



NIRB Application for Screening #126135 Grise Fiord Community Harbour Project

Application Type: New

Project Type: Coastal Infrastructure

Application Date: Friday, April 4, 2025

Period of operation: from 2030-03-25 to 2080-03-25

Project Proponent: Justin
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DETAILS

Non-technical project proposal description

English: The Government of Nunavut, Department of Community and Government Service (GN-CGS) is planning the construction of a Community Harbour in the Hamlet of Grise Fiord, Nunavut (the Project). Worley Canada Services Ltd., operating as Worley Consulting (Worley), has been retained by the GN-CGS to support the detailed design of a Community Harbour in Grise Fiord (the Project). Dynamic Ocean Consulting Ltd (Dynamic Ocean) is supporting Worley on the permitting requirements for the Project. A feasibility phase of the Project was undertaken from 2019 to 2022, with the detailed design phase initiating in Spring 2024. A Memorandum of Understanding (MOU) between the Qikiqtani Inuit Association (QIA), the GN, and the Government of Canada has resulted from the creation of the Tallurutiup Imanga National Marine Conservation Area (TI NMCA) and was signed in the summer of 2021. The purpose of this agreement is to recognize that marine infrastructure is connected to community wellbeing as well as economic and social development. With funding from the Government of Canada, the Project aims to address the marine infrastructure deficit in Grise Fiord. The permanent components of the Project include the construction of a new breakwater(s), dredging of a harbour basin and entrance channel, a boat launch ramp, laydown and storage area(s), small craft floats, access roadways, slope protection, and area and navigational lighting. Project supporting components required during construction include a quarry and haul road. The haul road and quarry will remain in place following construction, where the quarry may be transferred to the Hamlet following completion of the Project. Several field studies have been undertaken in 2019 and 2024 to support determination of existing environmental conditions. A drilling program was undertaken in the summer of 2024 and a second program will be undertaken in the spring of 2025 to inform geotechnical requirements for the detailed design. Project construction is scheduled to initiate in 2026 and be substantially completed in 2029. In water construction works at the harbour location will occur during the open-water season, while work at the quarry and adjacent areas may extend before and after the open-water season. Community consultations have been ongoing since the feasibility study and are designed to ensure that residents, hunters, fishers, and stakeholders are consulted using a variety of methods and materials. To date, seven community consultation visits have been conducted since 2018, including: meetings with the Hamlet, the Nauttiguqtiit (guardians), and local QIA representatives; design workshops with the Iviq Hunters and Trappers' Organization; Inuit knowledge (Inuit Qaujimajatuqangit [IQ]) workshops with elders and active hunters; and a community open house. The community has been very engaged in the Project and has provided valuable input into the harbour design concepts on numerous occasions. Meaningful consultation will be continued throughout the 'life cycle' of the Project, including during the detailed design and construction phases. Letters of support from the community are attached.

French: not applicable

[illegible]

Post-Closure Phase: from to

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Community Harbour Footprint	Dredging	Crown	see Section 1.3 of PSIR Report	in the marine environment N/A	see Section 1.17 of PSIR Report
Community Harbour Footprint	Harbour infrastructure	Crown	see Section 1.3 of the PSIR Report	in the marine environment N/A	see Section 1.17 of PSIR Report
Community Harbour Footprint	Marine Based Activities	Crown	see Section 1.13 of PSIR Report	in the marine environment N/A	see Section 1.17 of PSIR Report
Quarry (Borrow Pit) 2A	Quarry/Borrow pit	Municipal	Please note, while there are four options for the quarry (borrow pit), only one will be selected and used during construction.	An Archaeological Impact Assessment (AIA) was completed in August 2024 under Class 2 Archaeologist Permit 2024-63A and no archaeological sites were recorded within the Project footprint (or within a 100 m buffer). See Sections 5.4.1, 6.5.7, 7.2.3.6 of PSIR Report	see Section 1.17 of PSIR Report
Quarry (Borrow Pit) 2B	Quarry/Borrow pit	Municipal	Please note, while there are four options for the quarry (borrow pit), only one will be selected and used during construction.	An Archaeological Impact Assessment (AIA) was completed in August 2024 under Class 2 Archaeologist Permit 2024-63A and no archaeological sites were recorded within the Project footprint (or within a 100 m buffer). See Sections 5.4.1, 6.5.7, 7.2.3.6 of PSIR Report	see Section 1.17 of PSIR Report
Quarry (Borrow Pit) 2C	Quarry/Borrow pit	Municipal	Please note, while there are four options for the quarry (borrow pit), only one will be selected and used during construction.	An Archaeological Impact Assessment (AIA) was completed in August 2024 under Class 2 Archaeologist Permit 2024-63A and no	see Section 1.17 of PSIR Report

				archaeological sites were recorded within the Project footprint (or within a 100 m buffer). See Sections 5.4.1, 6.5.7, 7.2.3.6 of PSIR Report	
Quarry (Borrow Pit) 2D	Quarry/Borrow pit	Municipal	Please note, while there are four options for the quarry (borrow pit), only one will be selected and used during construction.	An Archaeological Impact Assessment (AIA) was completed in August 2024 under Class 2 Archaeologist Permit 2024-63A and no archaeological sites were recorded within the Project footprint (or within a 100 m buffer). See Sections 5.4.1, 6.5.7, 7.2.3.6 of PSIR Report	see Section 1.17 of PSIR Report
Community Harbour Footprint	Offshore Infrastructure (port, break water, dock)	Crown	see Section 1.3 of the PSIR Report	in the marine environment N/A	see Section 1.17 of PSIR Report

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Grise Fiord		Community Members	2022-05-12
Grise Fiord		Community Open House	2024-12-07
Grise Fiord	Tivai Kiguktak (HTO manager) / David General (SAO) / Marty Kuluguqtuq (ASAO) / Laisa Watsko (QIA)	Iviq HTO, Hamlet Council, Guardians, and QIA	2024-08-07
Grise Fiord	Manasie Kaunak (CLO)	AFA Community Representative	2024-08-07
Grise Fiord	David General (SAO) / Tivai Kiguktak (HTO manager)	Hamlet Council and Iviq HTO	2024-12-06
Grise Fiord	Haul Route Residents	Hamlet of Grise Fiord	2024-12-07
Grise Fiord	Jaypetee Akeeagok (chairman)	Arctic Fisheries Alliance	2018-11-17
Grise Fiord	Cpl. Nathan Jacobson	RCMP	2018-11-16
Grise Fiord	Cpl. Nathan Jacobson	RCMP	2019-05-30
Grise Fiord	Hamlet (Meeka Kiguktak (Mayor), Laisa Watso (QIA/CLO), Susie Kiguktak, Inger-Lise Christensen)/ Iviq HTO (Amon Akeeagok, Marty	Hamlet Council and Iviq HTO	2019-11-07

	Kuluguqtuq, Larry Audlaluk (EDO), Liza Ningiuk (QIA), Kavavow Kiguktak, Raymond Mercredi)		
Grise Fiord	Hamlet (Meeka Kiguktak (Mayor), Laisa Watso (Dep. Mayor), Arqna Audlaluk, Inger-Lise Christensen) / Iviq HTO (Amon Akeeagok (Chairperson), Marty Kuluguqtuq (Sec/Treasurer), Michael Kakkee, Kavavow Kiguktak, Raymond Mercredi)	Hamlet Council and Iviq HTO	2019-05-30
Grise Fiord	Hamlet (Meeka Kiguktak (Mayor), Lucy Nangaq, Arqna Audlaluk, Eva Muckpa, Susie Kiguktak) / Iviq HTO (Amon Akeeagok, Marty Kuluguqtuq, Larry Audlaluk, Liza Ningiuk, Michael Kakkik, Jeffrey Qaunaq)	Hamlet Council and Iviq HTO	2018-11-15
Grise Fiord	Hamlet (Meeka Kiguktak (Mayor), Laisa Watso (QIA), Susie Kiguktak, Inger-Lise Christensen)/ Iviq HTO (Amon Akeeagok (Chairperson), Marty Kuluguqtuq, Larry Audlaluk, Liza Ningiuk (QIA), Kavavow Kiguktak, Raymond Mercredi)	Hamlet Council and Iviq HTO	2021-12-07
Grise Fiord	Hamlet (Meeka Kiguktak, Laisa Watso, Susie Kiguktak)/ Iviq HTO (Amon Akeeagok (Chairperson), Marty Kuluguqtuq, Larry Audlaluk, Kavavow Kiguktak) / QIA (Ella Levin, Bryce Stevens)	Hamlet Council and Iviq HTO	2021-05-11

Authorizations

Indicate the areas in which the project is located:

