 upland borehole locations are shown on Figure 2; however, it is expected that only one-third to half of those will be used.



Diamond rotary drilling will occur from within a heated shack set up onsite over each borehole location. The drill and drill shack will be mounted on a skid and dragged to the drill location using a front-end loader, which will also be used to move the drill set-up to and from each borehole location.

It is anticipated that the program will include five days of 24-hour diamond drilling nearshore (estimated at 10 to 12 boreholes) and one day of drilling onshore (3 to 5 boreholes).

If required, additional geotechnical investigations may be carried out in Quarry Study Area 2 and 3, either in the spring or summer of 2024. Both Quarry 2 and Quarry 3 are existing quarries in Qikiqtarjuaq. Details on the number of boreholes will be determined following the geotechnical investigation in Quarry Study Area 1.

2.1.2 Terrestrial Surveys

The inland study areas include the future marine infrastructure site, the three potential quarry locations, and the road that connects the potential quarries to the future marine infrastructure site (Figure 1). The inland study areas will be visually assessed to characterize vegetation communities including vascular and non-vascular species. Vegetation surveys will be conducted by an experienced vegetation ecologist. Field surveys will consist of a combination of transect and/or controlled intuitive sampling and area searches, identifying species encountered to collect an inventory for the area, and collecting qualitative data on ecosystems to assist in classification of vegetation communities and characterization of wildlife habitat. Reconnaissance level surveys will be conducted for terrestrial wildlife in the inland study areas. Surveys methods may include transects and area searches looking for scat, browse activities, tracks, physical remains, as well as direct sightings.

Point count surveys, area searches, migratory and marine bird observation points will be used to assess the Study Area for wildlife, including birds and their habitat. Observations will be aided via the use of binoculars or spotting scopes.

Noise assessments will be conducted in conjunction with terrestrial surveys. Ambient noise measurements will be collected using a handheld noise meter in the Study Area At least three times per day.

2.1.3 Marine Surveys

A bathymetric survey will be completed during the open-water season in the Marine Study Area (Figure 1) using a Teledyne MB2 multi-beam unit mounted onboard a small remotely-operated boat. The boat will be operated from the shore by ABG personnel. Data will be collected on the water depths and bathymetric profile of the marine environment along the Broughton Channel coastline in Qikiqtarjuaq.

Tide and/or current gauges may be deployed in the Marine Study Area to collect site-specific data on water levels and currents in the vicinity of the future port infrastructure. If required, gauges will be deployed early in the ice-free season for a period of approximately two months. Tide gauges will be anchored using a concrete block (e.g., cinder block) or something similar.

Marine fish and fish habitat assessments will be completed in the Marine Study Area to collect data on fish species and abundance, habitat diversity and richness, habitat use, and food sources. A local boat operator will be contracted to support the marine fish habitat assessment. Video of the marine benthic habitat will be collected using an underwater camera or remotely operated underwater vehicle (ROV) along transects through the proposed port area. Fish sampling methods may include electrofishing, gill netting, angling, minnow trapping, fyke netting and/or beach seining. A habitat map will be developed showing habitats of the proposed footprint area. Benthic invertebrate sampling will be conducted to determine invertebrate diversity and abundance in the marine environment. Benthic invertebrate samples will also be collected to support regulatory applications. Methods of sampling may include plankton tows, sediment sampling, and netting. The benthic invertebrates and plankton samples will be enumerated and identified by an experienced marine invertebrate taxonomist.

Marine mammal surveys will be conducted in conjunction with the fish and fish habitat assessments. The Marine Study Area will be visually scanned from multiple shoreline vantage points to identify marine mammals using binoculars or spotting scopes. Bowhead Whales are known to aggregate near the Marine Study Area during the summer months; therefore, marine mammal surveys will be targeted when the whales are normally present between July and October. The Study Area is located within the core Polar Bear range and within a Polar Bear Denning Area. As a result, qualified biologists will scan for dens via scope from locations determined in conjunction with HTO and IQ holders to be safe vantage points.

Marine sediment samples will be collected within the Marine Study Area via a Ponar or Ekman sediment sample, a remotely operated vehicle (ROV), or by divers. Parameters evaluated will be selected to support regulatory applications. Water quality will be measured in situ using a handheld meter in the marine environment in and around the Study Area and in any identified fresh waterbodies.

The road that connects the potential quarries to the future marine infrastructure site will be visually assessed to identify freshwater fish habitat. Fish and fish habitat within 30 m of the road will be visually assessed to document fish habitat and fish presence.

