7 VALUED COMPONENTS EFFECTS ASSESSMENT

7.11 Marine Use

As specified in Section 5.0 of the Application Information Requirements (**AIR**), marine use has been identified as a valued component (**VC**) to be assessed for the Ksi Lisims LNG – Natural Gas Liquefaction and Marine Terminal (**the Project**). This section describes and assesses the potential effects on marine use from the Project (during all Project phases).

This assessment is linked to other VC assessments, either through integration (information from other VCs is incorporated into this assessment) or support (information from this assessment is incorporated into the assessment of other VCs).

Components of this assessment integrate information from the following VCs:

- Marine Resources (Section 7.09) – provided information on vessel traffic in the region
- Community Health and Wellness (Section 7.13) – provided information on the aesthetic conditions of the region and on food security, including information on marine species in the region that are harvested as country foods by Indigenous Nations
- Human Health (Section 7.14) – provided information on the marine species in the region that are harvested as country foods by Indigenous Nations
- Summary of Human and Community Well-being (Section 21.0) – provided information on food security, including information on the marine species in the region that are harvested as country foods by Indigenous Nations

Information provided in Section 7.11 is also used to inform the Indigenous assessments, Sections 11.0 to 19.0.

7.11.1 Overview

This section provides a brief summary of the Marine Use VC assessment.

During all Project phases, from a marine use perspective, the Project is expected to interact with the construction-related and permanent marine-based infrastructure, marine transport of workforce and construction materials, liquefied natural gas (**LNG**) carrier and natural gas liquid (**NGL**) product carrier loading, marine shipping and transportation, and facility and infrastructure maintenance including the transmission line within the transmission line assessment area (**TLAA**). The Project has the potential to result in the following effects on marine use:

- Change in marine navigation
- Change in marine fisheries and other uses
- Change in aesthetic conditions

In assessing the potential effects of the Project on marine use, existing conditions within the Project local and regional assessment areas were considered. Primary and secondary data indicates that:

- Various vessel types, small and large, transit along or intersect the marine shipping (transit) route (which is made up of the marine shipping route and the open water marine shipping route) and the materials and supply shipping route (see also Section 6.4.1.1 for a description of all shipping routes identified for the Project). There are approximately 51,600 total vessel movements per year according to Automatic Identification System (**AIS**) data
- Seven conservancies are located along the marine route
- There are Indigenous, commercial, and recreational fisheries located within the local assessment area (**LAA**), regional assessment area (**RAA**), open water assessment area (**OWAA**), and transmission line assessment area (**TLAA**). The primary commercial fisheries include salmon, groundfish, small pelagic fish and invertebrates
- Marine-based tourism and recreation activities within the LAA include wildlife viewing, vessel activities, and recreational fishing
- Seventeen viewpoints of importance were identified either at the Project Site (**Site**) or along the shipping routes

To reduce or avoid adverse residual effects and enhance positive residual effects, the following have been identified as key mitigation:

- Identify and install appropriate Aids to Navigation (**ATON**) within the marine Project footprint
- Establish a safety zone around the Project's marine components

The Project will contribute an additional 148 to 172 LNGCs and NGL product carriers, or a 3-4% increase in the current large commercial vessel traffic, navigating along the marine shipping (transit) route. With the implementation of the key mitigation measures, adverse residual effects on marine use are low to moderate with low to moderate uncertainty.

Other industrial and marine projects in the area have the potential to interact cumulatively with the Project adverse residual effects on marine use, including projects that contribute to marine traffic. If all reasonably foreseeable future physical activities move forward, the Project's contribution of 148 to 172 additional large vessels annual will equate about 6% of the total large marine vessel traffic. Overall, the risk to the Marine Use VC from cumulative effects is low to moderate, and the uncertainty of this assessment is moderate. No follow-up monitoring programs are proposed for marine use. Transport Canada will require the second phase of the Navigational Safety Assessment to be completed prior to the start of operations.

7.11.2 Relevant Statutes, Policies and Frameworks

The management of marine use is subject to several statutes, policies, and frameworks. These are identified in the AIR. Table 7.11–1 provides a list of the key legislation, policy, and regulatory guidance documents applicable to the assessment of marine use. Table 6.1.2 in Section 6.1 identifies additional sources of information on existing conditions collected for this valued component and applicable standards and guidance that have been identified by the Project to date.

Table 7.11–1 – Summary of Key Legislation, Policy, and Regulatory Guidance Documents for Marine Use

Regulation or Policy	Description
Federal	
Canadian Navigable Waters Act	Protects the public's right to travel on navigable waters and regulates the construction and operation of works that may infringe upon this right. The Act applies to all waters that the public may use for travel or transport, whether the water is on the list of 'scheduled' waters of the *Canadian Navigable Waters Act* or not. Projects that affect navigation require an application for an approval to Transport Canada's Navigation Protection Program.
Canada Marine Act and regulations	Governs federal ports in Canada, including Canada Port Authorities and public ports. The *Canada Marine Act* includes federal ports' authorities to maintain safe navigation and environmental protection within port boundaries, including directing and controlling vessel traffic.
Canada Shipping Act, 2001	Governs the safety of marine transportation and the protection of the marine environment and applies to Canadian vessels operating in all waters worldwide and to all foreign vessels operating in Canadian waters. Liquefied natural gas (**LNG**) carriers and Project-related vessels will transit along the designated shipping route in accordance with requirements of the *Canada Shipping Act, 2001* and its regulations. The Act includes the Collision Regulations that establishes rules about how to safely operate a vessel near other vessels. These rules apply to every type of vessel, from small self-propelled boats to large international vessels.
Pilotage Act	Provides the regulatory framework for the provision of pilotage services in specific waterways with mandatory pilotage requirements (i.e., the Pacific Pilotage Authority's mandated Pacific pilotage area); every ship of more than 350 gross tonnage that is not a pleasure craft are subject to compulsory pilotage (requirement that the ship be under the conduct of a licensed pilot or a pilotage certificate holder).
Marine Transport Security Act and regulations	Provides the regulatory framework for the security of marine transportation.
Fisheries Act	Provides the regulatory framework for the management and control of marine and inland fisheries and the protection of fish and fish habitat, including preventing pollution.
Nisg̲a'a Final Agreement Act (the Nisg̲a'a Treaty)	Provides the Nisg̲a'a Nation with constitutional certainty in respect of the Aboriginal people's section 35 right to self-government and recognizes Nisg̲a'a Lands and allows for joint economic initiatives in the development of the Nisg̲a'a Nation's natural resources; constitutionally protected rights and legislative jurisdiction that can facilitate the construction and operation of projects on or near Nisg̲a'a Lands.

7.11.2.1 International Maritime Organization Conventions

The International Maritime Organization (**IMO**) is a specialized agency of the United Nations, which is responsible for regulating shipping (IMO 2022). Canada is a member state and signatory to the IMO conventions and reflects the conventions in its marine regulatory framework (e.g., the *Canada Shipping Act, 2001*) (IMO 2022; GoC 2022a). Canadian maritime laws apply to all vessels operating in Canadian waters.

The IMO's International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), which took effect under the International Convention for the Safety of Life at Sea (**SOLAS**) in July 1986, is directly applicable to the LNG industry. The IMO's SOLAS Convention is an international maritime treaty that sets the minimum safety standards in the construction, equipment, and operation of merchant ships. The IGC Code applies to all vessels that transport LNG. The IGC Code describes details such as the design and construction standards for LNG carriers (**LNGCs**) and the equipment they should carry to minimize the risk to the vessel, to its crew, and to the environment. LNGCs will comply with all applicable federal and IMO requirements and other applicable classification rules, international requirements, and guidelines including, but not limited to:

- International Convention on Load Lines
- International Convention for the Prevention of Pollution from Ships
- Society of International Gas Tanker and Terminal Operators
- Oil Companies International Marine Forum Guidelines
- American Petroleum Institute Guidelines

7.11.2.2 Pacific North Coast Integrated Management Area

The Pacific North Coast Integrated Management Area (**PNCIMA**), also known as the Northern Shelf bioregion, is one of five National Large Ocean Management Areas identified in Canada's 2005 Oceans Action Plan; it is an area of approximately 102,000 square kilometres (**km^2**) and extends to the Canada--Alaska border in the north, to Brooks Peninsula on northwest Vancouver Island, to Quadra Island and Bute Inlet in the south, and as far west as the base of the continental slope (PNCIMA Initiative 2017; GoC 2021).

Large Ocean Management Areas are large marine areas with similar ecological characteristics including ocean temperatures, major currents, groupings of marine life, and habitats that all support a variety of common biological process and human activities (PNCIMA Initiative 2017). The PNCIMA plan is an initiative between the federal, provincial, and Indigenous Nations' governments. The PNCIMA initiative provides direction on and commitment to integrated, ecosystem-based, and adaptive management of marine activities and resources in the planning area. Ecosystem-based management recognizes the magnitude of interactions within an ecosystem and places human activities and impacts into the ecosystem-based management framework (PNCIMA Initiative 2017).

7.11.2.3 Marine Plan Partnership for the North Pacific Coast – North Coast Marine Plan

The Marine Plan Partnership for the North Pacific Coast (**MaPP**) is an initiative between the province of British Columbia (**BC**) and 17 Indigenous Nations that developed and are implementing marine use plans for BC's North Pacific Coast. The MaPP for the North Pacific Coast provides recommendations for marine management, uses, activities, and protection and are intended to inform economic development and stewardship of BC's coastal marine environment.

The MaPP region is divided into four subregions: North Coast, Haida Gwaii, Central Coast, and North Vancouver Island. The North Coast Marine Plan (**NCMP**) covers an area extending from Portland Inlet in the north to the south end of Aristazabal Island and is bounded by the coastal boundaries of the Kitimat--Stikine and North Coast Regional Districts to the east and the MaPP for Haida Gwaii area to the west.

The NCMP area includes the territories of six participating Indigenous Nations: Gitga'a First Nation, Gitxaała Nation, Haisla Nation, Kitselas First Nation, Kitsumkalum First Nation, and Metlakatla First Nation. Although the north coast subregion of the MaPP includes the marine waters of the Nass Area, only two spatial areas within the Nass Area are identified by the NCMP: 'Stewart' – a portion of the Bear River Estuary, and 'Kitsault' – at the head of Alice Arm. Both are identified in the NCMP as "areas for future planning consideration" in need of finer-scale planning information, subject to participation by the Nisga'a Nation. There are also several marine use plans that have been developed for areas that will be transected by the shipping routes to and from the Project (NCSFNSS and GoBC 2015).

The NCMP uses marine spatial zoning to inform decision makers and proponents of recommended uses when considering resource and tenure decision for activities within the jurisdictional mandate and authority of the provincial and Indigenous Nations' governments. Three types of zones are defined in the NCMP: the General Management Zone, which allocates space for a wide range of marine uses and activities that are governed and managed using an ecosystem-based management framework; the Special Management Zone, which allocates space for high priority and/or high potential sustainable marine uses and activities; and the Protection Management Zone, which allocates space primarily for conservation purposes or objectives, and may provide a basis for protecting localized conservation values.

The NCMP identifies Dundas Island as a Protection Management Zone to conserve areas of high cultural and historical value, including areas of habitation and marine harvesting, to protect ecological values and to protect unique and remote wilderness experiences for tourism and recreational purposes. The Protection Management Zone surrounds the Lax Kw'alaams/Dundas and Melville Islands Conservancy. There is documented evidence of 11,000 years of Indigenous use and occupation and the area has a high level of cultural significance (NCSFNSS and GoBC 2015). Indigenous Nations' uses of the area include the harvesting of salmon, groundfish, herring, invertebrates (e.g., clams and cockles), and other intertidal resources (NCSFNSS and GoBC 2015). The area is also a popular recreational and tourism destination (NCSFNSS and GoBC 2015).