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Other	Nunavut Planning Commission - Conformity Determination	Active	2024-12-12	
Government of Nunavut, Community and Government Services	Land Use Permit (LUP) for construction above the ordinary high water mark for land tenure under Commissioners or Untitled Municipal lands.	Not Yet Applied		
Hamlets and Municipalities	quarry permit (to be obtained by the contractor)	Not Yet Applied		
Hamlets and Municipalities	construction camp and laydowns (to be obtained by the contractor)	Not Yet Applied		
Hamlets and Municipalities	development permit for community harbour components that are above the HWL	Not Yet Applied		
Nunavut Water Board	Water License Type B for potential for withdrawal of freshwater or the need to cross freshwater crossings for haul road construction (to be obtained by the contractor).	Not Yet Applied		
Fisheries and Oceans Canada	Section 35(2) Fisheries Act Authorization (FAA). In-water or near-water works associated with the construction of the community harbour that have the ability to result in the HADD to fish or fish habitat, as defined under the Fisheries Act. Typically, when it is determined a HADD will occur (residual effects), it	Not Yet Applied		

	is primarily due to the Project footprint (areas of seabed that are no longer available to fish).			
Transport Canada	Notice of Works (NoW) Application for Approval. In-water works associated with the construction and operations of the community harbour that have the potential to interfere with navigation.	Not Yet Applied		
Aboriginal Affairs and Northern Development Canada	Land Use Permit (LUP) Class A. In-water works relative to the use of the seabed (areas below the OHWL (and thus considered Crown Land).	Not Yet Applied		
Natural Resources Canada	Authorization of Explosives and Magazine License Application. Blasting – For any industrial explosive that is to be imported into or manufactured, transported, possessed or used in Canada. Transport, storage and acquisition of explosives (to be obtained by the contractor).	Not Yet Applied		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Air	Project personnel travelling to the site will use air travel and arrive either on regularly scheduled commercial flights, or on private charter flights if required.	

Project accommodation types

Temporary Camp

Other,

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Drills	2-3	5 tons	Quarrying
Front end loader	2-3	966-988	Loading rock and moving cargo/equipment
Compactor	1	20 ton	Compacting road surfacing.
Dozer	1	D8	Leveling placed rock and road surfaces
Grader	1	140	Road maintenance
Spud barge/derrick	1	20 m x 50 m deck with 150 ton crane	Dredging, moving/lifting materials and equipment
Work boats	1-2	50-500 horsepower	Floating equipment movement and surveys
Telehandler	1	5 ton	Moving materials and equipment
Rough terrain crane	1	80 ton	Lifting materials
Rock crusher	1-2	--	Crushing run of quarry materials
Trucks	3-5	35-40 ton articulating	Hauling quarried rock
Pickup Truck	5	Crew cab; 3/4 ton	Crew and supplies movement
Mini-bus	1	15 passenger	Daily crew mobilization from hotel/accommodation to Project site .
Fuel/service truck	1	10 ton	Daily refueling and servicing of major mobile equipment, fueled from Government of Nunavut-Petroleum Products Division (GN-PPD) dispensers in Grise Fiord and/or Contractor supplied fuel storage facilities .
excavators	3-5	30-40 ton	Quarrying, handling armour stone, loading trucks, excavating, dredging, material placement

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Oxyacetylene	hazardous	10	140	1400	Cubic ft	Welding and cutting of steel
Explosives	hazardous	10	4	40	Metric Tons	Quarrying
Diesel	fuel	1	1250000	1250000	Liters	Mobile equipment; remote generators and heaters.
Gasoline	fuel	1	13000	13000	Liters	Pick-up trucks, small work boats, small

						generators, and All Terrain Vehicles.
Lube and Oils	hazardous	20	100	2000	Liters	Maintenance and mobile equipment
Paint	hazardous	10	2	20	Liters	Painting steel hardware and miscellaneous components
Propane	fuel	20	30	600	Liters	Heaters.

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
5	From the existing water supply infrastructure in Grise Fiord. Delivered by water truck if local supply is unable to meet needs.	Hamlet reservoir / water system

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Waste disposal	Combustible wastes	5 tons	Hamlet landfill	n/a
Waste disposal	Hazardous waste	2000 litres	Returned to south in sealed drums or lined bags, transported in 20' shipping containers and disposed in accordance with regulatory procedures.	n/a
Waste disposal	Non-Combustible wastes	1 ton	Hamlet landfill	n/a
Waste disposal	Overburden (organic soil, waste material, tailings)	Negligible	What little overburden exists at the quarry (borrow pits) will be set aside and stockpiled at the quarry (borrow pits) location.	n/a
Waste disposal	Sewage (human waste)	1000 m3	The Project will coordinate closely with the Hamlet of Grise Fiord and the GN to assess the capacity of the sewage lagoon prior to mobilizing the construction workforce. If necessary, the contractor will implement appropriate measures to manage the wastewater generated by the Project.	n/a

Environmental Impacts:

Please refer to Section 7 of the PSIR Report included in this application for detailed information on the predicted environmental impacts and proposed mitigation measures.

Additional Information

SECTION A1: Project Info

see Section 1.2 of PSIR Report

SECTION A2: Allweather Road

see Sections 1.6.3, 2.2.2, Figure 1-1 of PSIR Report. The majority of the haul road to be used to transport rock material from the quarry (borrow pits) to the community harbour will utilize existing road infrastructure

SECTION A3: Winter Road

SECTION B1: Project Info

SECTION B2: Exploration Activity

SECTION B3: Geosciences

SECTION B4: Drilling

SECTION B5: Stripping

SECTION B6: Underground Activity

SECTION B7: Waste Rock

SECTION B8: Stockpiles

SECTION B9: Mine Development

SECTION B10: Geology

SECTION B11: Mine

SECTION B12: Mill

SECTION C1: Pits

see Sections 1.6.2, 2.2.1, Figure 1-1 of PSIR Report. Four potential quarry (borrow pit) locations were selected, but only one will be used by the contractor during construction.

SECTION D1: Facility

see Sections 1.6.1, 2.1, Figure 1-1, Drawing 1-1 of PSIR Report

SECTION D2: Facility Construction

see Section 2.1.2 of PSIR Report

SECTION D3: Facility Operation

see Sections 2.1.4, 8.4 of PSIR Report

SECTION D4: Vessel Use

SECTION E1: Offshore Survey

SECTION E2: Nearshore Survey

SECTION E3: Vessel Use

SECTION F1: Site Cleanup

SECTION G1: Well Authorization

SECTION G2: Onland Exploration

SECTION G3: Offshore Exploration

SECTION G4: Rig

SECTION H1: Vessel Use

see Sections 1.3, 1.4 of PSIR Report

SECTION H2: Disposal At Sea

N/A there is no DAS associated with the Project.

SECTION I1: Municipal Development

Description of Existing Environment: Physical Environment

6.3 Physical Conditions Grise Fiord, which is located on the south coast of Ellesmere Island in Jones Sound, experiences long, cold winters and short ice-free periods in the open-water season. The area is characterized by marine and tundra environments with exposed valley walls, talus slopes, and steep cliff faces rising above the ocean. 6.3.1 Designated Environmental Areas Designated areas in Canada meet the International Union for Conservation of Nature (IUCN) definition of a protected area, which states protected areas are “a clearly defined geographic space, recognized, dedicated and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural value” (ECCC, 2016). The United Nations Convention on Biological Diversity known as Aichi Target 11 (Convention on Biological Diversity, 2010), committed countries, including Canada, to conserving 10% of coastal and marine areas and 17% of terrestrial areas and inland waters by 2020. In December 2022, The United Nations Convention on Biological Diversity adopted the Kunming-Montreal Global Biodiversity Framework (GBF), which ensure that committed countries, including Canada, must enable that at least 30% of terrestrial and inland water areas, and of marine and coastal areas are conserved through governed systems of protected areas and other effective area-based conservation measures, as outlined in Target 3 (Convention on Biological Diversity, 2022; DFO, 2021). As of 2022, terrestrial protected areas covered over 213,000 km² (10.2%) of Nunavut, achieving the 2020 target, but falling short of the 2030 targets for terrestrial and inland waters (ECCC, 2023). The RNLUP (NPC, 2023c) presents existing and proposed protected areas in Nunavut, some of which are described in Section 3.2 of the Grise Fiord ESEB report (Dynamic Ocean & Worley Consulting, 2025b). While Grise Fiord is within the NBRLUP (NPC, 2000), it will be replaced with the RNLUP (NPC, 2023c), once it is approved. For the purposes of this Report, the RNLUP has been used. Interactive maps from 2014, 2016, 2021 and 2023 are available on Interactive Maps website of

the NPC (NPC, 2023b). The designated areas were considered in the existing conditions and effects review are summarized in Table 6.3, with a more detailed description provided in Section 3.2 (Figures 3-1, 3-2) of the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b).