2.1.4 Archaeological Assessment

Archaeological assessment will be carried out by a licensed archaeologist in the Upland Study Area, Quarry Study Area 2, and Quarry Study Area 3. The field assessments will

follow standard archaeological procedures and will involve visual inspection of all existing exposures, systematic and judgmental shovel testing of areas with archaeological potential lacking exposures, and the documentation of the site location, nature, and complexity. Site evaluation will determine significance of the heritage resources and will consider archaeological resource value as well as other factors which contribute to site significance determination including historic, public, ethnic, economic, and scientific attributes. Community cultural values and perspective on relevant significant attributes used to determine site significance will be sought during community consultation, if applicable. All archaeological sites identified will be recorded in field notes, photographed, and GPS coordinates taken.

2.1.5 IQ Gathering

Inuit Qaujimajatuqangit (IQ) gathering sessions will be held in conjunction with the formal community consultations. The study team, including the Government of Nunavut (GN), CBCL, NVision, will work with the Hamlet and the Hunters and Trappers Organization (HTO) to invite knowledge holders to IQ workshops over the late winter, spring, and summer of 2024. Attendees will be presented with an overview of the planned activities and the Marine Infrastructure Project and asked to complete IQ questionnaires for the IQ sessions. All knowledge holders will be asked for their consent to participate prior to collection of IQ.

2.2 Project Schedule

The baseline field studies and IQ gathering will be carried out over the late winter, spring, and summer of 2024. The geotechnical site program will be conducted over 10 to 15 days in spring 2024. The environmental baseline field program and archaeological assessment will be completed over five to six days in summer 2024. The IQ gathering will take place over two to four days in spring or summer 2024.

| Project Activity | Schedule |
|----------------------------|---|
| Geotechnical Investigation | Spring: between April 1 and May 4, 2024 |
| Terrestrial Surveys | Summer: between July 15 and August 30, 2024 |
| Marine Surveys | Summer: between July 15 and August 30, 2024 |
| Archaeological Assessment | Summer: between July 15 and August 30, 2024 |
| IQ Gathering | Spring/Summer: between May 1 and September 30, 2024 |

2.3 Personnel

| Project Activity | Personnel |
|----------------------------|---|
| Geotechnical Investigation | ABG and Logan Drilling: 10 persons Local support: 1 to 2 persons |
| Terrestrial Surveys | CBCL: 1 to 2 persons Local support: 1 to 2 persons |
| Marine Surveys | CBCL: 1 to 2 persons ABG: 2 persons |

| Project Activity | Personnel |
|---------------------------|--|
| | Local support: 1 to 2 persons |
| Archaeological Assessment | ERM: 1 person Local support: 1 person |
| IQ Gathering | CBCL: 1 to 2 persons NVision: 1 to 2 persons GN: 1 to 2 persons Local support: To be determined |

2.4 Equipment and Materials

| Project Activity | Equipment/Material Type | Quantity | Dimension/Capacity | Proposed Use |
|-----------------------------|---|----------|---|---|
| Geotechnical Investigations | Coring/Sampling CME Drill Rig on skids with Drill shack | 1 | approx. 5 m x 6 m | coring/sampling |
| | Front-end loader | 1 | Determined by availability in community | transportation of drill rig and shack |
| | Pick-up trucks | 4 | approx. 2 m x 6 m | personnel and equipment transportation |
| | Diesel generators | 2 | approx. 2 m x 3 m | portable power source for drill shack |
| | Water pump | 1 | approx. 0.5 m x 0.5 m | marine water for drilling |
| | Herman nelson heaters | 2 | approx. 1 m x 2 m | heat for drill shack |
| | Oil-fired coil heaters for waterline | 1 | approx. 1 m x 2 m | prevent waterline freezing |
| | Diesel (8500 L) | 34 | 250 L | fuel for diesel generator and equipment |
| | Gasoline (680 L) | 17 | 40L Jerry Can, 110L Truck tank | fuel for equipment |
| | Propane | 4 | 30 lb tank | for heating torch |
| | Drilling Mud, | 36 | 50 lb bag or 20L pail | drilling additive for bedrock coring |
| | Hydraulic oil | 30 | 20 L | Drill rig |
| | 0/30 oil | 30 | 4 L | Drill rig |
| | Heavy duty bearing grease | 64 | 1 L | Drill rig |