The NCMP also identifies Big Bay, which is located adjacent to the Tsimshian Indian Reserve, as a Protection Management Zone. The purpose of this Protection Management Zone is to retain the natural diversity and abundance of marine life and to protect marine biodiversity and culturally important habitats and species (NCSFNSS and GoBC 2015). Big Bay is an estuary of provincial and federal significance (NCSFNSS and GoBC 2015). The estuarine habitat and many of the fish and shellfish that live there have cultural significance for Indigenous Nations (NCSFNSS and GoBC 2015). One of the largest herring spawning occurrences on the coast takes place in Big Bay (NCSFNSS and GoBC 2015).

7.11.2.4 Ocean Protection Plan – The Reconciliation Framework Agreement for Bioregional Oceans Management and Protection

The Reconciliation Framework Agreement, signed on June 21, 2018, represents the first formal commitment made by the Government of Canada and multiple First Nations to work together to protect the marine environment and improve marine safety. The Oceans Protection Plan and the Reconciliation Framework Agreement aims to create stronger relationships with coastal communities, and preserve and restore marine ecosystems, and enhance marine safety.

7.11.2.5 Indigenous Nations Marine Use Plans

Indigenous Nations marine use plans consider the management of the marine environment and its marine resources and the goals and vision of each respective Nation.

7.11.2.5.1 Land Use Plan for Nisg̲a’a Lands (2002)

The Land Use Plan for Nisg̲a’a Lands (2002; Nisg̲a’a **LUP**) establishes important considerations for uses of Nisg̲a’a Lands (as defined therein). The Nisg̲a’a LUP guides how the Nisg̲a’a Nation governs Nisg̲a’a Lands in accordance with of the following principles:

- Adherence to the principle of the common bowl
- Sustainable use of resources on Nisg̲a’a Lands for the benefit of Nisg̲a’a citizens
- Protection of the environment from ecological degradation
- Equitable access to Nisg̲a’a Lands and Nisg̲a’a resources for Nisg̲a’a citizens
- Although the Nisg̲a’a LUP does not apply to Category A Lands[1], these principles guide the Nisg̲a’a Nation in land use decisions with respect to all lands owned by the Nisg̲a’a Nation

[1] As per the Nisg̲a’a Final Agreement, the Nisg̲a’a owned Category A and Category B Lands (i.e., Nisga’a Fee Simple Lands) are land parcels located throughout the Nass Area (GoBC 2000). Category A Lands are comprised of 25 km^2 of land, consisting of 18 parcels, and Category B Lands are comprised of 2.5 km^2 of land, consisting of 15 parcels (GoBC 2000). The Nisga’a Nation own all mineral resources on or under Category A Lands and the province of BC own all mineral resources on or under Category B Lands (GoBC 2000).

7.11.2.5.2 Metlakatla Draft Marine Use Plan (2014)

The Metlakatla territory is in the Great Bear Rainforest between the Pacific Ocean and the Coast Mountain Range on the west coast of BC and is only accessible by air or by water (Metlakatla First Nation 2014). Access to resources for food, social, and ceremonial purposes is vital to the Metlakatla people (Metlakatla First Nation 2014). The Metlakatla draft Marine Use Plan outlines its marine spatial plan for its territory, developed to guide natural resource management to balance economic development, ecosystem health, and the social and cultural well-being of the community.

The marine spatial plan designates different zone types for sustainable natural resource use in different areas (Metlakatla First Nation 2014). While the Project Area itself does not overlap with any of these zone types, the shipping routes overlap with two: the Coast Tsimshian Use Zone and the Metlakatla Management Zone, which are both designated for Metlakatla traditional fisheries and cultural practice and ecotourism and recreational activities (Metlakatla First Nation 2014). Marine transportation, and the cumulative effects of multiple industrial projects, are listed as some of the Metlakatla First Nations' primary concerns for the marine environment as more industrial projects are being proposed and developed in the north coast region. It also lists the Metlakatla Pass and the Tree Knob group as areas of particular concern as they are areas that provide food and livelihood for their community (Metlakatla First Nation 2014).

7.11.2.5.3 Lax Kw'alaams Marine Resource Government and Management Plan (2022)

Members of Lax Kw'alaams connect with the marine environment in various ways such as through traditional use, transportation, and recreation. Economic development opportunities that exist and that are desired within the community include ecotourism, floating lodges and fishing charters, and aquaculture. Lax Kw'alaams is currently updating their existing Land and Marine Resources Plan, adopted in 2004 (Lax Kw'alaams Band 2021). The updated Lax Kw'alaams Marine Resource Government and Management Plan aims to identify the community's vision and goals and provide policies and strategies for protection, conservation, management, and development within the marine environment (Lax Kw'alaams Band 2022).

7.11.2.5.4 Kitsumkalum First Nation Marine Use Plan (2015)

The Kitsumkalum First Nation Marine Use Plan aims to maintain and re-establish the Kitsumkalum First Nation's connection to marine resources in their territory. The Kitsumkalum First Nation's traditional use region combines both coastal and inland areas that cover 5,941,000 hectares (**ha**) (Kitsumkalum First Nation 2015). The Kitsumkalum First Nation's coastal area begins at Portland Inlet in the north and extends southward through Chatham Sound, including important sites around Edye Pass and down Grenville and Principe Channels (Kitsumkalum First Nation 2015).

The Kitsumkalum Marine Use Plan outlines its approach to using ecosystem-based management to manage the effects of the industrial economy on natural ecosystems (Kitsumkalum First Nation 2015). It also outlines its designated draft zone types, which aim to facilitate sustainable resource use in Kitsumkalum First Nation territory (Kitsumkalum First Nation 2015). The Project Area does not overlap with any of these designated draft zone types. However, two of the designated draft zone types overlap with the Project's RAA. These include the Skeena Estuary Special Management Zone and the Stephens Island Special Management Zone. These two Special Management Zones limit some commercial fisheries' practices (i.e., invertebrate dive and trap and benthic trawl practices), but allow other marine uses to continue (Kitsumkalum First Nation 2015). As there are several new terminal and marine transportation projects proposed for north coast ports (e.g., Kitimat, Prince Rupert, Stewart), there is a growing concern from Kitsumkalum First Nation regarding the cumulative effects of multiple industrial projects.

7.11.2.5.5 Kitselas First Nation Land Use Plan (2019)

Kitselas culture and heritage is deeply rooted in the land (Kitselas First Nation 2019). The Kitselas First Nation's Land Use Plan's vision and guiding principles were created during the 2012 Land Use Plan process and continue to be supported in their updated plan. These guiding principles include flexible land management, protecting and preserving Kitselas' culturally significant areas, developing a community-owned plan, creating a plan for members of all ages, strengthening self-governance of Kitselas membership, and enhancing positive relationships within the region and with service providers (Kitselas First Nation 2019). Land use designations, outlined in the plan, include resource areas (e.g., areas for commercial fishing), which are lands primarily used for resource extraction and are intended to balance economic development within the natural resource sector and environmental stewardship and natural areas (e.g., areas that accommodate rivers and streams, shorelines, medicinal plant areas, culture camps, and boat launches), which are intended to be preserved as important wildlife habitat, sensitive environmental areas, and/or areas members can use for traditional land use purposes and enjoyment (Kitselas First Nation 2019).

7.11.2.5.6 Gitxaała Marine Use Plan (2011)

The Gitxaała Marine Use Plan was developed from 2009 to 2011 and continues to evolve today (Gitxaała Nation 2022). The Gitxaała Marine Use Plan sets out marine protection standards, a series of recommendations regarding approach and values, and outlines the objectives and strategies necessary to guide sustainable management of marine resources, such as for shellfish and marine plant aquaculture (Gitxaała Nation 2022). The Marine Use Plan informed the Government of BC's collaboration with the Nation towards the development of the spatial plan for the MaPP for the North Pacific Coast (NCSFNSS and GoBC 2015).

7.11.2.5.7 Gitga'at Marine Use Plan (2011)

The well-being of the Gitga'at people is integrated in the well-being of the environment and the abundance of natural resources (Gitga'at Nation 2011). The Gitga'at Marine Use Plan covers the marine and intertidal environment in Gitga'at territory and in the nearby areas that the Gitga'at people access and use for traditional purposes. The Gitga'at Marine Use Plan aims to describe the vision the Gitga'at people have for their marine environment, identify marine use zones and related management strategies and objectives, summarize some of the key management issues and the strategies, and identify economic development interests.

7.11.2.5.8 Haida Gwaii Marine Plan (2015)

The Haida Gwaii Marine Plan was written because of a collaborative planning process led by the Haida Nation and the province of BC. The Haida Gwaii Marine Plan provides guidance in four main areas: General Management Direction; Marine Economic Development Direction; Marine Spatial Zoning; and Plan Implementation, Monitoring and Amendment. It lists key issues, concerns, and opportunities including the declining, collapsed, or unsustainable fisheries, increasing shipping traffic, aquaculture development, tourism development, and recreational fishery expansion. As part of the marine planning process, the Haida Nation and the province of BC established several management zones based on the MaPP Zoning Framework: the General Management Zone, the Special Management Zone, and the Protection Management Zone (CHN and PBC 2015).

7.11.3 The Influence of Consultation and Engagement

The development of the AIR and this assessment was influenced by the Project's consultation with Technical Advisors to the Project, Indigenous groups, and the public. This section describes information and concerns related to marine use raised through consultation with government agencies, stakeholders, Indigenous groups, and community members (i.e., members of an affected Indigenous group). Where made available by Indigenous groups through consultation, information gathering, and voluntary information sharing, information on traditional knowledge and traditional use has been included.

Table 7.11–2 provides a summary of the topics and key information and concerns that the Project identified as part of its consultation and engagement efforts that relate to marine use, as well as a summary of the influence that the outcomes of this consultation and engagement had on the assessment.

Table 7.11–2 – Summary of Key Information and Concerns for the Project Related to Marine Use

Topic	Key Information and Concerns	Influence on the Assessment
Gender Based Analysis (GBA) Plus	▪ Request for data specific to communities, groups within the communities, family units, individuals, etc.	▪ These potential effects were considered in the assessment of potential change in marine fisheries and other uses and in consideration of GBA Plus, which considered Indigenous persons (see Section 7.11.7.3.3 and Section 7.11.7.4.3).
Assessment Boundaries (spatial boundaries)	▪ Concerns relating to the open water area, to the west of Triple Island (i.e., the 12 nautical mile [nm]).	▪ The spatial boundaries for the assessment of marine use were extended from Triple Island to the 12 nm limit (see Section 7.11.4.1).
Potential Interactions (waste management)	▪ Concerns relating to the transportation of waste.	▪ Waste management was added as a Project activity that may have a potential interaction with marine use (see Section 7.11.6.1).
Residual Effects (Indigenous marine use)	▪ Concerns relating to the potential effects on fisheries of cultural, economic, and traditional value.	▪ These potential effects were considered in the assessment of potential change in marine fisheries and other uses and in consideration of GBA Plus, which considered Indigenous identity (see Section 7.11.7.3.3).
Residual Effects (Indigenous marine use)	▪ Concerns relating to the potential effects of increasing marine shipping on Indigenous Nations' sense of place, sacred sites, and continued safe access to travel routes that are used daily.	▪ These potential effects were considered in the assessment of the change in marine fisheries and other uses and in consideration of GBA Plus, which considered Indigenous identity (see Section 7.11.7.3.3).
Residual Effects (marine use)	▪ Concerns relating to the potential effects on consumptive, non-consumptive, and cultural marine uses.	▪ These potential effects were considered in the assessment of the change in marine fisheries and other uses and in consideration of GBA Plus, which considered Indigenous identity (see Section 7.11.7.3.3).
Residual Effects (seasonality of fisheries)	▪ Request to consider the seasonality of fisheries and fishing-related activities.	▪ The seasonality of fisheries and fishing-related activities was considered in the assessment of marine use (see Section 7.11.7.3.3).
Residual Effects (wake effects)	▪ Concerns relating to the generation of wake from Project-related vessels and the potential effect on access to valued marine resources and access to preferred locations for fishing/harvesting.	▪ These potential effects were considered in the assessment of the change in marine fisheries and other uses and in consideration of GBA Plus, which considered Indigenous identity (see Section 7.11.7.3.3).