6.3.2 Geological Site Conditions

Bedrock near the community of Grise Fiord is part of the Etah plutonic assemblage (symbol pPep2, Figure 6.1). The assemblage includes major rock types such as tonalite, granite, minor paragneiss, and pegmatite. The community of Grise Fiord, based on Figure 6.1, is located along an approximate fault, which follows a valley running approximately northeast to southwest. Surficial Geology mapping of Grise Fiord and the surrounding areas was completed by (Tetra Tech, 2021) as part of a master drainage plan for Grise Fiord, and by Worley Consulting (in prep) as part of this scope of works. The hamlet of Grise Fiord and surrounding areas comprise five post glacial marine terraces between elevation 0 m to approximately 80 m above sea level. The marine terraces are staircase-like landforms formed during postglacial isostatic rebound during the Pleistocene and Holocene (Tetra Tech, 2021). The terraces are comprised of sands and gravels near surface with stratified clays, silts and sands at depth. The valley running north-west extending towards the airport in the south-east is a u-shaped valley carved out during glaciation. Surficial mapping in the valley indicates various till deposits with till plains and rolling and ridged moraines. An active fluvial channel and active fluvial fans are present at the base of steep slopes. The geological site reconnaissance undertaken in August 2024 confirmed that proposed borrow sources comprise till plains and rolling and ridged moraines comprised of clay up to boulder sized rock fragments. Samples were collected at the proposed quarry (borrow pit) locations for Acid Rock Drainage (ARD) and Metal Leaching (ML) potential. Acid Rock Drainage/Metal Leaching testing is currently underway at the time of this report.

6.3.3 Surface Features

The region is characterized by mountains with large U-shaped valleys calved out by a network of active and/or retreating glaciers, fed by the area's ice caps. There are two main valleys, one running northwest to southeast and the other northeast to southwest, which connect north of the community with an elevation change of approximately 500 m to 750 m from the community to the mountain plateaus. Valley walls are dominated by individual and coalescing rock fall talus cones and/or avalanche cones and boulder tongues, with very steep rock walls at the top, becoming gentler due to the accumulation of talus nearer the base. The community is located at the mouth of the two valleys which is relatively flat, compared to the surrounding mountainous terrain, sloping gently to the shoreline. A seasonal creek coming from the northeastern valley, east of Kuuraaluk Creek, runs through the Grise Fiord community, passing to the east of the airport runway. The shoreline includes a narrow beach, strewn with large boulders and is moderately sloped. Drainage is limited to summer melt of snow and ice channeled along minor creeks, following the two main valleys. The northeast to southwest valley drains through the community, forming Kuuraaluk Creek, whereas the northwest to southwest valley drains to the beach, to the west of the airport runway, approximately 1 km northwest from the community, forming Valley Creek.

6.3.4 Ground Stability and Permafrost

All of Baffin Island is in the Continuous Permafrost Zone (Osterkamp, 2001), where the ground remains below 0°C for a minimum of two years (International Permafrost Association). As per Journeaux Associates (2012), there is no sub-sea permafrost in Nunavut (Figure 6.2). However, Worley Consulting has experienced other projects (Nanisivik and Milne Inlet) where sub-sea permafrost was detected, and it is therefore likely to be present in Grise Fiord. The permafrost of Baffin Island uplands has been estimated to be 400 to 700 m thick (Aarluk, 2012) with a surface active layer that can vary widely from less than 1 m in wet soils to greater than 5 m in rock outcrop. While melting permafrost could affect the structures, it is unlikely in this case since melting sub-sea permafrost is a relatively slow process (hundreds of years), and it is typically located well below the seabed surface, which in this case is within the stable bedrock. The slopes to the north and east of the community harbour are comprised of marine terraces (gravels, sands, silts and clays) and are susceptible to permafrost degradation from construction activities. The contractor will be responsible to ensure that adequate measures are in place to protect the underlying permafrost.

6.3.5 Hydrology

The freshwater and marine watersheds pertinent to Grise Fiord are displayed in Figure of the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b). Both topics are described below.

6.3.5.1 Fresh Water

Two creeks (Valley Creek, Kuuraaluk Creek, see Figure 1.1, Figure 6.3) drain into Jones Sound in proximity of the community harbour. Neither of these creeks are fish bearing, and this was confirmed during the IQ Workshops.

- Valley Creek, located northwest of the community harbour has a culvert under repair, and is fed by glacier northeast of Grise Fiord and flows into Jones Sound west of the Hamlet.
- Kuuraaluk Creek (pronounced Kuu-Raa-Luk) (IQ Workshop 2019 - Marty Kuluguqtuq), located on the southeast corner of the community harbour, splits into two arms before draining into the harbour. Kuuraaluk Creek is not considered fish bearing and there was no mention of fish during the IQ workshop (Amon Akeegok, HTA Chair. pers. comm. December 2019). The northern arm of Kuuraaluk Creek will drain into the river, with the southern breakwater installed adjacent to the creek and a sediment basin installed in the intertidal area (see Section 2.1.2.4).

6.3.5.2 Marine

Grise Fiord is located on the northern shore of Jones Sound. Jones Sound connects to Baffin Bay in the east and the Arctic Ocean in the west. Water flows from the northwest to Cardigan Strait via Norwegian Bay, a narrow channel between Ellesmere Island and Devon Island, then east through Jones Sound into Baffin Bay (see Figure 1.4).

6.3.6 Air Quality

While air pollution is often thought of as being associated with industrial cities, construction activities taking place in Nunavut

can have an impact on local ambient air quality as well. For air quality monitoring within Nunavut, the GN has established the Nunavut Ambient Air Quality Standards (NAAQS), adopted in part from the Canadian Ambient Air Quality Standards (CAAQS). It is noted that the most recent NAAQS are current to 2011, and the CAAQS standards are current to 2020, with new standards being established for 2025 (GN, 2011). A summary of the NAAQS and CAAQS is presented in Table 6.4. The DoE works with ECCC to operate air quality monitoring in Nunavut, which is part of the National Air Pollution Surveillance (NAPS) Program. ECCC coordinates the operation of the NAPS program, which operates approximately 600 air-monitoring stations in over 175 locations in Canada. There are currently two active monitoring stations in Nunavut as part of the NAPS Program (current to 2022). These monitoring stations are located in Iqaluit (Water Lab, NAPS ID: 129303) and Alert (NAPS ID: 129401). Between these two, the Water Lab monitoring station has more complete data, current to 2019. Results are summarized in Table 6.4 and are compared to the NAAQS and CAAQS. Regional air quality monitoring was conducted in 2020 for North Baffin Island as part of the Baffinland Project Annual Report on Air Quality, Dustfall and Meteorology (Nunami Stantec Limited, 2021). At the Mary River Mine Site (approximately 576 km south-southeast from Grise Fiord), the annual average sulphur dioxide (SO₂) was measured at 0.12 µg/m³, well below the NAAQS annual standard of 30 µg/m³. The annual average nitrogen dioxide (NO₂) was measured at 18.3 ppb, within the NAAQS of 32 ppb but above the CAAQS of 17 ppb. Ozone (O₃), Total Suspended Particles (TSP), and fine particulate matter were not measured as part of the 2020 Annual Report. The Baffinland Project also released Air Quality Monitoring Results for 2019 (RWDI Air Inc., 2020). The annual average sulphur dioxide (SO₂) was measured at 0.7 µg/m³, far below the NAAQS annual standard of 30 µg/m³. The annual average nitrogen dioxide (NO₂) was measured at 19.2 ppb, within the NAAQS of 32 ppb but above the CAAQS of 17 ppb, the same trend from the 2020 report. Ozone, TSP, and fine particulate matter were again not measured as part of the 2020 Annual Report. Air quality monitoring was conducted in Resolute Bay (see Section 1.17 for distance and direction from Grise Fiord) and Kinngait (formerly Cape Dorset, approximately 1400 km south from Grise Fiord) from 2013–2017 by ECCC as an investigation into the impact of increasing ship traffic on the air quality in northern communities. Resolute Bay is one of the closest Nunavut communities to Grise Fiord (see Section 1.17) and air quality is expected to be similar. It was determined that waste burn, airport operations and town activities such as vehicle traffic, residential combustion and power generators contributed to particulate matter less than 2.5 µm (PM_{2.5}) pollution (Aliabadi et al., 2015). Sulphur dioxide pollution was affected by airport activities and ships anchoring in position (Aliabadi et al., 2015). The maximum measured SO₂ concentration was 1.05 µg/m³, which is much lower than the Nunavut standards: 450 µg/m³ (1-hour); 150 µg/m³ (24-hour); and 30 µg/m³ (annual). The PM_{2.5} concentration was recorded up to 10 µg/m³, which is lower than the 24-hour standard of 30 µg/m³.

6.3.7 Noise

Noise data specific to the Project Study Area was not available. It is assumed that noise would be generated from several sources including automobiles, aircrafts and ATVs/snowmobiles and general equipment used in the Hamlet. The Project site is adjacent to a main road which is currently used frequently by trucks and other vehicles accessing the existing breakwater and nearby residential and commercial properties. The area is also frequently used in winter by snowmobiles accessing the ice. The sources described may emit noise for short periods of time and noise effects diminish with distance from a source.