| Project Activity | Equipment/Material Type | Quantity | Dimension/Capacity | Proposed Use |
|---------------------------|--|----------|----------------------------------|--|
| | Transmission fluid | 10 | 4 L | Drill rig |
| | SAE 90 transmission oil | 30 | 4 L | Drill rig |
| | Antifreeze | 68 | 4 L | Drill rig |
| Terrestrial Surveys | Pick-up trucks | 1-2 | approx. 2 m x 6 m | personnel and equipment transportation |
| | Survey equipment (binoculars, spotting scope, tape measure, iPad, GPS, noise meter, camera, hand lens, plant press, transit/total station) | 1 | approx. 0.5 m x 0.5 m x 0.5 m | Field data collection (vegetation, wildlife, topographic, noise) |
| Marine Surveys | Boat (provided by community member) | 1-2 | approx. 2 m x 6 m | Fish and fish habitat surveys, marine sediment and water sampling, tide gauge deployment |
| | Remotely operated boat | 1 | approx. 1 m x 1.5 m | Bathymetric survey |
| | Underwater camera or underwater ROV | | approx. 1 m x 1.5 m | Fish and fish habitat surveys |
| | Survey equipment (fishing equipment, depth sounder, sediment sampler, water sampler, water meter, plankton tow nets, GPS, transect line, sample jars, coolers) | 1 | approx. 0.5 m x 1 m x 0.5 m | Fish and fish habitat surveys, sediment sampling, water quality sampling |
| | Tide gauge | 1-2 | approx. 3.5 m x 0.5 m | Water level measurement |
| | Current meter | 1-2 | approx. 1 m x 0.75 m | Water current measurement |
| Archaeological Assessment | Pick-up truck | 1 | approx. 2 m x 6 m | personnel and equipment transportation |
| | Survey equipment (tape measure, iPad, GPS, trowels, brushes) | 1 | approx. 0.15 m x 0.15 m x 0.15 m | Field data collection (archaeology) |

2.5 Water Use

Marine water will be used for the drilling. Approximately 38 m³/day will be extracted from the marine environment at or near the borehole location and will be recycled back to the channel.

Water samples will be collected during the marine surveys. The volume of water collected for these samples will be less than 10 L.

2.6 Waste Management

Little waste is expected to be generated from the baseline field surveys. Waste is primarily associated with packaging material. Non-hazardous waste will be bagged and disposed of at the Qikiqtarjuaq municipal waste disposal facility; it is estimated that approximately 17 garbage bags of waste will be generated. Waste containing controlled products (petroleum/chemical) will be packed into sealed containers and transported south for disposal at an approved facility in accordance with regulations; it is estimated that up to 4x250L drums of waste containing controlled products may be generated during the geotechnical investigations.

2.7 Alternatives

There are no other alternatives to collect the data required to design the project and support the permit applications.

3 Authorizations

All baseline field surveys will be conducted on land owned by the Hamlet of Qikiqtarjuaq. Authorizations expected to be required to conduct the baseline surveys and IQ gathering are listed below.

| Permit/ Approval | Regulatory Authority | Applicable Programs |
|--|--|---------------------------------------|
| Land Use Review & Conformity Determination | Nunavut Planning Commission (NPC) | All |
| Screening of Project Proposal | NIRB | All |
| Social Sciences Research License | Nunavut Research Institute (NRI) | IQ Gathering |
| Wildlife Research Permit | GN – Department of Environment | Wildlife surveys |
| License to Catch Fish for Scientific Purposes | Fisheries and Oceans Canada (DFO) | Fish, plankton, and sediment sampling |
| Class 1/Class 2 Nunavut Territory Archaeologist Permit | GN - Department of Culture, Language, Elders and Youth | Archaeological assessment |

4 Existing Environment

4.1 Biophysical

4.1.1 Atmospheric Environment

4.1.1.1 Air Quality

Ambient air quality is only measured at a few stations in Nunavut and data are not available for Qikiqtarjuaq. Qikiqtarjuaq has air quality that is typical of a remote northern community. There are no large industrial or commercial operations that would impact Qikiqtarjuaq air quality besides the existing airport and three quarries. Ambient air quality data collected by the National Air Pollution Surveillance (NAPS) program in 2016 in Iqaluit, 470 km from Qikiqtarjuaq, showed that the measured concentrations for NO_x, PM_{2.5}, and ozone were below the Nunavut Ambient Air Quality Standards. Generally, the air quality in Iqaluit is good most of the time (Nunami Stantec Limited, 2018).

The region has typical air temperatures ranging between lows near -35°C and highs near 10°C (Nunami Stantec Limited, 2018). Winds prevail from north and south-southwesterly directions in Qikiqtarjuaq. They are strongest from the north and northwest in winter, and north and northeast in summer (Nunami Stantec Limited, 2018).