Table 7.11–2 – Summary of Key Information and Concerns for the Project Related to Marine Use

Topic	Key Information and Concerns	Influence on the Assessment
Residual Effects (aesthetic conditions)	▪ Concerns relating to the potential effects on visual quality, sensory disturbance from noise, and ambient light.	▪ Aesthetic conditions, including visual quality, acoustics, and ambient light were considered in the assessment of marine use (see Section 7.11.7.4).
Cumulative Effects (marine shipping)	▪ Concerns relating to the cumulative effects of increased LNG carrier and associated marine traffic through or adjacent to significant and heavily utilized marine resource harvesting areas; concerns relating to issues affecting continued access to valued marine resources, access to preferred locations for fishing/harvesting, and loss of fishing gear.	▪ Additional past, present, and future physical activities were added to the table with potential Project interactions and effects on marine use and potential cumulative effects were considered in the assessment of marine use (see Section 7.11.11.1).

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7.11.3.1 Gender Based Analysis Plus Considerations Identified during Engagement

Subpopulations/subgroups identified in Table 7.11–3 may experience disproportionate effects from the Project, and thus have been assessed using the GBA Plus framework. Subpopulations were identified through community engagement and through a literature review of relevant projects.

Indigenous persons may have more complex marine use needs because some Indigenous persons rely on the natural environment to provide resources for food, social, and ceremonial purposes. Access to the marine environment and its marine resources is especially important in northern rural and remote communities, where food considered non-local may be more expensive. Food costs are often two to three times higher in communities more than 50 km from an urban centre (FNFNES 2019). Living in rural, remote, and Indigenous communities often means travelling some distance to access healthy, nutritious food (FNFNES 2019).

Table 7.11–3 – Subpopulations identified for GBA Plus Assessment

Subpopulation/subgroup	Rationale for incorporating GBA Plus
Indigenous persons	Indigenous persons' sense of place and well-being is tied to their natural environment. Indigenous persons place importance on access to natural resources for food, social, and ceremonial purposes. As traditional harvesting practices include shoreline harvesting areas and traditional boating routes that overlap with the shipping routes, Indigenous people may experience disproportionate effects from the Project.

7.11.4 Assessment Boundaries

The spatial, temporal, administrative, and technical boundaries for the assessment of effects on marine use are described below.

7.11.4.1 Spatial Boundaries

The spatial boundaries utilized for the assessment of marine use are described below and are shown in Figure 7.11–1, Figure 7.11–2, and Figure 7.11–3:

- The **Project Footprint** is the physical footprint for the Project (i.e., the areal extent of planned onshore clearing and marine infrastructure development at the Site)
- The **Local Assessment Area (LAA)** encompasses waters where Project marine activities have the greatest potential to adversely affect navigation, fisheries, and other uses. The LAA includes waters surrounding the marine terminal, waters in Portland Inlet, Main Passage, Chatham Sound, and waters extending 6 kilometres (**km**) on both sides of the marine shipping route between Wil Milit and the pilot boarding location at or near Triple Island Pilotage Station, and the materials and supply vessel shipping routes between Wil Milit and Prince Rupert and between Wil Milit and Gingolx

- The **Regional Assessment Area (RAA)** is comprised of the Pacific Fisheries Management Areas (**PFMAs**) 3 (excluding 3-1, 3-6, 3-10, 3-14), 4 (excluding 4-3, 4-4, 4-15), and 104 (subarea 104-2 only). This broader area is expected to include the area within which residual Project effects are expected to act cumulatively with similar residual effects from other projects and activities on marine navigation and marine fisheries, as well as other marine uses
- The **Open Water Assessment Area (OWAA)** encompasses waters where Project marine activities have the greatest potential to adversely affect navigation, fisheries, and other uses. The OWAA includes waters extending 6 km on both sides of the marine shipping (transit) route between the 12 nautical mile (**nm**) limit of Canada's territorial sea and the BC Coast Pilots boarding location at or near Triple Island Pilotage Boarding Station. The OWAA also includes PFMA 101
- The **Transmission Line Assessment Area (TLAA)** is the area within which a portion of the transmission line between the Project and Nisga'a Lands (as defined under the Nisga'a Treaty) will be developed. It encompasses portions of the Nisga'a Category A Lands and the Nass Area but does not include Nisga'a Lands (as defined in the Nisga'a Treaty). The portion of the transmission line within the TLAA will tie into a transmission line that will be developed on Nisga'a Lands, connecting to the BC Hydro grid at a substation in New Aiyansh. The marine use LAA encompasses the marine portion of the TLAA.

For the purposes of the assessment, the Proponents have defined the primary shipping routes anticipated for the Project as (see Figure 1.1-3):

- Marine shipping (transit) route – the route LNG carriers and NGL product vessels are expected to travel to/from the Site. This route is discussed/assessed as two routes:
  - Open water marine shipping route – identified travel route between the 12 nm Canadian territorial sea limit to the BC Pilots boarding station at Triple Island
  - Marine shipping route – identified travel route between Triple Island and the Site
- Materials and supply shipping route – two routes identified for the transport of materials, equipment, supplies, etc. and including personnel:
  - Between Prince Rupert/Port Edward and the Site
  - Between Gingolx and the Site

These routes are also discussed in Section 1.4, 6.4 and Appendix E (the Navigation Safety Assessment).

7.11.4.2 Temporal Boundaries

Temporal boundaries identify when an effect is evaluated in relation to specific Project phases and activities. Temporal boundaries are based on the timing and duration of Project activities and the nature of the interactions with marine use.

Based on the current Project schedule, the temporal boundaries for the assessment are:

- **Construction:** approximately three to four years, commencing following receipt of necessary regulatory approvals and a final investment decision by the Project
- **Operation:** a minimum of 30 years following completion of construction and commissioning
- **Decommissioning:** approximately 12 months following the end of operation

7.11.4.3 Administrative Boundaries

Administrative boundaries include specific aspects of provincial and federal legislative or regulatory requirements; standards, objectives, or guidelines, policy objectives; as well as regional planning initiatives that are relevant to the assessment of marine use. The proposed Project location is in the northwestern coastal region of BC on a site known to the Nisga'a Nation as Wil Milit, a former Indian Reserve, within the Nass Area, and located approximately 15 km west of the Nisga'a Nation community of Gingolx. The proposed site consists of undeveloped land that, in part, has previously been logged and is adjacent to established shipping routes. The proposed floating natural gas liquefaction facility and marine terminal will be located on Category A Land (District Lots 5431 and 7235) owned in fee simple by the Nisga'a Nation as defined in the Nisga'a Treaty and on a proposed Water Lot located on Portland Canal at the northern point of Pearse Island.

The Nisga'a Nation has constitutionally protected treaty interests in the Nass Area, which includes fisheries management and harvesting rights in approximately 26,000 km^2 (Figure 7.11–4). Marine fisheries are managed by Fisheries and Oceans Canada (**DFO**) using spatially defined management areas referred to as Fisheries Management Areas (**FMAs**), or in the Pacific region, PFMAs. The Project's marine shipping route intersects DFO's PFMAs 3, 4, 101, and 104, which comprise a subsection of the Northern Shelf bioregion or PNCIMA.

Transport Canada and other federal agencies govern Canadian waters. The Port of Prince Rupert, located within the traditional territory of the Tsimshian First Nation, is governed by the Prince Rupert Port Authority (**PRPA**), which was established as a governance body in 1997. The Projects marine shipping route to be followed by LNGCs does not transect PRPA boundaries, but other Project related vessels including those transporting goods and personnel may. The Project's LNGCs and Project related vessels will enter the Pacific Pilotage Authority (PPA)'s mandated Pacific pilotage area and will follow the proposed marine shipping route unless advised otherwise by the PPA and the BC Coast Pilots.

7.11.4.4 Technical Boundaries

Technical boundaries are the technical limitations or considerations for the assessment of marine use. Technical boundaries may include limitations in scientific and social information, data analyses, and data interpretation, or uncertainties in the assessment. The Canadian Coast Guard (**CCG**)'s Marine Communications and Traffic Services (**MCTS**) collect information under the authority of the *Oceans Act* and the *Canada Shipping Act, 2001* for the purpose of safe and efficient movement of vessels in Canadian waters. The CCG's MCTS provides broad spatial information regarding vessel transits in the Prince Rupert Vessel Traffic Services (**VTS**) Zone For the assessment of Marine Use, AIS data was obtained from the Bureau of Ocean Energy Management (**BOEM**) and National Oceanic and Atmospheric Administration (**NOAA**)'s MarineCadastre website (2021). AIS data was used to quantify the number of vessel movements and identify types of vessels transiting within the RAA. Under the IMO SOLAS Convention, all marine vessels over 300 gross tons and passenger ships of any size are required to always operate an AIS Class A system onboard. Since smaller vessels (e.g., fishing vessels, pleasure craft, and non-motorized vessels) are not required to be fitted with an AIS Class A, smaller vessels could not accurately be quantified or identified using AIS data. However, it does capture some smaller vessels that have chosen to operate an AIS Class B system for safety reasons (see Section 7.11.5.1.4 for more information).

Marine fisheries are managed by DFO using spatially defined management areas referred to as FMAs, or in the Pacific region, PFMAs. Government data collection methods and privacy restrictions limit the resolution of marine fisheries data. For example, to comply with the *Privacy Act* and *Access to Information Act*, DFO is unable to release fishing statistics when there is a reasonable possibility that the information could be connected to an individual fisher (i.e., there are fewer than three vessels in a PFMA). Therefore, statistics for small scale marine fisheries (i.e., fisheries where there are fewer than three vessels in a PFMA) in PFMAs 3, 4, 101, or 104 cannot be presented.

Limited quantitative and qualitative information on Indigenous fisheries and boating routes was available from DFO, British Columbia Marine Conservation Analysis (**BC MCA**), and some Indigenous Nations. Consequently, Indigenous fisheries harvest is assumed to occur across all known commercial fishing grounds, in addition to other identified areas.

7.11.5 Existing Conditions

This section describes the methods and sources of information used to characterize existing conditions and then provides an overview of existing conditions for marine use.

7.11.5.1 Methods

This section describes the methods and sources of information used to characterize existing conditions in the Project footprint, LAA, RAA, OWAA, and TLAA.

7.11.5.1.1 Existing Data

Methods and sources of information used to characterize existing conditions were gathered from consultation with Indigenous Nations and stakeholders, primary research, and from publicly available information, including government reports and data, environmental assessments (**EAs**) for other projects in the region, primary literature, and online sources.

7.11.5.1.2 Literature

Literature sources include DFO's Integrated Fishery Management Plans (**IFMPs**) and statistical reports, EAs (e.g., Aurora LNG, Cedar LNG, LNG Canada, Pacific NorthWest LNG), strategic marine planning resources such as the PNCIMA Plan, MaPP for the North Pacific Coast Initiative, Land Use Plan for Nisga'a Lands, and Prince Rupert Land Management Plan, and Nisga'a Fisheries and Wildlife Department (**NFWD**) reports.

7.11.5.1.3 Primary Research

Primary research was conducted to collect information where publicly available data were considered inadequate (i.e., small vessel traffic data). This primary research included collecting incidental observations and data during marine fish, marine mammal, remotely operated underwater vehicle, and intertidal surveys that were conducted along the marine shipping route. Incidental data collected during the vessel surveys included observations of marine vessel activity and fishing activity along the marine shipping route, which was used to supplement marine shipping and marine fisheries data. Surveys were conducted in June, July, September, and November 2021 and February, March, and July 2022. The Marine Resources Technical Data Report provides additional details on the marine fish, marine mammal, remotely operated underwater vehicle, and intertidal surveys conducted (Appendix 7.09A).