6.3.8 Climate Conditions

Typical of high latitude areas, Grise Fiord experiences 24 hours of sunlight from late April to late August, with an average high temperature of 5 °C in July. During the winter, the community experiences 24 hours of darkness, reaching an average low of -31 °C in February (Time and Date, 2025). Precipitation in Grise Fiord typically falls as snow through all 12 months of year, with the greatest rainfall occurring during July and August. Average monthly snowfall ranges from 25 mm in July to 227 mm in October. (Government of Canada, 2024a). Snow depth ranges from 228 mm in April to clear of snow from June to August (Government of Canada, 2024a). Annual mean sea ice extent has on average declined since 1979, at a current rate of 13.1% per decade (ECCC, 2021). Depending on the region, Canadian Arctic summer sea ice area has decreased by 5% to 20% per decade from 1968 to 2016 (Derksen et al., 2019). Inuit Qaujimajatuqangit reports from long-term residents of Grise Fiord state that the 'sea ice is not the same as before. It looks as though some smoke or pollution has settle on to it' and the melted sea ice 'seems to be like oil in ice puddle which look awful for drinking' (Nunavut Climate Change Centre, 2004). The thickness of the sea ice is thinner and rougher, with more packed ice occurring (Nunavut Climate Change Centre, 2004). In general, the strongest winds in Grise Fiord occur in the fall and early winter months (September to December), ranging between 20 – 31 km/h on average and peaking in October (Government of Canada, 2024a).

6.3.9 Marine Water and Sediment Quality

Water quality in Grise Fiord was assessed over one sampling event on 16 August 2019 by an experienced marine scientist and a local Inuit assistant. Water samples were taken from five locations as shown in Figure 7-3 of the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b). Sample locations were selected to give a broad overview of water quality in the vicinity of the Community Harbour Study Area. Marine water quality in Grise Fiord was relatively consistent across sites and depth profiles. Metal concentrations were below respective the Canadian Council of Ministers of the Environment (CCME) guidelines (CCME, 2003), for all locations except for GF-3 deep, where dissolved cadmium was marginally above. Dissolved metal concentrations generally were comparable to

total concentrations, indicating that metals typically are not bound to solids. pH, hardness, alkalinity, total organic carbon, Total Suspended Solids (TSS), sulphur and metal concentrations were consistent across shallow and deep samples. Sediment quality in Grise Fiord was assessed over one sampling event on 16 August 2019. Particle size distribution varies greatly between the four sampling locations. Percentages of sand increases while percentages of gravel decrease, with decreasing water depth and distance to shore. Concentrations of metals were generally similar throughout all sampling locations, with the exception of sodium at one site, which was less than a quarter of the concentration at the remaining three locations. Concentrations of metals (and other contaminants) in sediments depends largely on regional and local geology and oceanography, particle size and proximity to contaminant sources (Nunavut General Monitoring Plan, NGMP, 2013), and there is not enough information available in the literature to draw meaningful comparisons to sediment quality results in the Community Harbour Study Area. Polycyclic Aromatic Hydrocarbons (PAHs) were all below CCME guidelines, and Polychlorinated Biphenyls (PCBs) were below laboratory Reachable Detectable Limits (RDLs) across all sites. Detailed information regarding the water quality field survey including methods and laboratory analysis, is provided in the Section 5 of the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b).

6.3.10 Coastal Morphology Grise Fiord and the surrounding area are characterized by mountains and valleys which have been carved out by glaciers. The community of Grise Fiord is located on a series of staircase like marine terraces which occur from sea level to the toe of the surrounding mountains. The Community Harbour Study Area includes a relatively flat shoreline, surrounded to the north by steep marine terraces.

6.3.11 Bathymetry Bathymetric surveys have been completed by Frontier Geosciences Inc (Frontier) during the feasibility (2019) and detailed design (2024) phases of the Project. The 2024 bathymetric survey results were not available at the time of this PSIR Report, however Figure 6 4 shows the feasibility phase results. Seabed elevation at the seaward extent of the Community Harbour Study Area is approximately 0.5 to 1.0 m CD.

6.3.12 Tides and Currents Tide levels for Grise Fiord station were obtained from Canadian Tide and Current Tables, Volume 4 (CHS, 2025), and are provided in Table 6 5. There are two major wind-driven currents in the Arctic Ocean, the Beaufort Gyre and the Transpolar Drift Stream. Surface water circulates clockwise from east to west. The Arctic Ocean connects to the Atlantic Ocean through the Baffin Island Current, a combination of the West Greenland current inflow, and Arctic outflow from channels of the Canadian Arctic Archipelago (Britannica & The Editors of Encyclopaedia, 1998). In 2024, surface current data was collected in Grise Fiord using a drogue (a surface float with a GPS tracker). The surface float was set up with an Automatic Identification System (AIS) transponder, which enabled it to be tracked throughout the day so that its location was known for retrieval. Current data was collected for approximately 75 minutes, starting at high tide. The average and maximum current speed were 0.19 km/h and 3.4 km/h, respectively, with a net displacement towards the northeast.

Description of Existing Environment: Biological Environment

6.4 Biological Conditions Given the harsh climates of the region, biological diversity surrounding Grise Fiord are mostly limited to treeless landscapes, migratory birds, and marine ecosystems.

6.4.1 Terrestrial Vegetation (Including Rare Plants) Most of Nunavut is located within the Tundra Biome and the Northern and Southern Arctic Ecozones (Ecological Stratification Working Group) (ESWG, 1995). Specifically, the Project is located within Ecoregion 13 - Lancaster Plateau, which is associated with southeastern Ellesmere Island. The Northern Arctic Ecozone incorporates the coldest and driest landscapes in Canada. In addition to the harsh climate, the high winds and shallow soils result in sparse and dwarfed plant life. Herb and lichen communities are the dominant vegetative cover. Lichen communities are associated with rock fields and hilly upland areas. Vegetation cover is higher on wetter sites, sheltered valleys, and moist corridors along creeks and rivers that typically are more nutrient rich. A review of the Species at Risk Public Registry (Government of Canada, 2024c) showed only Porsild's bryum (*Haplodontium macrocarpum* [Hooker] Spence), listed as Threatened under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Schedule 1 under the Species at Risk Act (SARA), whose mapped range overlaps the Haul Road Quarry (HRQ) Study Area. Field surveys were conducted from 15 to 16 August 2019, by an experienced vegetation ecologist and a local Inuit field assistant. An Ecological Land Classification (ELC) survey was completed to identify the vegetation communities in the HRQ Study Area. Field studies also focussed on identifying each species encountered to collect an inventory for the area. Specimens of unknown species were collected and identified by a taxa expert. A total of 65 vegetation species were identified, including five shrub, 15 graminoid, 15 forb, 12 bryophytes, and 18 lichen species. Seven distinct vegetation communities were identified and mapped within the HRQ Study Area (see Figure 8-2 in the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b) including Upland Lichen Barren, Upland Dwarf Shrub, Open Water, Disturbed Human-Caused, Wetland Graminoid-Moss Drainage, Coastal Shoreline and Flats, and Upland Graminoid Meadow.

6.4.2 Terrestrial Wildlife (including Habitat and Migratory Patterns) In general, habitat within Community Harbour Study Area is of limited value for terrestrial wildlife. Human development in the Hamlet extends to the edge of the ocean. The beach is developed and has structures

and small craft vessels along its length. Dogs were also tied up along the shoreline and likely deter wildlife. The buildings along the beach and Hamlet area may provide cover for small mammals and weasels. At low tide, the intertidal zone likely provides foraging opportunities. However, the value of these areas for habitat is low given the amount of disturbance and frequent human activity. Habitat available for wildlife in proximity to the proposed haul route and proposed quarry (borrow pit) areas are similarly of low quality for terrestrial wildlife. Most of the terrain is comprised of rock and outcrop areas with sparse dwarf shrubs and crustose lichens. Patches of wetland and graminoid-moss communities are also present but are infrequent and small. Security, escape, and thermal cover for some small mammals is present. In general, the HRQ Study Area provides low habitat value for terrestrial animals. The following species were identified as having the potential to inhabit the HRQ Study Area, which was explored during a field survey in August 2019. Arctic hare (*Lepus arcticus*) have confirmed presence (IQ Workshop 2019 - Amon Akeeagok; IQ Workshop 2019 - Manasie Noah; IQ Workshop 2019 - Marty Kuluguqtuq), and portions of the HRQ Study Area may provide habitat for a low population density. Portions of the HRQ Study Area may support a low density of Peary Land collared lemmings (*Dicrostonyx groenlandicus*), but overall, likely provide little value for this species. No lemmings were identified and habitat in the HRQ Study Area was considered limited. Wolverines (*Gulo gulo*) are a wide-ranging, generally nomadic species, and occurrence within the HRQ Study Area is unlikely and would only be transient if present. Arctic fox presence has been confirmed (IQ Workshop 2019 - Amon Akeeagok; IQ Workshop 2019 - Manasie Noah; IQ Workshop 2019 - Marty Kuluguqtuq) and based upon expected home range sizes, the HRQ Study Area might only partially support one pair or family group of foxes. In the case of arctic wolves (*Canis lupus arctos*) on Ellesmere Island, their primary prey are caribou (*Rangifer tarandus pearyi*) and muskoxen (*Ovibos moschatus*) (Anderson & Kingsley, 2015; McLoughlin et al., 2004). Given that it is expected that wolves follow caribou herds (Krizan, 2006) and muskoxen infrequent the Hamlet, it is unlikely that wolves would frequent this area. With the identification of muskoxen scat east of the Hamlet, as well as willows for browse and graminoid meadows, muskoxen could potentially occupy the HRQ Study Area for short periods of time, but the likelihood is low.