4.1.1.2 Ambient Noise

Noise data specific to Qikiqtarjuaq is not available. Natural sounds such as winds, waves, precipitation, marine life, and cracking ice are the most common noises in the Arctic region of Baffin Bay and Davis Strait. Sounds from marine traffic, snowmobiles, non-industrial machinery, and rifle-fire are also present (Nunami Stantec Limited, 2018).

Underwater ambient noise levels in the Arctic region vary largely depending on the season and environmental conditions. Weather, ice conditions, marine mammals, and marine traffic are main contributors to underwater noise levels.

4.1.1.3 Ambient Light

In late June and early July, there is almost 24-hours of daylight in Qikiqtarjuaq, but just a few hours of daylight during December. A small amount of artificial light is produced, mainly from the residences in Qikiqtarjuaq.

4.1.2 Terrestrial Environment

Qikiqtarjuaq is located in the Arctic Cordillera Ecozone. The Arctic Cordillera Ecozone consists of an extensive mountain chain, where ice barrens and rock are dominant. Extreme cold, winds and lack of soils on the higher elevations of the ecozone mean few

plants or animals are found there, however vegetation and wildlife are present at lower elevations (Canadian Council on Ecological Areas, 2014).

4.1.2.1 Terrain and Soils

Most of the terrain on Broughton Island consists of glacial-scoured bare rock. Shorelines around Qikiqtarjuaq typically consist primarily of bedrock with pockets of sand with gravel and cobble veneer. Cryosolic¹ soils dominate what little soil is found in the region. (Nunami Jacques Whitford Limited, 2008). Most of the project area is flat or undulating but is surrounded by hills and mountainous terrain.

4.1.2.2 Vegetation

Vegetation is largely absent in the Arctic Cordillera Ecozone, and is mainly limited to hardy plants, mosses, and lichens. The vegetation grows along sheltered coastlines, slopes and animal dense areas. Mosses and lichens such as the Crustose Lichen (*Acarospora badiofusca*) can be found on rocky surfaces (Canadian Council on Ecological Area, 2014). Plants found in the Arctic Cordillera Ecozone include Arctic Poppy (*Papaver radicum*), Arctic White Heather (*Cassiope tetragona*), Arctic Willow (*Salix arctica*), Bilberry (*Vaccinium uliginosum*), Cottongrass (*Eriophorum angustifolium*), *Diapensia*, Purple Saxifrage (*Saxifraga oppositifolia*), Moss Campion (*Silene acaulis*), Mountain Avens (*Dryas octopetala*), Mountain Sorrel (*Oxyria digyna*) and River Beauty (*Chamerion latifolium*) (McGill University, 2024).

4.1.2.3 Wildlife and Habitat

Terrestrial mammals found in the Arctic Cordillera Ecozone include Polar Bears (*Ursus maritimus*), Barren-Ground Caribou (*Rangifer tarandus groenlandicus*), Arctic Wolves (*Canis lupus arctos*), Arctic Hares (*Lepus arcticus*), Collared Lemmings (*Dicrostonyx groenlandicus*), Arctic Foxes (*Vulpes lagopus*), Ermines (*Mustela erminea*), and Wolverines (*Gulo gulo*) (McGill University, 2024). Polar Bears and Barren-Ground Caribou are pushed to land when the sea ice begins to melt in the spring. Birds found in the Arctic Cordillera Ecozone include the Rock Ptarmigan (*Lagopus muta*), Gryfalcon (*Falco rusticolus*), and Snowy Owl (*Bubo scandiacus*). Songbirds that can be found in the Arctic Cordillera Ecozone include the Hoary Redpoll (*Acanthis hornemanni*), Common Redpoll (*Acanthis flammea*), Snow Bunting (*Plectrophenax nivalis*), and Lapland Longspur (*Calcarius lapponicus*). Waterfowl include the Snow Goose (*Anser caerulescens*), Common Eider (*Somateria mollissima*), King Eider (*Somateria spectabilis*), and Red-Throated Loon (*Gavia stellata*). Shore and seabirds found in the coastal areas include Thick Billed Murre (*Uria lomvia*), Black-Legged Kittiwake (*Rissa tridactyla*), Ruddy Turnstone (*Arenaria interpres interpres*), Red Knot (*Calidris canutus*), Black Guillemot (*Cepphus grylle*), Common Ringed Plover (*Charadrius hiaticula*), Little Ringed Plover (*Charadrius dubius*), and Northern Fulmar

¹ Cryosolic soils are formed in mineral or organic materials that have permafrost within 1 or 2 m of the soil surface (Government of Canada, 2013).

(*Fulmarus glacialis*) (McGill University, 2024). With the exception of the Rock Ptarmigan and the Snowy Owl, the listed birds migrate and are most commonly seen in Nunavut in the spring and summer months.