Primary research was also collected through interviews with citizens of Nisga'a Nation, key informants, community members, and concerned stakeholders. Issues of importance to Indigenous groups were identified through consultation activities and through a review of Indigenous knowledge, Indigenous marine use and land use studies, and secondary data sources, where available. Indigenous knowledge and Indigenous marine use and land use data have been integrated into the overview of existing conditions, where appropriate. Where possible, information pertaining to Indigenous groups was disaggregated.

7.11.5.1.4 Marine Vessel Traffic Data

Marine vessel traffic data were collected from multiple sources including the CCG's MCTS, PPA, and PRPA. AIS data from the BOEM/NOAA's Marine Cadastre website and from the Navigational Safety Assessment (Section 7.11.5.1.5) were used to quantify the number of vessel movements and identify types of vessels transiting within the RAA. AIS is an automated, autonomous system that tracks the location of vessels. The AIS data collected for vessel movements includes the vessel's name, maritime mobile service identity number, dimensions, and load status. Under the IMO SOLAS convention, all marine vessels over 300 gross tons and passenger ships of any size are required to always operate an AIS Class A system onboard. These can only be turned off temporarily for valid security reasons. Smaller vessels are not required to be fitted with an AIS Class A system but may choose to operate an AIS Class B system for safety reasons.

7.11.5.1.5 Navigation Safety Assessment

Through the Oceans Protection Program, Transport Canada reviewed the Technical Review Process of Marine Terminal Systems and Transshipment Sites (**TERMPOL**) (Transport Canada 2022a). Through this review process, it was determined that an enhanced Navigational Safety Assessment (**NSA**) would replace the TERMPOL (Transport Canada 2022a). The NSA was proposed to modernize the review process and reduce the number of duplicative marine reviews (Transport Canada 2022a). Transport Canada requires the completion of an NSA as part of the EA. An NSA is an opportunity for agencies (and other members on the Technical Advisory committee, Indigenous Nations, and the public) to review the proposed Project and determine whether additional resources (e.g., pilots), controls, or infrastructure (e.g., ATON) are required and when they need to be in place. Existing conditions, where available, were drawn from the results of the NSA studies. See Appendix E for the reports required to fulfill the NSA requirements.

7.11.5.1.6 Marine Fisheries Data

Marine fisheries data were collected from multiple sources, including DFO's Statistical Service Unit and the BC MCA online database. These data were supplemented with information obtained from consultation with Indigenous Nations and stakeholders and publicly available information. A review of available marine fisheries catch and effort data was completed. Effort is defined as the amount of time spent on the water catching fish and is used to describe marine fisheries.

Data on Indigenous fisheries were obtained from DFO and through consultation with Indigenous Nations (see Sections 11.0 to 19.0) and were supplemented with information obtained from publicly available sources including, but not limited to, Aurora LNG's Marine Use and Navigable Waters Assessment (2017), Cedar LNG's Marine Use Assessment (2022), LNG Canada's Marine Transportation and Use Assessment (2014), and Pacific NorthWest LNG's Navigation and Marine Resource Use (2014).

7.11.5.1.7 Marine-Based Tourism and Recreation Data

Marine-based recreation and tourism data were collected from the BC MCA online database, DataBC, and were supplemented with information from stakeholder and Indigenous Nations and publicly available information including, but not limited to, Aurora LNG's Marine Use and Navigable Waters Assessment (2017), Cedar LNG's Marine Use Assessment (2022), LNG Canada's Marine Transportation and Use Assessment (2014), and Pacific NorthWest LNG's Navigation and Marine Resource Use (2014).

7.11.5.1.8 Aesthetic Conditions

Aesthetic conditions information was identified using the province of BC's Ministry of Forests, Lands, and Natural Resource Operations' Visual Landscape Inventory (**VLI**), Geographic Information Systems (**GIS**) software, and Google Earth Pro. This information was supplemented with information obtained from consultation with Indigenous Nations, where Indigenous marine harvest and culturally important sites were considered. It was also supplemented with information obtained from stakeholders and publicly available information including, but not limited to, Aurora LNG's Visual Quality Assessment (2017) and LNG Canada's Visual Quality Assessment (2014).

7.11.5.2 Overview

This section provides an overview of existing conditions for marine use in the Project footprint, LAA, RAA, OWAA, and TLAA.

7.11.5.2.1 Navigable Channels

LNGCs are anticipated to enter Canadian waters from the west through Dixon Entrance north of Haida Gwaii and will pick up a BC Coast Pilot at a designated location near Triple Island. LNGCs will be piloted between Triple Island and the Project's marine terminal by BC Coast Pilots to support the safe inbound and outbound transit of LNGCs consistent with applicable marine navigation laws and regulations. With the pilot on board, LNGCs will travel east, south of the Dundas Island group and then travel north through Chatham Sound, Main Passage, through Portland Inlet and then northeast into Portland Canal. The marine shipping route from Triple Island to the Site is approximately 110 km in length. The Project's actual marine shipping route and/or procedures for LNGCs may change, informed by future engagements with BC Coast Pilot and analyses and engagements with Indigenous communities, government agencies, and stakeholders.

The narrowest section of the marine shipping route is approximately 2,800 metres (**m**), which is 56 times the breadth of the largest anticipated LNGC that will be used for the Project. All channels along the route exceed the TERMPOL guidelines for one-way vessel operations, which require the channel width to be a minimum of at least four times the design vessel's breath, and two-way vessel operations require the channel width to be a minimum of at least seven times the design vessel's breadth (Transport Canada 2015; Transport Canada 2018). The results of the NSA will inform the Project's actual marine shipping route and procedures for LNGCs.

Marine Environment – Tide, Wind, and Waves

There are 11 tide stations located within the LAA (Figure 7.11–5). Table 7.11–4 presents the mean and maximum range of tidal heights within the LAA. Tides near Gingolx are mixed semi-diurnal, with a mean tidal range of between 3.7-7.2 m (NHC 2022).

Table 7.11–4 – Mean and Maximum Range of Tidal Heights, LAA

Station	Location		Mean Tidal Height	Maximum Range of Tidal Heights
	Latitude	Longitude		
Kincolith	54.999	-129.978	3.81	7.27
Ranger Islet	54.837	-130.175	3.73	7.23
Port Simpson	54.560	-130.431	3.85	7.36
Moffatt Islands	54.446	-130.726	3.61	7.05
Qlawdzeet Anchorage	54.208	-130.768	3.69	7.14
Seal Cove	54.331	-130.280	3.78	7.39
Prince Rupert	54.317	-130.324	3.85	7.98
Fairview Terminal	54.283	-130.361	3.82	7.44
Prince Rupert RoRo	54.235	-130.335	3.81	7.26

Table 7.11–4 – Mean and Maximum Range of Tidal Heights, LAA

Station	Location		Mean Tidal Height	Maximum Range of Tidal Heights
	Latitude	Longitude		
Port Edward	54.229	-130.296	3.71	7.05
Porpoise Channel East	54.215	-130.289	3.8	7.35

SOURCE: GoC 2022b

The BC north coast's coastal storms generate strong winds, which create large waves in the inlets and fjords (NHC 2022). The Aleutian Low and Pacific High seasonal weather patterns have a strong influence on the prevailing winds in the northeast Pacific region (NHC 2022). During the winter months, the Aleutian Low and the cyclonic winds cause prevailing southerly winds and during the summer months, the Pacific High causes prevailing northwesterly winds (NHC 2022).

The highest wave recorded at the Site between September 2021 and February 2022 was measured at 0.8 m (Westmar Advisors 2022c). This wave occurred during a northerly storm in the first week of January 2022 (Westmar Advisors 2022c). The Project's Coastal Flood Hazard Assessment used a numerical modelling approach to assess the local wave conditions that are expected to occur at the Site. Modelling was conducted using the Simulating Waves Nearshore (**SWAN**), which is a numerical wave model used to simulate wave generation and propagation in deep water into coastal areas and shorelines (NHC 2022). The model results summarized the 1-in-50-year waves from the southwesterly (with prevailing winds within Dixon Entrance), southwesterly (with prevailing southeasterly winds within Hecate Strait), easterly, and north-easterly (NHC 2022). The significant nearshore wave heights ranged between 1.3-1.9 m and peak wave periods ranged between 4.6-5.6 seconds for year 2100 based on the 1-in-50-year events (NHC 2022). Kitselas First Nation emphasized that extensive experience and intimate knowledge of the weather, tides, and marine environment is required to be successful in navigating the waters on the northwest coast (Kitselas First Nation 2022).

Navigational Safety

The locations of the 55 anchorages and anchorage areas located in the RAA and OWAA are shown on Figure 7.11–6. These are formally designated anchorages; however, these anchorages would not be appropriate for use by an LNGC or other commercial vessels. Areas of refuge, which are regulated by Transport Canada in collaboration with DFO, are sheltered locations designed for vessels to anchor when weather conditions are not ideal. Marine users may contact the CCG's MCTS centres when they need to locate the nearest safe harbour locations. Project-related vessels will remain underway and there are no planned anchorages anywhere along the marine shipping route. Project-related vessels would only use an anchorage or an area of refuge in a case of an emergency on the LNGC or extreme weather.

LNGCs and NGL product carriers will not anchor as part of normal operation. Delays will be managed through delaying departure from the marine terminal or arrival at the pilot boarding stations. The NSA identified the following anchorages as being suitable for LNGCs or NGL product carriers. There are three areas with recognized anchorages near the marine shipping route:

- Egeria Bay – located on the east side of Langara Island. The area near western entrance to Dixon Entrance is suitable for LNGCs
- Port Simpson – accessed through Inskip Passage. There are three defined anchorages, two of which have the dimensional requirements for the anchorage of LNGCs
- Prince Rupert Port Authority – anchorages 9 and 10 (Ridley Island) and anchorages 24, 30, and 31 (Stephens Island) have been identified as meeting TERMPOL's swing radius recommendation of 925 m to accommodate Q-Flex sized LNGCs

The NSA identified four areas with emergency anchorages along the marine shipping route:

- McIntyre Bay – anchorage is located four to five km west-northwest of Rose Point
- Virago Sound – located at the mouth of Naden Harbour
- Whitesand Island – located off the east coast of Dundas Island
- Melleville Island – anchorage is located in the area between the eastern side of Melleville Island and Hammond Rocks

Alternatively, under emergency circumstances, LNGCs could slowly circle under their own power or be held in position, without anchoring, using tugs in a vessel holding area. Chatham Sound, Portland Inlet, and Nass Bay were identified as possible holding areas. Nass Bay would only be considered under emergency circumstances and if conditions made Chatham Sound and Portland Inlet unsuitable.

Aids to Navigation

Aids to Navigation (ATON) include devices or systems, external to a vessel, that assist mariners in determining their position and course, warn mariners of dangers or obstructions, and advise mariners of the location of the best or preferred route (CCG 2011). The Canadian ATON System is comprised of a mix of visual (lateral and cardinal), aural, and electronic ATON such as fixed aids on the shoreline (e.g., lighthouses, radar reflectors, and fog signals), navigational lights and beacons, and floating-based ATON (e.g., buoys) (CCG 2011). There are also radio ATON, which include Global Position System (**GPS**), Differential GPS, and Radar Reflectors and Radar Beacons. GPS is a satellite-based radio aid to navigation system owned by the United States government and operated by the United States Space Force (CCG 2007). The CCG uses the GPS, maintained by the United States government, and provides corrections through the DGPS stations (CCG 2007). There are four DGPS stations in the CCG's Pacific region (CCG 2007). The Prince Rupert area is serviced by the DGPS station located in Sandspit on Haida Gwaii (CCG 2007). The CCG is mandated to provide ATON in Canadian waters (CCG 2011). The CCG's Western Region maintains over 3,856 ATON and 27 staffed light stations.