6.4.3 Migratory and Marine Birds (including Habitat and Migratory Patterns) In general, terrestrial habitat in the Community Harbour Study Area is of limited value to migratory and marine birds. Human development dominates the Community Harbour Study Area with structures and small craft vessels along its length. Moreover, teams of dogs were tied up along its length. Species breeding in the Community Harbour Study Area are likely those that nest on bare ground and gravelly areas (e.g., snow buntings: *Plectrophenax nivalis*) and are relatively tolerant of human disturbance (e.g., common raven: *Corvus corax*). However, human use and dogs likely discourage birds from nesting. At low tide, the intertidal zone provides foraging opportunities, but only for those species tolerant of human activity (e.g., gulls [*Larus* spp.] and ravens). Consequently, the value of these habitats is likely low given disturbance and human activity. A review of the Nunavut Wildlife Harvest Study (NWHS) (Priest & Usher, 2004), revealed that several bird species are harvested by hunters in the Hamlet, confirming their presence and breeding in the surrounding area (see Table 10-1 in the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b)). The species most harvested are ptarmigan (*Lagopus muta*), snow goose (*Chen caerulescens*), eider ducks (*Somateria* spp.), and Canada goose (*Branta canadensis*), respectively. Location data for harvested birds were not collected for most species. Hunters in the Hamlet hunt both common eiders (*S. mollissima*) and king eiders (*S. spectabilis*) and information on the location of harvests for these species was collected. Although no bird harvests have been recorded within the Project Study Area, eider hunting has historically occurred (see Appendix A, Table A- 11 in ESEB Report (Dynamic Ocean & Worley Consulting, 2025b) in nearby fiords (South Cape Fiord, Harbour Ford, Grise Fiord, and Starness Fiord) and at the mouths of these areas towards Jones Sound. During the field survey from 15 to 16 August 2019, six bird species were identified. No nesting or breeding behaviour was identified. The lack of breeding behaviour does not preclude the potential for birds to nest in the area. Flocks of glaucous gulls (*Larus hyperboreus*), northern fulmars (*Fulmarus glacialis*), and snow buntings were identified within the HRQ and Community Harbour Study Area (see Figure 10-1; Appendix A, Table A-11 and Table A-12 in the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b)). In addition, a flock of common eiders were identified approximately 500 metres offshore from the Community Harbour Study Area (see Figure 10-1 in the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b)). Field-collected data for migratory and marine birds including coordinates are reported in Appendix A, Table A-11 and Table A-12 of the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b).

6.4.4 Fish Habitat (including Marine Vegetation) Field surveys were conducted in the Community Harbour Study Area in 2019 (15 to 17 August 2019) and 2024 (3 to 6 September 2024) to assess habitat conditions. The intertidal shoreline was primarily hard substrates consisting of cobble, gravel and sand, indicating low habitat quality. No marine vegetation was observed in the intertidal zone during either field survey. Amphipods were observed and typically associated with boulder habitat or in sandy depressions which remain inundated at low tide. As confirmed in the IQ Workshop 'there are lots of amphipods around' (IQ Workshop 2019 - Marty Kuluguqtuq), and in GN (2012), where the amphipod 'areas of occurrence' are 'everywhere' around the Grise Fiord foreshore. Subtidal surveys displayed low to moderate habitat quality from both 2019 and 2024 field surveys. The depth of the area observed during the subtidal field surveys ranged from 0.4 m to 23.5 m CD

for the community harbour location, and to a maximum of 3.0 m for the Community Harbour Study Area, with a tidal range between 2.7 to 4.0 m (see Section 4.7 in the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b). In the subtidal field surveys, marine vegetation primarily included rockweed and thread brown algae in infrequent to moderate densities across the entire Community Harbour Study Area. Rockweed was observed in the shallow subtidal and not in the intertidal. Rockweed and kelp are considered abundant in Grise Fiord as confirmed through the IQ Workshop; 'its everywhere' (IQ Workshop 2019 - Amon Akeeagok). Marine vegetation was most prevalent in areas with hard substrates (i.e., cobble and boulder).

6.4.5 Fish and Marine Mammals

Focal fish and marine mammal species were selected based on several variables which included: their importance to Inuit for subsistence and food security, their geographic ranges which includes the potential to occur in the Project Study Area, and for their representative role in food chain dynamics. Species identified as focal are listed in Table 6.6. Species categories were defined to represent the extent to which the marine species migrate and whether they are permanent residents of Arctic waters. These definitions are provided in Section 6.4.5.1.

6.4.5.1 Species Spatial Categories

6.4.5.1.1 Fish

Marine fish that are found in the Arctic occupy the ocean differentially, either as residents, migratory species or anadromous, as defined below:

- **Migratory:** species that migrate exclusively in the marine environment on an annual or seasonal basis, triggered by local climate, food availability or for mating reasons.
- **Resident:** species that occupy the same general area throughout the year.
- **Anadromous:** the movement of fish between freshwater and marine environments for the purposes of feeding in one environment and spawning in the other.

The coastal marine environment fronting the Community Harbour Study Area may be used by migratory species such as Arctic char (*Salvelinus alpinus*) and Arctic cod (*Boreogadus saida*). Both species are present predominantly during the open-water season. Sculpins and marine invertebrates, including amphipods and truncated soft-shell clams, are also a common part of the benthic ecosystem in Nunavut. Arctic char are an important subsistence and commercial fishery species in Nunavut that have both a lacustrine and anadromous life history. Anadromous Arctic char live primarily in fresh water and migrate to the ocean for a short summer migration (~20 to 45 days) (Bégout et al., 1999; Klemetsen et al., 2003), at which time they may double their body mass (Jørgensen et al., 1997). The Nunavut Coastal Resource Inventory (NCRI) for Grise Fiord does not reference any occurrence of in or around Grise Fiord, which was confirmed during the IQ Workshop (GN, 2012; IQ Workshop 2019 - Manasie Noah; IQ Workshop 2019 - Marty Kuluguqtuq). The closest anadromous river to Grise Fiord is in Baad Fiord (IQ Workshop 2019 - Amon Akeeagok). There is no information on the migratory patterns of Arctic char in and around Grise Fiord. Arctic cod are a pelagic marine species believed to be the single most important species in the trophic link between plankton, and marine birds and mammals in the Arctic ecosystem (Hobson & Welch, 1992). Little is known about size distribution of Arctic cod; however, they are reported to be 'everywhere' in Grise Fiord (IQ Workshop 2019 - Amon Akeeagok; IQ Workshop 2019 - Manasie Noah; IQ Workshop 2019 - Marty Kuluguqtuq; IQ Workshop 2019 - Marty Kuluguqtuq; IQ Workshop 2019 - Amon Akeeagok). Often, when Arctic cod are observed, they are being followed by predators, including narwhal (IQ Workshop 2019 - Marty Kuluguqtuq) and seals (IQ Workshop 2019 - Manasie Noah). The presence of sculpin was confirmed during the IQ Workshop as being one of the main fishes caught (IQ Workshop 2019 - Manasie Noah; IQ Workshop 2019 - Marty Kuluguqtuq). In Grise Fiord, subsistence fishing for sculpin is conducted along the tide line east of the community and near shore in an area southwest of the community (Figure 4.1). The distribution of Arctic amphipods is dictated by habitat type and food resources available (Oceans North Conservation Society et al., 2018). When amphipods are present in intertidal benthic environment, there is a tendency to be associated with moist habitats, which consist of either rock (boulder, cobble) or seaweed (typically rockweed). The truncate soft-shell clam (*Mya truncata*) is an in-faunal species in the Arctic that plays an important role in carbon cycling. Amphipods and soft-shell clams are important food sources for a variety of marine animals including; marine mammals (walrus, bowhead whales, bearded seals (Hobson et al., 2002)); fish (Arctic char), and birds (benthic-feeding eider ducks, Thick-billed murre) (Crawford et al., 2015; Gaston & Elliott, 2014; Whitehouse et al., 2017). Given the sedentary adult life stage of the soft-shell clam, they are a valuable and predictable food source for these higher trophic level species (Highsmith & Coyle, 1990). During intertidal surveys in 2019 and 2024, the only invertebrates observed were amphipods. For the subtidal Remote Operate Vehicle (ROV) surveys, truncate softshell clams (*Mya truncata*) were the most abundant invertebrate. Truncate softshell clam densities ranged from 5/m² to upwards of 15/m², and their occurrence classification ranged from trace to infrequent. Other marine invertebrates observed included:

- Green sea urchins (*Strongylocentrotus drobachiensis*).
- Limpets (*Tectura* sp.).
- Brittle stars (*Ophiura sarsi*).
- Anemones (unidentified).
- Hydroids (*Lafoeina maxima* and possibly *Lafoe* sp.).

6.4.5.1.2 Marine Mammals

Marine mammals that are found in the Arctic were categorized as either Arctic residents or Seasonal visitors, as defined below:

- **Arctic resident:** species that resides in the Arctic year-round.
- **Seasonal visitor:** species that predictably resides within the Arctic region for a portion of the year, which most typically is the open-water season.