4.1.2.4 Terrestrial Species at Risk and Species of Conservation Concern

Listed bird and terrestrial mammal species known to occur in or near the Qikiqtarjuaq baseline study areas are shown in the table below. Likelihood of occurrence in the baseline study areas was based on a traditional knowledge report prepared for the Qikiqtani Inuit Association (Qikiqtani Inuit Association, 2018), Nunavut Coastal Resource Inventory (Nunavut Coastal Resource Inventory, 2010), and Government of Canada information on species at risk in Nunavut (Government of Canada, 2021).

| Species Name | Scientific Name | COSEWIC ¹ | SARA ² | Nunavut Rank ³ | Likelihood of Occurrence in the Baseline Study Areas |
|--------------------------------------|-----------------------------------|----------------------|-------------------|---------------------------|--|
| Birds | | | | | |
| Buff-breasted Sandpiper | <i>Calidris subruficollis</i> | Special Concern | Special Concern | S3 | Low |
| Ivory Gull | <i>Pagophila eburnea</i> | Endangered | Endangered | S1 | Low |
| Red-necked Phalarope | <i>Phalaropus lobatus</i> | Special Concern | Special Concern | S3 | Low |
| Red Knot <i>islandica</i> subspecies | <i>Calidris canutus islandica</i> | Not at Risk | Special Concern | S4 | Low |
| Red Knot <i>rufa</i> subspecies | <i>Calidris canutus rufa</i> | Endangered | Endangered | S2 | Possible |
| Ross's Gull | <i>Rhodostethia rosea</i> | Threatened | Threatened | S1 | Possible |
| Terrestrial Mammals | | | | | |
| Wolverine | <i>Gulo gulo</i> | Special Concern | Special Concern | S3 | Low |

¹ COSEWIC = Committee on the Status of Endangered Wildlife in Canada

² SARA = *Species at Risk Act*

³ Nunavut Territorial Rank: S1=critically imperilled, S2=imperilled, S3=Vulnerable, S4=apparently secure, NR = not ranked

4.1.3 Freshwater Environment

4.1.3.1 Surface Water Resources

Several intermittent watercourses intersect with roads that will be used to travel from the Hamlet of Qikiqtarjuaq to the Marine and Upland Study Areas and the three quarries that occur within the baseline study area. A river crosses the road that provides access to the quarries.

The drinking water reservoir for Qikiqtarjuaq is located a significant distance from the Marine and Upland Study Areas. High terrain separates the drinking water reservoir from the study areas and the three quarries. It is not expected that the drinking water reservoir will be impacted by the baseline studies.

4.1.3.2 Freshwater Fish and Fish Habitat

Arctic Char (*Salvelinus alpinus*) can be found in freshwater watercourses on Qikiqtarjuaq. The community of Qikiqtarjuaq traditionally harvest Arctic Char from adjacent lakes and rivers (Fisheries and Oceans Canada (DFO), 2016). No watercourses are located within the project area. There are no freshwater resources in the area that the baseline studies will occur. There are a few watercourses in proximity to the airport and hamlet. The most predominant watercourse in the area is the Kuruluk River, which is used for Qikiqtarjuaq's water supply.

4.1.4 Marine Environment

4.1.4.1 Marine Water and Sediment Quality

Water in Baffin Bay and Davis Strait exhibits temperatures that range from approximately -1°C in the surface layer (less than 200 m depth), 1°C in the intermediate layer (200-1,000 m depth) and 0°C in the bottom layer (greater than 1,000 m depth) (Nunami Stantec Limited, 2018). Surface water at Qikiqtarjuaq was measured in 2007 and found to range from 0.1°C to 1.2°C (Nunami Jacques Whitford Limited, 2008). The breakup of sea ice in Broughton Channel typically occurs by mid-July to early August. The channel is usually free of ice from July to September and starts to freeze again in early October (ECCC, 2017). Limited information on marine water quality and sediment quality in the Qikiqtarjuaq area currently exist.

4.1.4.2 Marine Fish and Fish Habitat

Qikiqtarjuaq experiences a tidal range of approximately 1.6 m. Subtidal habitats around Qikiqtarjuaq typically consist primarily of fine substrates with limited boulder cover (Nunami Jacques Whitford Limited, 2008). Benthic substrate behind the breakwater at Qikiqtarjuaq consists of mostly sand with more fine silt and limited boulder cover. Limited aquatic vegetation is found nearshore Qikiqtarjuaq and consists primarily of Rockweed (*Fucus* sp.) and some Kelp (*Laminaria longicruris* and *Alaria esculenta*) (Nunami Jacques Whitford Limited, 2008). Sandy and mixed substrates near Qikiqtarjuaq provide suitable habitat for Arctic Soft-shelled Clams (*Mya* spp.) (International Council for the Exploration of the Sea (ICES), 2019).