ATON are to be used in conjunction with other marine publications to facilitate the proper understanding and interpretation of their function. These other marine publications include nautical charts (published by the Canadian Hydrographic Service), the *List of Lights, Buoys and Fog Signals* (published by the CCG), the *Radio Aids to Marine Navigation* (published by the CCG), *Canadian Aids to Navigation* (published by the CCG), and monthly and annual editions of Notices to Mariners (**NOTMARs**) and Notices to Shipping (**NOTSHIPs**) (managed and published by the CCG) (CCG 2011; Westmar Advisors 2022a). Based on the CCG's *List of Lights, Buoys and Fog Signals* for the Pacific Region, ATON relevant to the marine use LAA have been identified in Figure 7.11–7 (CCG 2020b). There are ATON in the LAA located in the Portland Canal, on Dundas Island, and surrounding Prince Rupert (CCG 2020b).

ATON will be used to identify the Project's marine facility, provide warnings and guidance to local and passing marine traffic, and assist the BC Coast Pilots in berthing and de-berthing the LNGCs and NGL product carriers. ATON will conform to all local and international requirements, including locations, height, colour, and light sequencing. Additional ATON to be considered include laser berthing monitoring system to assist berthing of LNGCs and product carriers.

7.11.5.2.2 Marine Authorities

In Canada, the federal government has authority related to fisheries, navigation, federal lands, and international relations, including responsibilities related to the management of boundary waters shared with the United States. The federal government governs Canada's marine safety regime. Transport Canada, DFO, CCG, and their science partners at Environment and Climate Change Canada jointly maintain the marine safety system. The PPA and the BC Coast Pilots administer marine pilotage services in the waters of Western Canada.

7.11.5.2.2.1 Transport Canada

Transport Canada is responsible for transportation policies and programs that promote safe, secure, efficient, and environmentally responsible transportation (Transport Canada 2021a). Transport Canada helps ensure the safe operation of commercial shipping by certifying officers and crews on Canadian ships and inspecting foreign flag vessels entering Canada waters to make sure they follow strict safety and anti-pollution standards (Transport Canada 2019a). It is responsible under the *Canada Shipping Act, 2001* to ensure safe and environmentally responsible commercial marine operations, and the *Canada Marine Act*, to oversee Canada's ports, including the Port of Prince Rupert, which offers North America's shortest and most efficient land-sea route to Asian markets (Transport Canada 2019a).

Western Canada Marine Response Corporation

The Western Canada Marine Response Corporation (**WCMRC**) is a Transport Canada-certified marine spill response organization for Canada's west coast (WCMRC 2022). Its mandate, under the *Canada Shipping Act, 2001,* is to be prepared to respond to marine oil spills along all 27,000 km of BC's coastline and to mitigate the impact when a spill occurs (WCMRC 2022). There are caches of equipment stored in predetermined locations to reduce marine spill response times. The WCMRC conducts spill response training with coastal Indigenous Nations. Training with the Nisga'a Nation is ongoing.

Transportation Safety Board of Canada

The Transportation Safety Board of Canada (**TSB**) is an independent agency that advances transportation safety by investigating occurrences, including occurrences in the marine environment (TSB n.d.). The TSB is guided by various industry standards, as well as policies created within the agency, to help ensure investigations are conducted in a systematic, thorough, and unbiased manner (TSB n.d.). The *Canadian Transportation Accident Investigation and Safety Board Act* and regulations are relevant to the work performed by the TSB (TSB n.d.).

Prince Rupert Port Authority

The PRPA is a local port authority constituted under the *Canada Marine Act* to operate the Port of Prince Rupert. The PRPA is responsible for the overall planning, development, marketing, and management of the commercial port facilities within the Port of Prince Rupert (PRPA 2022a).

Fisheries and Oceans Canada

Fisheries and Oceans Canada (DFO) is responsible for safeguarding Canadian waters and managing Canada's fisheries and oceans resources. DFO helps to ensure health and sustainable aquatic ecosystems through habitat protection and science. It supports the economic growth in the marine and fisheries sectors, and innovation in areas such as aquaculture and biotechnology.

Canadian Coast Guard

The CCG is a special operating agency within DFO that ensures the safety of mariners in Canadian waters and protects Canada's marine environment (CCG 2022a). It is the lead federal agency responsible for ensuring marine safety throughout Canadian waters. Its mandate is stated in the *Oceans Act* and *Canada Shipping Act, 2001*. The *Oceans Act* and the *Canada Shipping Act, 2001* provide the legal framework that governs the CCG's responsibility to marine navigation, environmental response services, marine search and rescue services, maritime security, icebreaking and ice management, dredging, and marine communications and traffic management (CCG 2019).

The CCG fleet of vessels delivers the on-water portion of their mandated programs, including ATON, waterways management, environmental response, marine search and rescue, and ice break and ice management (CCG 2021a). The fleet supports DFO as they carry out science and conservation and protection operations and supports commercial fishing, maritime transportation, shipping and tourism industries, and recreational boating (CCG 2021a). Located within the CCG's Western Region are seven operating bases, 13 search and rescue stations, four seasonal Inshore Rescue Boat stations, five staffed Environmental Response depots, two MCTS centres, one Joint Rescue Coordination Centre, and one Regional Operations Centre (CCG 2020a).

Marine Search and Rescue Services

Marine search and rescue services are available 24-hours a day, seven days a week, and 365 days per year, and are provided by the CCG in partnership with the Canadian National Defence and the Canadian Armed Forces. The CCG Auxiliary is made up of over 4,000 volunteers that assist in its marine search and rescue

efforts. Marine search and rescue response is coordinated by the Joint Rescue Coordination Centre and maritime rescue subcentres.

In BC, the regional not-for-profit association was called the CCG Auxiliary – Pacific. It was established as a registered charitable organization and permitted to issue tax receipts to individual and corporate donors (RCMSAR n.d.). In 2012, the name changed to the Royal Canadian Marine Search and Rescue (RCMSAR n.d.). There are five stations situated in the northern region, located at Hartley Bay, Kitimat, Lax Kw'alaams, Masset, and Prince Rupert (Figure 7.11–7; RCMSAR n.d.).

The Nisga'a Nation is a member of the Coastal Nations Coast Guard Auxiliary, an all-Indigenous volunteer organization that augments the marine search and rescue capacity in federally mandated waters as official partners of the CCG (CN-CGA 2020). The objective of the Coastal Nation Coast Guard Auxiliary program is to provide strategically located, trained, and qualified members and vessels that are prepared and available to support CCG activities (CN-CGA 2020). The Nisga'a Nation joined the Coastal Nations Coast Guard Auxiliary in 2020. The Coastal Nations Coast Guard Auxiliary has more than 50 members who have been trained in marine search and rescue and are on-call to respond to marine emergencies 24-hours-a-day, 365-days-a-year in remote areas along the BC coast (CN-CGA 2020). The Nisga'a Lisims Government (**NLG**) has their own Enforcement Department with conservation officers that enforce regulations in the Nass Area on both land and water (Moore 2022, pers. comms.). The enforcement department operates three vessels to patrol the waters and enforce fishing and hunting regulations; one of which is a modified fishing vessel (Moore 2022, pers. comms.). Beginning in late 2023 or early 2024, the NFWD will operate a high-speed marine vessel that will assist in marine search and rescue missions. The NLG is also seeking support for training and cross-training with the CCG so that volunteers and paid staff will have the capacity to respond to incidents at-sea (Moore 2022, pers. comms.).

Marine Communications and Traffic Services

The CCG's MCTS centres are responsible for monitoring radio frequencies and respond to mariners' calls for assistance. It also broadcasts maritime safety information; manages marine traffic in designated waterways; provides navigation information and assistance, including marine communication policies and procedures; and screens vessels and issues clearances to ships prior to entry into Canadian waters. There are currently 158 radio towers located across Canada and 11 remote communication sites in the Arctic that support these services.

Navigational safety information is provided to mariners by the CCG, which also surveys channel conditions and informs mariners of water depths, currents, and levels. Two mechanisms, which the CCG uses to communicate navigational safety information to mariners are the NOTMARs and Navigational Warnings (**NAVWARNs**) (CCG 2022b). The NOTMARs provide the necessary information needed to update chart and nautical publications (e.g., Canadian Sailing Directions, *List of Lights, Buoys and Fog Signals*, Annual Edition of NOTMARs and Radio ATON), including missing or damaged ATON and dangerous debris. They also advise mariners of new initiatives, services, and announcements which concern the maritime community. The NAVWARNs inform mariners about hazards to navigation. Verbal NAVWARN alerts are broadcast to

mariners through the CCG's MCTS; written NAVWARN alerts are issued when the hazard location is beyond broadcast range or when the information remains in effect for an extended period.

Vessel Traffic Services (**VTS**) are operated by the CCG's MCTS centres, which monitor the movement of vessels using very high frequency (**VHF**) radio, direction-finding equipment, AIS, and in some areas, surveillance radar. The Prince Rupert MCTS centre, which provides VTS for the Prince Rupert VTS Zone, is in Prince Rupert, BC. The Prince Rupert VTS Zone is the largest VTS Zone in Canada, extending from Cape Caution to the Alaska border south to include the Tofino VTS Zone; it was consolidated with Prince Rupert in Spring 2014. Vessels which are 20 m or more in length, engaged in towing or pushing any vessel or object, other than fishing gear, where the combined length of the vessel and any vessel or object towed or pushed by the vessel is 45 m or more in length of the length of the vessel or object being towed or pushed by the vessel is 20 m or more in length, are required to participate.

Prior to entering Canadian waters, vessels are required to obtain a VTS clearance, which is issued by a MCTS Officer after screening information about identity, condition, cargo, and intentions of the vessel. The vessel is required to maintain a listening watch on designated marine VHF radio channels and report at specific positions, Calling-In-Points. The MCTS Officer provides the vessel with information such as navigation safety advice and weather information. In many places traffic routing systems, which consist of 'one-way' lanes and separation zones and are shown on nautical charts, have been established to further enhance vessel movement safety (PRPA 2020a).

Pacific Pilotage Authority

Commercial vessels greater than 350 gross tons, while travelling in the pilotage waters of the west coast of Canada, are legally obliged to use the services of a Canadian marine pilot as per the *Pilotage Act* and Pacific Pilotage regulations (PPA 2022a). The PPA is a federal crown corporation whose mandate is to administer marine pilotage services in the waters of Western Canada (PPA 2022a). Its jurisdiction encompasses the entire BC coast, extending approximately two nautical miles from every major point of land (PPA 2022a). The jurisdiction includes the Fraser River and stretches from Alaska in the north to Washington State in the south and is one of the largest mandatory pilotage areas in the world (PPA 2022a). The PPA's mandate is to establish, operate, and administer, in the interests of safety of navigation, an efficient pilotage service within the region set out in respect of the PPA, whilst aligning with the principles set out in the *Pilotage Act* (PPA 2022a). The PPA also issues Notices to Industry when there are important updates to pilotage rules and regulations, as well as to advise mariners of new initiatives, services, and announcements concerning pilotage (PPA 2022b).

The Master, Owner, or Agent of a vessel that is to arrive in a compulsory pilotage area must notify the PPA of their estimated time of arrival, Coordinated Universal Time (**UTC**) and local time, off Triple Island, at least 48 hours prior to their arrival, and must confirm or correct their estimated time of arrival 12 hours prior to their arrival (PPA n.d.).

The PPA contracts the services of the BC Coast Pilots, a private company, under a service agreement for the BC Coast, excluding the Fraser River area, which is covered by the Fraser River Pilots (BC Coast Pilots n.d.). There are five mandated pilotage areas on the coast of BC and there are 115 licensed BC Coast Pilots

that pilot vessels in the pilotage areas except for the Fraser River (BC Coast Pilots n.d.). A licensed BC Coast Pilot is an experienced and licensed professional mariner who directs the navigation of a vessel on the BC coast (BC Coast Pilots n.d.). Their services provide an added level of safety to vessels as placing a BC Coast Pilot on the vessel ensures that at least one member of the bridge team has an in-depth knowledge of local dangers and is not fatigued. On the north coast, a BC Coast Pilot will board and disembark a vessel at the Triple Island Pilot Station (BC Coast Pilots n.d.).