Seven species of marine mammals are considered residents of the Grise Fiord area (Table 6.6). These include three species of cetacean—narwhal (*Monodon monoceros*), beluga (*Delphinapterus leucas*), and bowhead (*Balaena mysticetus*)—which seasonally occur during the spring, summer, and early winter months. Beluga whales in

this region belong to the Eastern High Arctic-Baffin Bay population, and IQ suggests that their presence is closely tied to the North Water Polynya, which extends into Jones Sound (QIA, 2018). Narwhals primarily encountered near Grise Fiord belong to the Jones Sound subpopulation (DFO, 2010; Watt et al., 2013). According to IQ, narwhals are not present year-round in this area but are seasonally found from May to October in Jones Sound and the coastal waters of Ellesmere Island (QIA, 2018). Coburg Island and its surrounding waters also appear to be an important feeding ground for narwhals (Government of Canada, 2017). Bowhead whales seasonally migrate into the area during the months of spring, summer, and early fall. During this time, they follow the ice edge and occur in open bays and straits. None of these cetacean species are commonly found within the area, with bowhead whales relying mainly on pelagic food sources such as zooplankton and beluga and narwhal relying on Arctic cod as they migrate through the region. Ringed seals (*Pusa hispida* ssp. *hispida*), bearded seals (*Erignathus barbatus* ssp. *barbatus*), and the Atlantic walrus (*Odobenus rosmarus* ssp. *rosmarus*) are considered resident species in Grise Fiord and Jones Sound. Ringed seals are the most abundant pinniped species in the region, remaining in Arctic waters year-round. They can be found throughout Jones Sound and the surrounding waterways near Grise Fiord, relying on the floe edge and breathing holes during the winter months, and continuing to use these areas until early July. From July to October, they move into open water (QIA, 2018). While less is known about the ecology of bearded seals, Grise Fiord and its surrounding waters fall within the known spring-summer distribution range for this species (COSEWIC, 2007). IQ reports that bearded seals have been observed in the area year-round, except for January. However, there is some variability, as other sources suggest the species may not be present during the winter months (QIA, 2018). In Grise Fiord, bearded seals are most observed during the open water season, from June to September (IQ Workshop 2019 - Amon Akeegok; IQ Workshop 2019 - Manasie Noah; IQ Workshop 2019 - Marty Kuluguqtug). Atlantic walrus are year-round residents of the Arctic, although their distribution varies seasonally in relation to ice cover (COSEWIC, 2006). Most migration activity is observed in mid-October (Koski et al., 1993), when walrus leave as ice forms and move to areas with open water and mobile ice. Walrus are known to winter in several locations in Lancaster Sound (DFO, 2018), including Jones Sound, Devon Island, the floe edge of the North Water Polynya (Born et al., 1995). Polar bears (*Ursus maritimus*) are found throughout the high Arctic, including the Grise Fiord area (IQ Workshop 2019 - Amon Akeegok; QIA, 2018). Most sightings occur from March to June, though they can sometimes be observed into early fall in certain years (Garshelis et al., 2012). Polar bears are particularly attracted to the Grise Fiord dump and areas along the shoreline where human food caches are present (IQ Workshop 2019 - Amon Akeegok), increasing the potential for human-polar bear conflicts. Polar bears are commonly seen along the ice edge foraging for seals in Jones Sound as well (Garshelis et al., 2012). Although these marine mammal species are resident to Grise Fiord and its surrounding waters, most are seasonal visitors that migrate to the area for breeding and feeding. It is likely that habitat surrounding the Project site can support the lower trophic species that marine mammals feed on, and thus there are minimal impacts expected from the Project construction on resident marine mammals.

6.4.6 Species at Risk Species discussed in this section have been assessed by international (IUCN, COSEWIC and SARA), territorial agencies (GN DoE), and the RNLUP (NPC, 2023c). A list of the at-risk vegetation, wildlife, marine and migratory birds, marine fish and marine mammals that have potential to occur in the Project Study Area and their likelihood of occurrence are listed in Table 3-2 of the ESEB Report (Dynamic Ocean & Worley Consulting, 2025b). Fisheries and Oceans Canada has generated an Aquatic Species at Risk (SAR) map; however, at this time it does not include Grise Fiord (DFO, 2024b).

Description of Existing Environment: Socio-economic Environment

6.5 Socioeconomic Conditions The Hamlet of Grise Fiord is known locally as Ajuittuq, which means the “place that never thaws” in Inuktitut. The community is located at the entrance to a fiord on the southern shores of Ellesmere Island at Jones Sound. It is the northernmost community in Canada and is one of the coldest inhabited places in the world. Grise Fiord is surrounded by the Arctic Cordillera Mountain range which shields the community from harsh winds. The nearest communities are Resolute Bay, Arctic Bay and Pond Inlet (see Section 1.17, Figure 1 4).

6.5.1 Population, Education and Language According to 2021 census data from Statistics Canada, the total population of Grise Fiord is 144 people, representing an increase of 11.6% since 2016 (Statistics Canada, 2023). The population is young with a median age of 28 years old and children aged 0-14 years representing nearly a quarter (24.1%) of the total population. The Nunavut Bureau of Statistics estimated the population of Grise Fiord as of 01 July 2023 to be 160 (GN, 2023). The total Inuit population is 135 or 93.8% of the total population according to Statistics Canada 2021 census data (Statistics Canada, 2023). In 2021, of the total population 15 years old and over in Grise Fiord, nearly a third (30 individuals) held a secondary school diploma (or equivalent) as their highest educational attainment. An additional 30 individuals held a postsecondary certificate, diploma or degree. Of the 30 individuals with postsecondary accreditations, one third (10 individuals) held apprenticeship or trades certificates; and another third graduated with a University Bachelor’s degree. Nearly half (50 individuals) of the total

population 15 years old and over held no certificate, diploma or degree. Inuktitut is the prevalent language in Grise Fiord, reported as the mother tongue for 65.5% of residents. However, just over one quarter (26.6%) of employed residents in Grise Fiord work in settings where Inuktitut is the language most often used at work (Statistics Canada, 2023). A majority of the total population in Grise Fiord also speak English (135 residents or 93.1%).

6.5.2 Employment and Economic Activity

Grise Fiord experiences higher participation rates and higher unemployment rates compared to Nunavut as a whole. Of the population 15 years old and over (110), 70 people or 63.6% participate in the labour force in Grise Fiord compared to 58.6% participation for the territory. The unemployment rate was reported as 21.4% in Grise Fiord compared to 16.9% for Nunavut (Statistics Canada, 2023). Low levels of literacy and numeracy present a challenge to labour force development across Nunavut (GN & NTI, 2022). "...the largest group of adult learners in Nunavut needs programming that focuses on literacy, life skills, completion of high school or high school equivalency, adult basic education, and personal empowerment," (GN & NTI, 2022). Individuals with low levels of literacy are prevented from gaining meaningful employment, "while others are dead-ended in positions from which they can't progress without additional education and training" (GN & NTI, 2022). Additionally, according to the community's 2024/25 Infrastructure Plan, the community has been without a daycare facility for over 5 years. The absence of a daycare facility has far reaching effects on the families specifically, and the community general. Many parents in Grise Fiord find it hard to find care for their young children during work hours because the community lacks a licensed daycare. The economy in Grise Fiord can be characterized as a combination of traditional subsistence activities (including hunting, fishing, trapping and gathering) and wage based economic activities. Key employers in the community include the Hamlet of Grise Fiord, the GN (education, power, and health centre) and the Grise Fiord Inuit Co-op and Hotel. Tourism is a growing sector in the economy and Grise Fiord is a frequent destination for polar expeditions and cruise ships travelling the Northwest Passage. Many residents continue to rely heavily on fish, seal and whale hunting, both for subsistence and as a cultural activity, including customary resource sharing practices. According to the 2021 census, residents participate in a variety of occupations including: fishing and hunting; utilities; and educational services. Public administration accounted for the largest industry, occupying one third (33.3%) of the total labour force activity in Grise Fiord (Statistics Canada, 2023).