Ice breakup typically occurs from mid June to early July, with Arctic Char (*Salvelinus alpinus*) appearing in the Hamlet of Qikiqtarjuaq later in July, when the ice is fully gone. Arctic Cod (*Boreogadus saida*), sculpins, shellfish and kelp are also commonly harvested from the hamlet (Nunami Jacques Whitford Limited, 2008). Other fish found in Baffin Bay and Davis Strait are American Eel (*Anguilla rostrata*), Atlantic Cod (*Gadus morhua*), Atlantic Salmon

(*Salmo salar*), Capelin (*Mallotus villosus*), Greenland Shark (*Somniosus microcephalus*), Grenadier (*Coryphaenoides acrolepis*), Herring (*Clupea harengus*), Northern Wolfish (*Anarhichas denticulatus*), Sand Lance (*Ammodytes hexapterus*) and Greenland Halibut (*Reinhardtius hippoglossoides*) (Qikiqtani Inuit Association, 2018).

4.1.4.3 Marine Mammals

Marine mammals important to the Qikiqtarjuaq community include seals, Narwhals (*Monodon monoceros*), and Bowhead Whales (*Balaena mysticetus*) (Nunami Jacques Whitford Limited, 2008). Ringed Seals (*Pusa hispida*) and Bearded Seals (*Erignathus barbatus*) can be found on the coast near Qikiqtarjuaq throughout the year, while Hooded Seals (*Cystophora cristata*) and Harp Seals (*Pagophilus groenlandicus*) pass by during open water periods. Atlantic Walruses (*Odobenus rosmarus rosmarus*) and Polar Bears are also found near the coast of Qikiqtarjuaq (Qikiqtani Inuit Association, 2018). Killer Whales (*Orcinus orca*), Atlantic White-Sided Dolphins (*Lagenorhynchus acutus*), Harbour Porpoises, (*Phocoena phocoena*), Minke Whales (*Balaenoptera acutorostrata*), North Atlantic White Whales (*Eubalaena glacialis*), and Northern Bottlenose Whales (*Hyperoodon ampullatus*) have been found in the waters near Qikiqtarjuaq. Beluga Whales (*Delphinapterus leucas*) were historically more common in the waters off Qikiqtarjuaq, but are rarely seen today (Qikiqtani Inuit Association, 2018).

4.1.4.4 Marine Species at Risk and Species of Conservation Concern

Listed marine species known to occur in or near the Qikiqtarjuaq baseline study areas are shown in the table below. The likelihood of occurrence in the baseline study areas was determined based on a traditional knowledge report prepared for the Qikiqtani Inuit Association (Qikiqtani Inuit Association, 2018), the Nunavut Coastal Resource Inventory (Nunavut Coastal Resource Inventory, 2010), and Government of Canada information on species at risk in Nunavut (Government of Canada, 2021).

| Species Name | Scientific Name | COSEWIC ¹ | SARA ² | Nunavut Rank ³ | Likelihood of Occurrence in the Baseline Study Areas |
|--|-----------------------------------|----------------------|-------------------|---------------------------|--|
| Marine Mammals | | | | | |
| Atlantic Walrus (Central/Low Arctic population) | <i>Odobenus rosmarus rosmarus</i> | Special Concern | - | S3 | Possible |
| Beluga Whale (Eastern High Arctic/Baffin Bay population) | <i>Delphinapterus leucas</i> | Special Concern | - | S3S4 | Possible |
| Bowhead Whale | <i>Balaena mysticetus</i> | Special Concern | - | S3 | Likely |
| Fin Whale | <i>Balaenoptera physalus</i> | Special Concern | Endangered | NR | Low |