7.11.5.2.3 Marine Infrastructure

Marine infrastructure within the LAA and RAA is primarily comprised of ports (e.g., the Port of Prince Rupert), small craft harbours, marinas and moorage facilities, and aerodromes and seaplane bases.

7.11.5.2.3.1 Ports

The City of Prince Rupert is located on the northern mainland of BC at the eastern end of Dixon Entrance (Figure 7.11–8). The Port of Prince Rupert, known for its naturally deep and ice-free harbour, straightforward and open approaches to ocean shipping lanes, and direct rail access to North America, is one of the busiest ports in Canada (PRPA 2020a; Transport Canada 2019b). Prince Rupert is the north coast terminus of CN Rail Line and is connected to the rail system throughout North America, making it an important transportation corridor to Canada and the US. Since its founding in 1914, the Port of Prince Rupert has remained a hub of marine activity on the north coast of BC, and it is currently the third largest port in Canada (ClearSeas 2020; PRPA 2020c).

The Port of Prince Rupert became a federal port in 1972 and in 1984 became a crown corporation (PRPA 2020c). Around the same period, Ridley Terminals Inc. began its coal export operations out of the port (PRPA 2020c). The PRPA was established in 1999 pursuant to the *Canada Marine Act* and it is accountable to the Canadian Minister of Transport (PRPA 2020c). The navigable waters that define the PRPA include the Prince Rupert Harbour, the Wainwright Basin, the Morse Basin, and the waters south of Digby Island and west of Ridley Island (PRPA 2020c). The Canadian Port Authority system is designed to make Canadian ports competitive, efficient, and commerce oriented (PRPA 2020c).

The Fairview Terminal was built in 1975 and was the first terminal in Prince Rupert, playing an important role in the modern economic development of western Canada (PRPA 2020c). The Northland Cruise Terminal opened in 2002, attracting cruise ships on their way to Alaska from Washington State (PRPA 2020c). In 2008, the Fairview Container Terminal opened, followed by the Westview Wood Pellet terminal in 2013 (PRPA 2020c). Ridley Terminals Inc. began expanding its terminals in 2015 (PRPA 2020c). The Fairview Terminal began expanding its terminal in 2016 (PRPA 2020c). In 2019, the Ridley Island Propane Export Terminal opened (PRPA 2020c). As of 2020, the Port of Prince Rupert has seven primary terminals (PRPA 2020c):

- Fairview Container Terminal
- Northland Cruise Terminal
- Prince Rupert Grain
- Ridley Island Propane Export Terminal

- Ridley Terminals Inc.
- Westview Wood Pellet Terminal
- Prince Rupert Ferry Terminal (Atlin Terminal)

The port handles a wide array of cargoes including containers, coal, grain, propane, wood pellets, logs, specialty cargo, and project cargo. The Prince Rupert Ferry Terminal (Atlin Terminal), located within the Port of Prince Rupert, is the northern BC terminal for both the BC and Alaska State Ferries (PRPA n.d.).

The main commercial approach to the port is via Dixon Entrance, Brown Passage, and Chatham Sound passing Lucy Island, Rachael Islands, and the Kinahan Islands travelling southeast toward Ridley Island and Lelu Island. The number of deep-sea vessels calling on the Port of Prince Rupert has continued to increase. Passenger vessels, including BC Ferries and Alaska State Ferries (i.e., the Alaska Marine Highway System), make regular scheduled calls to the Port of Prince Rupert. Coastal tug and barge operations, commercial fishing vessels, charter fishing vessels, and private pleasure craft are also numerous in the Prince Rupert area, especially during the summer season.

There are several marine facilities located within the boundaries of Prince Rupert and Port Edward such as marinas and moorage facilities (see Section 7.11.5.2.3.3). In addition to large vessel traffic, numerous small commercial and recreational vessels utilize the Port of Prince Rupert (see Section 7.11.5.2.4.2).

7.11.5.2.3.2 Small Craft Harbours

The Small Craft Harbour program is implemented by the DFO nationwide. The program supports harbours that are critical to the fishing industry so that they can remain in operation and in good working condition (DFO 2022j). There are three types of harbours, as defined by DFO: core fishing harbours, non-core fishing harbours, and recreational harbours (DFO 2021d). Core fishing harbours are those harbours that are critical to fishing and aquaculture industries managed by harbour authorities (DFO 2021d; DFO 2022j). There are three core fishing harbours located in the RAA, each with their own harbour authority. These are the Port Edward Harbour Authority, Stewart Harbour Authority, and Dodge Cove Harbour Authority (Figure 7.11–8; DFO 2021d). There are two non-core fishing harbours located in the RAA, including Hunts Inlet (Porcher Island) and Port Simpson (Figure 7.11–8; DFO 2021d). Recreational harbours are those which support the recreational community (DFO 2021d) There are no recreational harbours located in the RAA.

Also located within the RAA is Gingolx and Kitsault. The Nisga'a Village of Gingolx is located on Portland Inlet, approximately 170 km northwest of Terrace (Gingolx n.d.). Kitsault, located at the end of the Observatory Inlet, is a remote area of Alice Arm. The upland settlement of Kitsault was established in 1979 to house workers and families of a molybdenum mine (NCSFNSS and GoBC 2015). The mine was shut down in 1982 and the town was evacuated (NCSFNSS and GoBC 2015).

Port Edward

Located approximately 15 km south of the City of Prince Rupert on the Tsimshian Peninsula is the District of Port Edward. The Port Edward Harbour Authority was incorporated in 1996 under the direction of its board of directors (Port Edward Harbour Authority n.d.). Under a contract from the Small Craft Harbour Program, the Port Edward Harbour Authority manages, operates, and maintains four sites: Cowbay Harbour, Fairview Harbour, Port Edward (Porpoise) Harbour, and Rushbrook Harbour (Port Edward Harbour Authority n.d.). The four sites provide annual moorage for between 1,900 and 2,300 vessels annually, depending on the fishing season and weather (Port Edward Harbour Authority n.d.).

The Port Edward Harbour Authority ensures safe accessible service for harbour fishers and other uses, with the overall goal of enhancing facilities, operations, and economic development (Port Edward Harbour Authority n.d.). The Port Edward Harbour Authority manages multiple core fishing harbours, including (Port Edward Harbour Authority n.d.):

- Rushbrook Harbour – Located at the north end of George Hills Way. The Rushbrook Harbour has a 400-vessel capacity. One third of its capacity is reserved for non-commercial fishing vessels, based on availability during non-commercial fishing periods. The office is open from Monday to Friday, seven days a week during the fishing season. The building has restroom and shower facilities available
- Fairview Harbour – Located at the foot of Gore Avenue. The Fairview Harbour has a 250-vessel capacity. It has an office on the wharf, which is open during regular working hours. The building has restroom, shower, laundry, and garbage facilities available
- Port Edward (Porpoise) Harbour – The Port Edward (Porpoise) Harbour has a 25-vessel capacity and is designed to handle vessels up to 60 m. There is almost 1,000 ft of floats with gillnet repair racks. The Site has two large building complexes that house storage lockers, a vessel repair company, net and gear storage, a seine net repair area, a seine net and gillnet storage facility, and the head office of the Port Edward Harbour Authority. One of the buildings has restroom, shower, and laundry facilities available
- Cow Bay Harbour – Located in Cow Bay between the Yacht Club and Cowbay Marina. The Cow Bay Harbour has a 15-vessel capacity

Stewart

Stewart is located at the head of Portland Canal and is home to the northernmost port in BC. The District of Stewart has a 100-year port history in supporting the forestry and mining sectors (NCSFNSS and GoBC 2015). There is log handling, quarrying, and industrial tenures within the area (NCSFNSS and GoBC 2015). The Port of Stewart, managed by the Stewart Harbour Authority, hosts a bulk terminal and barge terminal. Commodities shipped to or from Stewart include mineral ore, forest products, and break-bulk cargo (District of Stewart n.d.; Stewart World Port n.d.).

Dodge Cove

Dodge Cove is a small, unincorporated community, which is made up of 40 residents (Statistics Canada 2022). It is located on Digby Island and is accessible year-round by seaplane, ferry, or other vessels (HAABC n.d.). Some residents commute from Dodge Cove to Prince Rupert for work or school, travelling by boat. The Dodge Cove Harbour Authority manages the Dodge Cove Harbour property and facilities (HAABC n.d.).

Oona River (Porcher Island)

Oona River is a community, located on Porcher Island, which accessible year-round by seaplane, ferry, or other vessels (Oona River n.d.). The Oona River Community Association manages the Oona River Harbour property and facilities as the Oona River Harbour Authority (Oona River n.d.). It provides moorage for commercial fishing vessels, residents, and the traveling public (Oona River n.d.). The use of the facility is governed by the Fishing and Recreational Harbour Act and a Moorage Agreement (Oona River n.d.). The Oona River Harbour is tidal, meaning it has a shallow entrance only accessible at high tide (Oona River n.d.).

7.11.5.2.3.3 Marinas and Moorage

There are several marina and moorage facilities located within the RAA (Figure 7.11–8). There is a public boat launch, located in Gingolx, that is often used for recreational purposes. The Gingolx community dock is available for moorage but is currently in need of some upgrades (e.g., a new breakwater) (Stewart 2022a, pers. comm.). The Cow Bay Marina, located in Cow Bay next to the Atlin Terminal, is also available for moorage. It has the capacity to berth up to 51 vessels and offers slips for vessels that are up to 100 feet, with a capacity to moor larger vessels on the dock's breakwater. Vessels use the marina as a resupply stop before travelling to locations such as Haida Gwaii and AK. One of the oldest yacht clubs in Canada, the Prince Rupert Rowing and Yachting Club, is also located in Cow Bay next to the Atlin Terminal. The Prince Rupert Rowing and Yachting Club offer moorage from September to May each year and can accommodate up to 83 vessels.

7.11.5.2.3.4 Aerodromes and Seaplane Bases

Seaplanes connect coastal communities, camps, and lodges and provide a method of transport to remote locations such as lakes for unique wilderness experiences. There are a few aerodromes and seaplane bases located within the RAA (Figure 7.11–8), including:

- Prince Rupert/Digby Island Water Aerodrome
- Kincolith Water Aerodrome
- Kitkatla Water Aerodrome
- Stewart Seaplane Base
- Port Simpson Seaplane Base
- Alice Arm Seaplane Base

The Prince Rupert/Seal Cove Seaplane Base is home to Prince Rupert's seaplane fleet as well as the Flight Services Station (YPR n.d.). The CCG is also based here. The Seal Cove seaplane base was established by the Royal Canadian Airforce during World War Two (YPR n.d.). The hangars date from that era. Inland Air Charters offer daily scheduled flights from the Prince Rupert seaplane Base (YPR n.d.). Other companies that offer transportation services include Ocean Pacific Air, Helijet, and Lakelse Air (Universal Helicopters) (YPR n.d.). The safe landing and takeoff of seaplanes will remain unaffected by Project-related vessels transiting the marine shipping route (Westmar Advisors 2022a).

7.11.5.2.4 Marine Vessel Traffic

The marine waters of the region serve as marine navigation routes for Indigenous, commercial, industrial, and recreational users connecting Stewart, Kitsault, Gingolx, and Laxgalts'ap to communities and ports to the south, as well as to international destinations. Most commercial and industrial vessels going past Wil Milit are destined for port facilities in Stewart. Indigenous, commercial, and recreational fishing vessels also use this area. Findings from the NSA indicate that Brown Passage is a focal point, as most of the regional marine vessel traffic traveling east-west passes through this area. The principal location of marine vessel traffic crossing the Project's marine shipping route is at or near the Triple Island Pilot Boarding Station (Westmar Advisors 2022a). Chatham Sound was also identified as a focal point of potential interaction or intersection with Project-related vessels and marine shipping-related activity (Westmar Advisors 2022a). Vessels such as tugs, fishing, sailing, and pleasure craft move north-south through Chatham Sound and move to and from Prince Rupert in the east, towards Dundas Island on the west side (Westmar Advisors 2022a).