6.5.3 Land and Resource Use

6.5.3.1 Harvesting and Food Security

Hunting remains essential to life in Grise Fiord. Harvesting of seal and narwhal are of particular importance. The availability of traditionally harvested foods in Grise Fiord is crucial because it lowers the demand for imported food, which is expensive and most often less nutritious. Additionally, the harvesting, preparation, and sharing of meat and skins offers important opportunities for community members to maintain Inuit cultural practices. Residents also obtain food at the Co-Op and convenience store, and through sealift. However, "Low incomes and high food prices mean most Inuit households can afford less than half the cost of a healthy food basket, while very low-income households can afford only 6–13% of the cost of a healthy food basket" (Inuit Tapiriit Kanatami, 2021). Additionally, the AFA vessel comes in annually to supply the community with food and hunting supplies. There are often community sales of AFA supplied goods that are priced lower than items at the Co-op store or from sealift (Jaypetee Akeeagok, AFA Chairman. November 2018). Harvesting locations identified during the IQ program have been provided in the Land Use and Occupancy map (Figure 4 1). Harvesting in the community occurs mainly along the shoreline fronting town and to the East. A large clam bed is harvested on the east side of the community (Figure 4 1). Some people also harvest kelp in this area, and some wait for it to be pushed onshore (IQ Workshop 2019 - Amon Akeeagok). Although a smaller bed of clams occurs to the west in the area of the community harbour, no clam harvesting or any kind of plant harvesting is conducted there due to the wastewater discharge (IQ workshop 2024). Fishing for sculpin is conducted along the tide line east of the community and near shore in an area southwest of the community (see Figure 4 1). Fishing is done by jigging, there are no gillnets placed (IQ workshop 2019 and 2024). Hunters wait for seals and other marine mammals (including narwhal) all along the shoreline fronting the community, to the east of the community and, to a lesser extent, in an area southwest of the community (see Figure 4 1). "The seal waiting area to the southwest was used more a long time ago, now many of the young won't walk all that way and mostly stay all along the shore closer to the community" (IQ Workshop 2019 - Amon Akeeagok). Belugas are commonly observed and harvested close to shore, west of the community, in the area of the community harbour. Additionally, hunting for seals along ice cracks that form at rocky outcrops along the shoreline is common: "the ice will have cracks and seals will make holes, as soon as freeze up happens it creates cracks and then we hunt along these cracks until breakup in Spring" (IQ Workshop 2019 - Manasie Noah). Trapping does not occur anywhere within the municipal boundaries of Grise Fiord, including in the areas where Arctic fox and Arctic Hare are present enroute to the ptarmigan hunting area (Grise Fiord IQ Workshop 2019 and 2024). "People feel that animals are too close to the dump and sewage lagoon to harvest them. There used to be fox traps in the area but not so today. However, if a hare or fox is clean and away from refuse, one may harvest if he/she so choses." (IQ Workshop 2019 - Marty Kuluguqtuq). Polar bear tracks are commonly sighted at the dump and all along the shoreline where there are food caches (IQ Workshop 2019 and 2024). Although small blueberry patches are picked for leisure near the seal waiting area southwest of the community (see Figure 4 1) (IQ Workshop

2019 - Manasie Noah), there are no specific or significant plant harvesting areas to avoid in or around the Study Area (IQ Workshop 2019 and 2024). A known Thule site east of the community and a potential archaeological site west of the community were marked on the map by knowledge holders. There were no other known cultural sites identified by knowledge holders in or around the Study Area (IQ Workshop 2019 and 2024).

6.5.3.2 Access and Navigation

Small craft vessels and skidoos are critical for subsistence harvesting in the Arctic. The majority of harvesting activities are conducted far from Grise Fiord and require small craft vessels and skidoos for access, as made evident by a local hunter: "The community depends on boating for our food, livelihoods, to harvest healthy country food for our kids and grandkids" (Jaypetee Akeagok, AFA Chairman. November 2018). Currently, Grise Fiord does not have an established boat harbour. Boat owners moor their small craft vessels in a rudimentary mooring basin in one of two arms at the mouth of the Kuuraaluk Creek to protect their small craft vessels from storm waves. Kuuraaluk Creek is the major creek that runs through the middle of the Hamlet. Access into and out of the mooring basin is restricted at low tide. The only marine infrastructure consists of two mooring bollards for the fuel re-supply tanker. Dry cargo from sealift is lightered to shore in the conventional manner, that is, using small tugs and barges that are carried on board the arriving ship. The barges are brought into the beach immediately in front of the RCMP detachment building and temporarily stored in the area surrounding the road that also fronts the RCMP detachment. When the AFA vessel arrives with their annual stores, a GN supplied float is deployed for lightering and brought into the sealift beach area, which is close to the community freezer. Local boat activities are generally segregated from sealift. The community has been building a road to Nuvuk along the beach by extending the community's main road along the valley behind the Greenlander mountain (see Figure 4 1). Progress on the road has been gradual and currently extends to approximately 250 m from the furthest proposed quarry area (borrow pits). The road aims to provide critical access for hunters to the fjord. The fjord thaws earlier in the spring and freezes faster in the fall extending the ability to hunt and fish during these transitional seasons (IQ workshop 2024). In general, ice is accessed all along the shoreline and is considered fairly easy most years (IQ workshop 2019 and 2024). Ice trails and access locations change from year to year depending on where the ice has rafted that year. In the spring, when the ice gets too fractured, ice access points continue to move east along the coast to access hunting grounds (see Figure 4 1) (IQ Workshop 2019 and 2024). No concerns were expressed about the Project affecting ice access during consultations.

6.5.3.3 Tourism

Grise Fiord is Canada's most northern community, located 1,160 km from the Arctic Circle. It is nestled among majestic mountains at the end of the stunning fiord that offers a unique tourist experience. Grise Fiord is the closest community to Quttinirpaaq National Park - Canada's second largest and most northern National Park. The Nirjutiqavvik National Wildlife Area is also located nearby. Ausuittuq Adventures run by Terry Noah is a 100% locally owned Inuit outfitting business providing several tours in and around Grise Fiord, including iceberg viewing, dog team rides, seal hunting and photography tours among many others. The HTA can also arrange for local Inuit guides to support tourists. Cruise ship and private pleasure craft visits to the community have steadily increased over recent years. According to the Hamlet, the community now receives an average of seven cruise ship visits annually.

6.5.4 Local and Regional Traffic Patterns

Grise Fiord is serviced twice a week by scheduled commercial flights on Kenn Borek Air Ltd. (currently on Mondays and Thursdays). The roads in Grise Fiord are gravel surface with no walkways. Pedestrians, ATVs, snow machines, cars and trucks all share the road. The Hamlet manages snow clearing and dust suppression on roads. The Hamlet has identified a need for a pedestrian walkway to connect the two halves of the community and minimize risk from polar bears (GN, 2024a). The community is currently divided by commercial buildings, the school, and municipal infrastructures on one end of town, and the majority of residences on the other. In order to get from one side to the other, pedestrians have to walk along the main road to get to school and work. This is concerning especially in the dark season and with the presence of polar bears that commonly travel along the shoreline. Sealift is a vital link for all communities in Nunavut that supply residents with their annual cargo of goods and materials. Details on the sealift operations are provided in Sections 1.13 and 6.5.3.2.

6.5.5 Human Health and Community Wellness

The Health Centre in Grise Fiord was built in 1990 and is adequately resourced with two nurses and equipped to meet most health care needs from the community. According to the most recent data, Grise Fiord Health Centre had a total of 1,642 visits in 2016 and 9.8 visits per capita (GN, 2018). The Health Centre has the ability to provide X-rays and sutures; prescribe drugs; intubate patients; and, in emergency cases, stabilize patients to be medevacked by plane to hospitals in Iqaluit or further south. The Health Centre offers 24-hour on-call emergency service. Given the remote location of Grise Fiord, fly-in specialists are not a regular occurrence; however, an occupational therapist and speech therapist visit once a year. In addition, nurses have access to tele-help to access specialists. The Health Centre occasionally closes during holidays when staffing is insufficient. Due to weather and remoteness, delays for medical evacuations can take up to 6 days in some circumstances, emphasizing the need for the contractor to plan accordingly (Supervising nurse. pers. comm. December 2024). Workers are also advised to bring all required medication with them and to have first aid response capacity and supplies such as bandages, antiseptic, over the counter medications etc. Beyond public health programs and the health centre, Inuit traditional activities such as harvesting, preserving food, preparing skins and resource sharing contribute greatly to

familial and cultural cohesion which are critical to community wellness. In addition, social activities such as sports, Inuit games, arts and crafts and land-based programs are important factors in promoting community health and personal well-being in Grise Fiord.