| Species Name | Scientific Name | COSEWIC ¹ | SARA ² | Nunavut Rank ³ | Likelihood of Occurrence in the Baseline Study Areas |
|---|---------------------------------|----------------------|-------------------|---------------------------|--|
| Killer Whale | <i>Orcinus orca</i> | Special Concern | - | S2S3 | Possible |
| Narwhal | <i>Monodon monoceros</i> | Special Concern | - | S3 | Likely |
| Polar Bear | <i>Ursus maritimus</i> | Special Concern | Special Concern | S3 | Likely |
| Ringed Seal | <i>Pusa hispida</i> | Special Concern | - | S4 | Likely |
| Marine Fish | | | | | |
| Atlantic Cod (Newfoundland and Labrador population) | <i>Gadus morhua</i> | Endangered | - | NR | Likely |
| Atlantic Wolffish | <i>Anarhichas lupus</i> | Special Concern | Special Concern | NR | Low |
| Lumpfish | <i>Cyclopterus lumpus</i> | Threatened | - | NR | Possible |
| Northern Wolffish | <i>Anarhichas denticulatus</i> | Threatened | Threatened | NR | Possible |
| Roundnose Grenadier | <i>Coryphaenoides rupestris</i> | Endangered | - | NR | Low |
| Spotted Wolffish | <i>Anarhichas minor</i> | Threatened | Threatened | NR | Low |
| Thorny Skate | <i>Amblyraja radiata</i> | Special Concern | - | NR | Low |

¹ COSEWIC = Committee on the Status of Endangered Wildlife in Canada

² SARA = *Species at Risk Act*

³ Nunavut Territorial Rank: S1=critically imperilled, S2=imperilled, S3=Vulnerable, S4=apparently secure, NR = not ranked

4.2 Socio-economic

4.2.1.1 Population and Language

According to Statistics Canada, the population of Qikiqtarjuaq in 2021 was 593 (Statistics Canada, 2023). The languages spoken are Inuktitut and English.

4.2.1.2 Education and Employment

Qikiqtarjuaq has a 42.4% employment rate and 33.3% unemployment rate (TriNav Fisheries Consultants Inc. (TFC), 2020). With the decommissioning of the distant early warning line system, the economy of Qikiqtarjuaq has declined (Nunami Stantec Limited, 2018). Employment comes mainly from government and natural resources industries such as fishing. Seal, walrus, narwhal, and Arctic char are commonly hunted and fished for subsistence (Nunami Stantec Limited, 2018). There is also a small clam fishery. A Parks

Canada office supports Auyuittuq National Park (Nunami Stantec Limited, 2018). There is also an airport, hotel, and lodge, as well as two supply and retail stores located in Qikiqtarjuaq which provide some employment (TFC, 2020).

4.2.1.3 Housing and Community Infrastructure

The total number of occupied private dwellings in Qikiqtarjuaq is 160 (Statistics Canada, 2023). Infrastructure in Qikiqtarjuaq includes a hamlet office, RCMP office, fire hall, health centre, maintenance garage, parking garage, power plant, airport, small craft harbour, school, college, daycare, public and staff housing, pool, arena, playground, water system, and wastewater and sewage disposal infrastructure.

4.2.1.4 Transportation

Existing roads connect the Hamlet of Qikiqtarjuaq to the marine, upland, and quarry study areas. The roads in Qikiqtarjuaq are narrow and gravel surfaced.

4.2.1.5 Archaeological and Cultural Historic Resources

There are remnant structures including rock and sod houses, indicating traditional habitations and burial sites along the coast of Qikiqtarjuaq, remnants of the Thule culture (Nunavut Coastal Resource Inventory, 2010).

5 Environmental Effects and Mitigation Measures

The table below presents a summary of potential environmental effects and mitigation measures relevant to the Baseline Studies for Qikiqtarjuaq Marine Infrastructure.

| Potential Environmental Effect | Mitigation Measures |
|--|---|
| Disturbance of wildlife - Terrestrial and marine wildlife may be disturbed and move away from or be attracted to land-based and in-water activities. | Local field assistants will accompany the field program personnel to monitor for disturbance to marine and terrestrial wildlife and their habitat. |
| Disturbance of marine mammals via underwater noise from drilling activities. | Drilling will occur when bay is ice covered and marine mammals are not expected to be present. If marine mammals are observed within 500 m of the drilling location, drilling activities will cease until the marine mammal has left the area. |
| Disruption of fish habitat through direct alteration of the seabed, increased turbidity, or accidental spills. The alteration of the seabed is temporary and limited to the small area occupied by each borehole. A low magnitude increase in suspended sediment will be temporary and limited to the area surrounding each in-water borehole. | The alteration of the seabed is limited to the small area occupied by each borehole. The borehole diameter will be limited to approximately 10 cm. The amount of fuel and drilling additive will be limited to that required to complete the drilling for each day. A non-toxic, biodegradable drilling additive will be used, if required. Secondary containment will be in place under the drill rig motor. A spill response plan and spill response kit adequate to contain the potential volume of fuel in the equipment will be maintained on-site and implemented in the event of a spill. |
| Loss of fish- Fish could be drawn into water intake while pumping water from the shoreline. | Although the geotechnical program is in marine waters, DFO's <i>Interim code of practice: End-of pipe fish protection screens for small water intakes in freshwater</i> will be followed. |
| Loss of shellfish - Shellfish mortality may occur where sedentary species are in the direct path of the drill head. This is limited to the small area occupied by each borehole. | The drill head will be advanced slowly to allow mobile species to leave the borehole area. |

| Potential Environmental Effect | Mitigation Measures |
|--------------------------------------|---|
| Disruption of traditional land uses. | <p>The community will be advised of the field program prior to arrival of the field team. The field program will not interfere with traditional use by local people.</p> <p>Communication with the community and use of a local community members to assist when conducting the environmental field program will mitigate the potential to interfere with local hunting or fishing.</p> |