7.11.5.2.4.1 Large Vessel Traffic

Vessels approaching the Port of Prince Rupert and the Port of Stewart will enter an area of responsibility of the Prince Rupert VTS Zone. While larger than the RAA, the Prince Rupert VTS Zone provides context for the level of marine traffic in the region (see Appendix 7.11A for further details). The NSA found no discernable seasonal patterns among tugs, barges, and large vessel types such as cargo ships and tanker vessels but did observe seasonality of large passenger/vehicle vessels (Westmar Advisors 2022a). Large passenger/vehicle vessels' presence is higher throughout the summer months when cruise ships are active versus in the winter when only ferries with routes in and out of Prince Rupert and smaller water taxis are in operation (Westmar Advisors 2022a). Overall, large vessel movements along or intersecting the Project's marine shipping route are infrequent (Westmar Advisors 2022a). Large vessels transiting along or intersecting the Project's marine shipping route are primarily comprised of cargo vessels of 125 to 200 m in length and tugs of 13 to 44 m in length, travelling past the Site, to and from Stewart (Westmar Advisors 2022a). Brown Passage is the busiest section for these vessels and averages approximately 21 vessels per week, or three per day (Westmar Advisors 2022a).

Passenger/Vehicle Vessels

Passenger and passenger vehicle vessels such as cruise ships and ferries utilize the Project's RAA. Most vessels travelling to Prince Rupert, travel via Hecate Strait or through the Inside Passage. Findings from the NSA indicate that passenger and vehicle vessel movements occur mostly north south and through

both Chatham Sound and the Triple Islands (Westmar Advisors 2022a). According to AIS data, from the period of 2016-2020, there is an average of approximately 7,120 vessel movements through the RAA per year (MarineCadastre 2021; Figure 7.11–9).

Cruise Ships

The main destination for cruise ships, travelling through Canadian waters, is Alaska. On an average year, around 380 cruise ships will leave the Salish Sea bound for Ketchikan, Juneau, and other tourist destinations (ClearSeas 2020). This is supported by the results of the NSA, which found that passenger vessels (mostly cruise ships passing through enroute to Alaska) cross the marine shipping route at Triple Islands approximately 370 times per year (Westmar Advisors 2022a). It also found that some of these vessels cross through Chatham Sound (approximately 218 times per year) (Westmar Advisors 2022a). Cruise ships that stop in Prince Rupert are serviced by the Northland Cruise Terminal. This seasonal industry plays an important role in the local tourism industry revenues from crew and passenger visitor spending (PRPA 2020c; InterVISTAS Consulting Inc. 2021). Between 2004 and 2019, Prince Rupert welcomed approximately 655,000 passengers with an estimated direct economic impact of $50 million (PRPA 2022b).

The cancellation of the summer cruise ship season in 2020 due to the COVID-19 pandemic, and then the subsequent Interim Order issued for all of 2021, led to a reduction in passenger volumes at the Port of Prince Rupert and in BC as a whole (Transport Canada 2021b; InterVISTAS Consulting Inc. 2021). Piloted passenger vessels decreased from 105 in 2019 to 0 in 2020 and 1 in 2021. As of November 1, 2021, the prohibition of cruise ships in Canadian waters was no longer in effect, under the condition that cruise ship operators were in full compliance with public health requirements (GoC 2022c; PRPA 2022b). On April 4, 2022, the PRPA announced the return of cruise ships to the Port of Prince Rupert with the release of their 2022 cruise ship schedule (PRPA 2022b). Forty-three vessels, with approximately 60,622 passengers and 23,661 crew members, were expected to call on the port between May and September 2022 (PRPA 2022b). On an average year, the Northland Cruise Terminal's berth can accommodate 60 vessels, with approximately 100,000 passengers (PRPA 2022b).

Ferries

Ferries serve as an important transportation service for coastal marine recreational and coastal communities. Two ferry services operate through the Port of Prince Rupert: BC Ferries and the Alaska Marine Highway System – Alaska State Ferries.

British Columbia Ferries

BC Ferries operates year-round scheduled ferry services from Port Hardy (Bear Cove) and Graham Island (Skidegate) to Prince Rupert and the return trips. The Port Hardy (Bear Cove) to Prince Rupert route, and the return trip (Route 10) traverses the Queen Charlotte Strait and then follows the Inside Passage to Prince Rupert. The Graham Island (Skidegate) to Prince Rupert route, and the return trip (Route 11) crosses through to the open waters of Hecate Strait then travels just north of Porcher Island to Prince Rupert. The summer season (i.e., July to September, or Q3) is the busiest season for BC Ferries

(see Appendix 7.11A for further details). Additional sailings are added during the summer months to meet the increased demand. Table 7.11–5 presents the total number of roundtrips completed on BC Ferries' Routes 10 and 11.

The decrease in the number of roundtrips completed for both Routes 10 and 11 in 2020 can be attributed to the COVID-19 pandemic (BCFC 2022). In mid-March 2020, traffic levels experienced a notable decline because of the COVID-19 pandemic (BCFC 2022). Sailings that were added in anticipation of spring break and Easter long weekend were removed from the schedule (BCFC 2022). By the end of March 2020, BC Ferries made the decision to cancel seasonal hiring and have approximately 400 personnel work from home, including all call centre staff within the Customer Service Centre (BCFC 2022). From 2017 to 2021, there was an average of 253 ferries (roundtrip) departing the Port of Prince Rupert (Table 7.11–5).

Table 7.11–5 – Roundtrips on BC Ferries' Route 10 and 11, 2017 to 2021

Route	Year					
	2017	2018	2019	2020	2021	Average
10	90	89	102	77	97	91
11	158	163	171	150	169	162
Total	**248**	**252**	**273**	**227**	**266**	**253**

SOURCE: BCFC 2022

Alaska Marine Highway System – Alaska State Ferries

The ferries of the Alaska Marine Highway make up a large part of AK's highway system, covering 3,500 miles of coastlines and providing service to over 30 communities that stretch from Bellingham, Washington to Dutch Harbor in the Aleutian Chain (State of Alaska n.d.). Alaska Marine Highway System (**AMHS**) operates year-round scheduled ferry services from Bellingham, Washington to Alaska, with stops in Prince Rupert (State of Alaska n.d.). The AMHS route system is divided into two subsystems: the mainline routes, which take more than 24 hours to complete, and the shorter routes that have vessels depart from their home port in the morning, travel to their destination port, and then return to their home port on the same day (State of Alaska n.d.). The mainline routes in the southeast carry a high percentage of tourists and vehicles in the summer (State of Alaska n.d.). From 2015 to 2019, there was an average of 67 ferries vessels departing the Port of Prince Rupert (Table 7.11–6).

Table 7.11–6 – Alaska Marine Highway System Prince Rupert Port Departures, 2015 to 2019

Port	Year					
	2015	2016	2017	2018	2019	Average
Prince Rupert	77	76	68	61	55	67

SOURCE: State of Alaska n.d.

Tugs and Barges

Tugs and barges make up a key part of marine vessel traffic. They provide transportation for essential good to remote and coastal communities and deliver both raw materials and finished goods to support key sectors of the local economy such as sawmills and pulp mills (ClearSeas 2020). All tugs in the area are also equipped with AIS and communicate well with other vessels (Dillon Consulting 2020).

Marine-based forestry operations are an important component of coastal logging operations. Timber is transported by trucks or trains to log dumps, where log bundles or individual logs are slid into the water or logs are placed in the water by helicopters (NCSFNSS and GoBC 2015). The logs are organized into log booms until they are ready to be transported to a processing centre (NCSFNSS and GoBC 2015). Logs are transported by tug and/or barge to off-Site sort yards, mills, and shipping ports for further manufacturing or exportation (NCSFNSS and GoBC 2015). Once processed, logs are either transported by land or by water to a dryland log-sorting site in Prince Rupert, Port Edward, or Ridley Island (PNCIMA Initiative 2017). There are 450 log-handling tenures and coastal watersheds that flow into the north coast area for a total of 57.4 km^2 (PNCIMA Initiative 2017). Tugs also play a key role in assisting vessels with berthing and de-berthing and escorting tankers near shore. Vessels calling on the Port of Stewart rely on tugs from Prince Rupert for berthing and deberthing. In Prince Rupert, Wainwright Marine Services have been operating since 1967 (Wainwright Marine 2022). It currently operates with a fleet of seven tugs and ten barges and provides shipping and towing services 24 hours a day, seven days a week, year-round (Wainwright Marine 2022).

Tug traffic follows well-defined routes, but the NSA found tug traffic to be the mostly widely dispersed of all vessel types. The NSA concluded that this is because of the dispersed nature of the industries and communities' tugs and barges support and due to the vessel Masters' preference to operate in sheltered waters (Westmar Advisors 2022a). The mapping of tug traffic patterns indicates that tugs have a seasonality to their trade. During the summer, when the weather is calmer and storms are less likely, tugs travelling north along the coast tend to use a more direct and less sheltered route through Queen Charlotte Sound (ClearSeas 2020). Much of the tug and barge traffic follow the Inside Passage route from southern BC to Alaska, especially during the winter when the weather is harsher and less predictable (Dillon Consulting 2020). The sheltered Inside Passage is the safer, preferred route (ClearSeas 2020).

According to AIS data, from the period of 2016-2020, there is an average of approximately 8,770 tug and barge movements through the RAA per year (MarineCadastre 2021; Figure 7.11–10).

Deep Sea Bulk Carriers and Cargo Ships

The marine commercial transportation sector is developing as a source of economic activity on the north coast due to its proximity to the Asian markets (PNCIMA Initiative 2017). Traffic transiting between Asia and Canada is representative of Canada's economy, with commodity shipments dominating the exports from Canada and manufactured goods dominating the imports from Asia (PNCIMA Initiative 2017).

The NSA found that cargo ships, of comparable size of the Project's design vessels, follow well-defined paths congruent with the Project's marine shipping route (Westmar Advisors 2022a). Cargo ships primarily travel from the west through Dixon Entrance or from the south to Prince Rupert (Westmar Advisors 2022a). It also found that most cargo ships passing to or from the open ocean at the western end of Dixon Entrance do so on the southern side of Learmonth Bank (Westmar Advisors 2022a). Meanwhile, tanker traffic moves exclusively in an east-west direction, in and out of Prince Rupert via Dixon Entrance (Westmar Advisors 2022a).

The PRPA reported an uncharacteristic decline in cargo volumes in 2021 (a 23% decrease year-over-year) (PRPA 2022c; see Appendix 7.11A for further details). This was attributed to factors including, but not limited to, extreme weather events (e.g., wildfires, flooding), intermodal supply chain disruptions, industry-specific issues, economic uncertainty because of the COVID-19 pandemic and its effects, and a competitive west coast market (PRPA 2022c; see Appendix E for further details). The Port has positioned itself for growth by continuing to construct and invest in new infrastructure to enable trade and diversity in the region (PRPA 2022c). The PRPA's navigational risk assessment study used the Maritime Research Institute of the Netherlands' marine traffic and safety assessment "SAMSON" model that specializes in identifying the most probable location for incidents (PRPA 2020b). The model predicts that there will be 1,207 commercial vessels (excluding passenger vessels) calling to the Port of Prince Rupert by 2030, by using current port activities as a benchmark, but also analyzing future scenarios. These future scenarios included potential growth and diversification in terms of vessel numbers, vessel types (e.g., container, bulk, and tanker), and vessel sizes from the Port of Prince Rupert and other north coast developments (PRPA 2020b).

The Project's location at Wil Milit is in a remote wilderness area and, other than some logging several decades ago, it has been primarily used by the Nisga'a for traditional purposes. Regionally, industrial use has included coastal logging and associated log storage and transport, regional mines, and associated shipping of minerals out of the port facilities in Stewart and commercial fishing processing.