6.5.6 Housing and Community Infrastructure and Services

The Nunavut Housing Corporation's (NHC) Annual report for 2023-2024 listed Grise Fiord's housing need as a percentage of stock at 29% indicating a less critical need for housing compared to other communities in the territory (NHC, 2024). Temporary accommodation in Grise Fiord is very limited and is currently provided by the Grise Fiord Lodge with nine rooms and capacity for nineteen guests total (Grise Fiord Inuit Co-op and Lodge Manager. pers. comm. November 2019). Water is collected from glacial run-off streams from the mountain, gathered in a holding pond and gravity fed to two 3.7 million L holding tanks with the community using about 5 million L annually. The Hamlet monitors water levels daily to ensure adequate and supply and confirmed that there are no current concerns regarding the capacity and reliability of the source water for the community. Water is treated with chlorine before being loaded into trucks at the fill station for distribution to holding tanks in each building and residence. Currently, there is one water truck that delivers water daily to residences and commercial operations and one back-up water truck. A new water treatment plant (described in Section 7.4) is currently being planned and expected to be operational by 2028/29. The community has a non-engineered sewage lagoon with a capacity of 19,360 m³ that receives the trucked sewage from holding tanks for each building. The sewage lagoon is located approximately 800 m away from the Hamlet next to the solid waste landfill. The lagoon is a single cell retention system where effluent undergoes natural treatment prior to being discharged into the ocean. According to the Hamlet, the sewage lagoon is relatively small, and its capacity is strained during years with higher-than-average snow and rain. The lagoon is decanted once per year, typically in late June or early July. While the lagoon has functioned adequately to meet current community demands, an influx of approximately 30 additional people could pose capacity challenges (David General, SAO pers. comm. December 2024). Additionally, sewage and municipal wastewater are collected by a sewage truck on a daily basis. There is a back-up sewage truck, however, it currently requires major repairs. The municipal waste facilities include a domestic solid waste area, and a bulk metal waste area located approximately 800 m away from the Hamlet near the sewage lagoon and close to the Arctic Ocean. The Hamlet stated that they have insufficient equipment for sorting waste at the landfill and emphasized the need for proper fencing to contain debris and manage the risks posed by polar bears (David General, SAO. pers. comm. December 2024). The GN's 2023-2024 supplementary capital budget allocates just over \$1M for upgrades to the solid waste facility under the Small Communities Fund (SCF). These upgrades aim to address existing capacity and operational challenges at the facility. Electricity is provided by diesel generators owned and operated by QEC, a territorial corporation wholly owned by the GN. Qulliq Energy Corporation is the sole generator, transmitter, and distributor of electrical energy in Nunavut. A new 10kW solar power system with net metering was installed on the west side of the Hamlet/community complex in 2022. According to the Hamlet, an additional 100kW solar power system for the community is expected to be installed by 2025. Fuel for electricity generation and other needs is imported, stored, and distributed by the GN-PPD. Fuel is stored at a tank farm located less than 500m from the centre of town. Although there have been no significant issues with fuel delivery or storage capacity (see Table 12-4) in the community in recent years (except for a jet fuel shortage in 2022), the community often runs low before the annual resupply in mid-August. The fuel storage tanks have not been cleaned for many years. Condensation within the diesel tank has caused issues in the past resulting in milky diesel supply that impacted heavy equipment (Marty Kuluguqtuq, SAO. pers. comm. December 2024). According to the Hamlet's 2024/25 Infrastructure Plan (GN, 2024a), the community plans to expand diesel tank capacity, as there is currently only one diesel tank, and renovate the tank farm, as the existing fuel tanks are old and showing signs of aging. Fire protection is the responsibility of the Hamlet and currently relies on 8-9 volunteer firefighters. The Hamlet reports they have sufficient resources for fire response. However, there is no firehall and one of the Hamlet's buildings currently houses the fire truck, fire-fighter bunker gear, and air compressor. This building serves as the Firehall since no other building was made available for this purpose. It does not have washroom facilities, nor running water and requires a renovation (GN, 2024a). The RCMP detachment office is staffed with two full time officers on 2-year rotations. Landline, mobile, and internet services are provided by Northwestel/Bell Mobility and Qiniq. The local community radio (Atta Suvaguuq Radio Society) broadcasts daily in Inuktitut and English.

6.5.7 Archaeological and Culturally Significant Sites

Two AIAs were conducted in support of the Project, in 2019 and 2024. The 2024 AIA, conducted under NU Permit 2024-63A by Brent Murphy with AECOM Canada ULC (AECOM), focused on areas not assessed during the 2019 survey (AECOM, 2024). These included two proposed quarry areas and access road corridors that could be impacted by the development. The 2024 AIA was carried out between 27 to 29 August 2024 and consisted of a comprehensive pedestrian survey of all areas potentially affected by the Project. This included areas excluded from the 2019 survey, such as portions of the Community Harbour Study Area, potential borrow sites, and access roads. The assessment identified no archaeological sites within the development footprints or the 100-meter buffer zones. Two previously recorded sites, RChi-3 and RChi-5, were revisited during the survey; however, these sites are outside the areas impacted by the Project. Local knowledge guided the

process, with Terry Noah from Grise Fiord assisting in the survey and landform interpretation. No archaeological or paleontological sites were observed within the defined Project Study Area.

Miscellaneous Project Information

Identification of Impacts and Proposed Mitigation Measures

Refer to Section 7 of the attached PSIR Report.

Cumulative Effects

All Project effects previously described are expected to be negative and mitigatable, or positive. The past, present and reasonably foreseeable projects which have the potential to interact with the Project have been identified to be included within this Cumulative Effects Assessment.

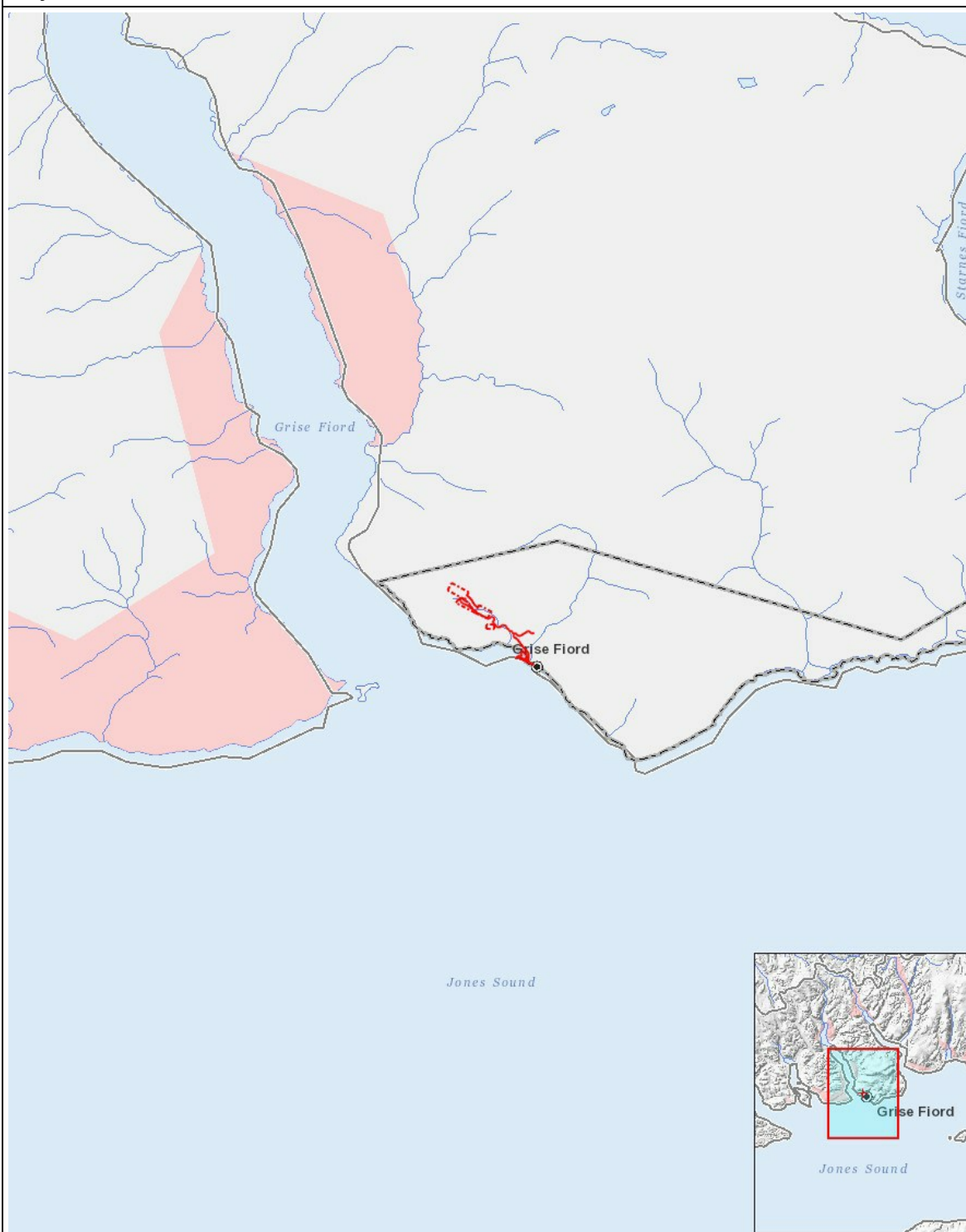
Impacts

Identification of Environmental Impacts

	PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Construction																									
Dredging		-	-	-	-	M	-	-	-	M	M	M	M		-	-	M	M	-		-	P	M	M	M
Harbour infrastructure		-	-	-	-	M	-	-	-	M	M	M	M		-	-	M	M	-		-	P	M	N	M
Quarry/Borrow pit		-	M	-	-	M	-	-	-	M	-	M	M		-	M	-	M	-		-	P	M	M	M
Operation																									
Harbour infrastructure		-	-	-	-	-	-	-	-	-	-	M	M		-	-	-	-	-		-	P	P	P	P
Decommissioning																									
-		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-

(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Location



List of Project Geometries

1	polyline	Community Harbour Footprint
2	polyline	Quarry (Borrow Pit) 2A
3	polyline	Quarry (Borrow Pit) 2B
4	polyline	Quarry (Borrow Pit) 2C
5	polyline	Quarry (Borrow Pit) 2D
6	polyline	Potential Haul Route Addition
7	polyline	Potential Haul Route Addition
8	polyline	Haul Route on Existing Road/Track
9	polyline	Haul Route on Existing Road/Track
10	polyline	Haul Route on Existing Road/Track