6 Consultation

A community consultation was conducted on December 12, 2023, and provided information on the 2024 baseline field program to representatives from the Hamlet of Qikiqtarjuaq, the Qikiqtani Inuit Association, and the Hunters and Trappers Organization (HTO).

Detailed plans for the geotechnical investigation drilling program and approaches to the terrestrial, marine, and archaeological studies will be presented to the community during the next community consultation session in March 2024.

7 References

Canadian Council on Ecological Areas. 2014. Arctic Cordillera Ecozone. Available [Online: Arctic Cordillera Ecozone \(ecozones.ca\)](https://ecozones.ca). Accessed February 8, 2024.

Environment and Climate Change Canada (ECCC). 2021. Species at Risk in Nunavut 2021. Available Online: https://publications.gc.ca/collections/collection_2022/eccc/cw66/CW66-775-2021-eng.pdf Accessed December 20, 2023.

Environment and Climate Change Canada (ECCC). 2017. National Marine Weather Guide Arctic Regional Guide. Available Online: https://publications.gc.ca/collections/collection_2017/eccc/En56-240-5-2017-1-eng.pdf Accessed December 21, 2023.

Fisheries and Oceans Canada (DFO). 2023. Aquatic Species at Risk Map. Available Online: <https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html>. Accessed December 18, 2023.

Fisheries and Oceans Canada (DFO). 2016. Results of a traditional ecological knowledge study on Arctic char in Qikiqtarjuaq (Nunavut) fishing areas. Canadian Manuscript Report of Fisheries and Aquatic Sciences 3090.

Government of Canada. 2013. Chapter 6: Crysolite order. Available Online: <https://sis.agr.gc.ca/cansis/taxa/cssc3/chpt06.html>. Accessed February 8, 2024.

Government of Canada. 2021. Species at risk in Nunavut 2021. Available Online: <https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre/species-risk-nunavut-2021.html#toc2>. Accessed February 8, 2024.

International Council for the Exploration of the Sea (ICES). 2019. Mapping Arctic clam abundance using multiple datasets, models, and a spatially explicit accuracy assessment. ICES Journal of Marine Science (2019), 76(7), 2349–2361. doi:10.1093/icesjms/fsz099.

McGill University. 2024. The Canadian Biodiversity Website. Available Online: <https://canadianbiodiversity.mcgill.ca/english/index.htm>. Accessed February 8, 2024.

Nunami Jacques Whitford Limited. 2008. Nearshore Fish and Fish Habitat Assessments Related to Marine Structure Developments at Arviat, Chesterfield Inlet, Pangnirtung, Qikiqtarjuaq and Repulse Bay, Nunavut. Project No. 1024457.

Nunami Stantec Limited. 2018. Environmental Setting and Review of Potential Effects of Oil and Gas Activities. Prepared for Nunavut Impact Review Board. Project No. 123221001.

Nunavut Coastal Resource Inventory. 2010. Qikiqtarjuaq. ISBN: 978-1-55325-207-8.

Parks Canada. 2003. Terrestrial Ecozones of Canada. Available Online: <http://parkscanadahistory.com/publications/fact-sheets/eng/ecozones.pdf> Accessed December 12, 2023 from

Statistics Canada. 2023. (table). *Census Profile*. 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released November 15, 2023. <https://www12.statcan.gc.ca/census-recensement/2021/dp/pd/prof/index.cfm?Lang=E> (accessed December 11, 2023).

TriNav Fisheries Consultants Inc. (TFC). 2020. Economic Feasibility of Establishing an Offloading Port in the Hamlet of Qikiqtarjuaq. Prepared for the Government of Nunavut.

Qikiqtani Inuit Association. 2018. Qikiqtaaluk Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut for the Baffin Bay and Davis Strait Marine Environment. Prepared by Heidi Klein, Sanammanga Solutions Inc. for submission to the Nunavut Impact Review Board for the Baffin Bay and Davis Strait Strategic Environmental Assessment.



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