From 2017 to 2021, there was an annual average of 1,432 piloted vessel movements[2] to anchorages or ports located in the RAA (i.e., Port of Prince Rupert, Port of Stewart, and the Triple Island Pilot Boarding Station) (see Appendix 7.11A for further details). In compliance with the *Pilotage Act*, all vessels of more than 360 gross tonnage that are not a pleasure craft are subject to compulsory pilotage. In 2021, the number of piloted bulk carriers decreased 41.5% year-over-year (see Appendix 7.11A for further details). However, the number of container, general cargo, and tanker vessels increased year-over-year by 24.0%, 42.9%, and 51.1%, respectively (see Appendix 7.11A for further details).

According to AIS data, from the period of 2016-2020, there is an average of approximately 9,021 deep sea bulk carrier movements and 71 deep sea cargo/tanker vessel movements through the RAA per year (MarineCadastre 2021; Figure 7.11–11).

[2] A vessel movement is defined as any one-way trip.

7.11.5.2.4.2 Small Vessel Traffic

Small vessel traffic within the LAA and RAA is primarily made up of commercial fishing vessels, water taxis, and recreational vessels. Findings from the NSA indicate that most of the total marine vessel traffic throughout the region is made up of fishing and recreational vessels (Westmar Advisors 2022a). The NSA found that sailing, pleasure craft, and fishing activity increases significantly throughout the summer months and that sailing and pleasure craft activity is absent during the winter months (Westmar Advisors 2022a).

Passenger Vessels and Water Taxis

Ferries

City of Prince Rupert – Digby Island Ferry

The Digby Island Ferry, operated by the City of Prince Rupert, offers passenger and vehicle services between the Digby Island Ferry Terminal on Digby Island and the Fairview Terminal in Prince Rupert (YPR 2022). Although the Digby Island Ferry is the most common mode of transportation to and from Prince Rupert Airport (**YPR**), some choose to travel to and from Prince Rupert by seaplane or helicopter. The ferry completes four roundtrips daily (YPR 2022).

Metlakatla Ferry Service

The Metlakatla Ferry service was the first business started by the Metlakatla Development Corporation (Metlakatla First Nation 2022a). The Metlakatla Ferry Service vessels leave Prince Rupert from the Metlakatla Ferry dock located in Cow Bay and travel to the community of Metlakatla (Metlakatla First Nation 2022a). It operates a fleet of three ferries and offers transportation charters for businesses and residents on the north coast (Metlakatla First Nation 2022a). In 2020, the Metlakatla Ferry Service temporarily suspended its operations due to the COVID-19 pandemic (Metlakatla First Nation 2022a). It re-started its operations, but as of June 2022, the community remains closed to non-members and non-essential staff (Metlakatla First Nation 2022a). The Metlakatla Ferry Service operates 22 roundtrip services from Monday to Friday; one of these services is strictly for School District 52 (Metlakatla First Nation 2022a). The Friday afternoon services to Metlakatla run in conjunction with the North Co-Corp schedule (Metlakatla First Nation 2022a).

Water Taxis

North Co-Corp

The North Co-Corp is a ferry owned by the following three communities: Hartley Bay, Kitkatla, and Metlakatla. The ferry services Hartley Bay, Kitkatla, Metlakatla, and Oona River (Metlakatla Development 2016). The ferries run between one and three round-trips per day (on Sundays, Mondays, Thursdays, and Fridays), year-round (Metlakatla Development 2016).

Orca Spirit Marine Services

Orca Spirit Marine Services began operations along the coast of BC in 1996 (Orca Spirit Marine Services 2022). Orca Spirit Marine Services offers services that facilitate the movement of people and goods and services both the public and private sector organizations (Orca Spirit Marine Services 2022). It provides transportation services 24 hours a day, seven days a week, year-round, along the entire BC coast and has a location in Prince Rupert (Orca Spirit Marine Services 2022).

West Coast Launch

West Coast Launch was founded in 1988 in Prince Rupert. West Coast Launch and Prince Rupert Adventure Tours work together to offer the north coast a wide range of professional marine transportation services (West Coast Launch 2022). Its fleet consists of eight high-quality vessels situated in both Prince Rupert and Kitimat (West Coast Launch 2022). West Coast Launch has formed partnerships with Indigenous Nations, including a limited partnership with Gingolx Enterprises Ltd., the economic development arm of the Nisga'a Village of Gingolx, and a joint venture partnership with the Gitxaała Nation (West Coast Launch 2022). These partnerships were developed to better service the Nisga'a area and the Prince Rupert, Kitkatla, Kitimat, and surrounding areas while also providing employment opportunities for the Nisga'a First Nation and the Gitxaała Nation (West Coast Launch 2022).

Commercial Fishing Vessels

Fishing activity is widely disbursed throughout the region. There is fishing activity along the identified shipping route. Fishing activity increases significantly throughout the summer (Westmar Advisors 2022a). AIS data was used to quantify the total number of commercial fishing vessels within the RAA as DFO data may inflate the number of vessels present because many vessels may fish throughout multiple PFMAs or use one vessel for various fisheries (e.g., invertebrates). According to AIS data, from the period of 2016-2020, there is an average of approximately 9,951 commercial fishing vessel movements through the RAA per year (MarineCadastre 2021; Figure 7.11–12).

Recreational Vessel Traffic

Marine recreational vessel traffic is common within the RAA as activities such as recreational boating, sea kayaking, coastal camping, diving, and wildlife viewing attract both local residents and tourists from other parts of the province, country, and the world. These activities tend to be seasonal, occurring mostly in the summer months (i.e., July to September) when weather is warmer (BC EAO 2006; Westmar Advisors 2022a). Findings from the NSA indicate that activity from sailing and pleasure craft is present during the summer and absent during the winter (Westmar Advisors 2022a). Coastal campsites that exist within the RAA are mostly only accessible by small vessels (Figure 7.11–13). For example, there are coastal campsite locations near Hunts Inlet, southwest of Alice Arm and Kitsault, near the Gingietl Creek Ecological Reserve, and on Haida Gwaii, near the Tow Hill Ecological Reserve. Findings from the NSA indicate that sailing and pleasure craft activity occurs primarily north-south through Chatham Sound (Westmar Advisors 2022a). It also found that there is some local activity, near the

northern coast of Haida Gwaii; however, these movements are remote from the Project's marine shipping route (Westmar Advisors 2022a).

According to AIS data, from the period of 2016-2020, there is an average of approximately 6,325 recreational vessel (i.e., pleasure craft) movements through the RAA per year (MarineCadastre 2021; Figure 7.11–14).

Recreational boaters travel through the RAA for many reasons like leisure, tourism, and recreational fishing. Popular recreational boating routes include routes through Chatham Sound, Portland Canal (alongside the US-Canadian border), Prince Rupert, and around Triple Island (Figure 7.11–13). Sea kayaking activities occur in Chatham Sound, around Prince Rupert, and towards Porcher Island (Figure 7.11–13). These activities primarily occur along the coast or in sheltered areas, as opposed to exposed, open waters.

The Nisga'a Village of Gingolx offers a public boat launch that leads to opportunities for kayaking, boating, and sport fishing. The surrounding bays and inlets provide spectacular kayaking and canoeing. Visitors can paddle out to visit the remains of old canneries (Gingolx n.d.).

Military and Government Vessels

As discussed in Section 7.11.5.2.2.1, the CCG provides critical services to Canadians, 24-hours a day, seven days a week, and 365 days per year. CCG vessels are always present along the coast of BC. Its fleet is comprised of several types of vessels as well as helicopters to deliver on-water services (CCG 2021a). Its fleet includes training vessels, specialty vessels, chartered vessels, air cushions vehicles, special navaids vessels, mid-shore patrol vessels, channel surveys and sounding vessels, icebreakers, multi-purpose vessels, science and research vessels, and search and rescue lifeboats (CCG 2021a). The Department of National Defence, which supports the Canadian Armed Forces, defends Canadians' interests at home and abroad (Department of National Defence 2021). The Canadian Armed Forces serve on the sea, on land, and in the air with the Navy, Army, Air Force, and Special Forces (Department of National Defence 2021). Findings from the NSA indicate that military and government vessel activity is concentrated between Prince Rupert and the Triple Island Pilot Boarding Station, due to pilot vessels and the CCG and Search and Rescue (**SAR**) vessel activity (Westmar Advisors 2022a).

The NSA found that military and government vessels and fishing vessels travelling west-west from Lax Kw'alaams to the Dundas Islands would intersect the Project marine shipping route. However, an analysis of the plots of yearly traffic found that there were only approximately 20 trips in all of 2019, meaning flow volume on this route is too low to likely cause issues with intersecting vessel traffic (Westmar Advisors 2022a).

According to AIS data, from the period of 2016-2020, there is an average of approximately 2,089 military and government vessel movements through the RAA per year (MarineCadastre 2021).

7.11.5.2.5 Automatic Identification System Data Summary

Based on AIS, there was an average of 51,556 vessel movements per year and approximately 141 vessel movements daily on average in the RAA from 2016 to 2020 (Table 7.11–5). Figure 7.11–16 and

Figure 7.11–17 present summaries of vessel movements (by type) through the RAA and demonstrate seasonality of vessel movements. There are an increased number of movements through the summer months (i.e., between June and September). Figure 7.11–17 presents a summary of vessel movements (by type) through the RAA and demonstrates the mean time of day vessels travel. There are typically an increased number of movements in the afternoon and evening (i.e., after 16:00 hours).

The Regulation 19 of the IMO's SOLAS Chapter V Convention – *Carriage Requirements for Shipborne Navigation Systems,* sets the minimum carriage requirements for shipborne navigational systems and equipment (CCG 2021b). In Canada, as outlined in the Navigation Safety Regulations, the obligation to carry Class A AIS systems is extended to self-propelled vessels of 300 gross tonnage or more engaged on an international voyage; all vessels of 500 gross tonnage or more that is not engaged on an international voyage, excluding fishing vessels; and all passenger vessels despite the vessels' size (CCG 2021b; Westmar Advisors 2022a). Vessels that are not internationally or nationally mandated to be fitted with AIS (e.g., pleasure craft, fishing vessels, and warships) may choose to be fitted with Class B AIS systems as an additional safety measure. However, since there is no legal requirement, those vessels may not be captured in the AIS data (CCG 2021b). Vessels that are not required to carry AIS, such as fishing and recreational vessels, also sometimes do not appear on radar, which has been identified by the PRPA as an issue for large commercial vessels navigating in the area (Dillon Consulting 2020). The PRPA has tried in the past to provide the PRPA's Port Information Guide to all commercial fishing license holders as an attempt to educate commercial fishing license holders on the locations of shipping lanes in the area and traffic flows (Dillon Consulting 2020). It also distributed several AIS units to local fishers to better understand fishing activities in the area and to inform commercial vessels of fishing activities in the area (Dillon Consulting 2020).

Table 7.11–7 – Average Number of Vessel Movements by Vessel Type, yearly, RAA, 2016 to 2020

Vessel Type	Average Number of Vessel Movement per Year	Average Daily Number of Vessel Movements
Passenger Vessels	7,120	20
Tugs and Barges	8,770	24
Deep Sea Bulk Carriers	9,021	25
Deep Sea Cargo/Tanker Vessels	71	0
Military and Government Vessels	2,089	6
Commercial Fishing Vessels	9,951	27
Recreational Vessels (Pleasure Craft)	6,325	17
Other	8,210	22
Total	**51,556**	**141**

NOTE:
Other = vessels that did not have a vessel type code

SOURCE: MarineCadastre 2021

7.11.5.2.5.1 Automatic Identification System Data Summary – along the Marine Shipping Route

The existing regional marine vessel traffic data was further refined to focus on vessels crossing "fences" at various locations relevant to the marine shipping route (Westmar Advisors 2022a). These fence locations include the following:

- Dixon Entrance – West
- Triple Islands – West
- Triple Islands – North
- Triple Islands – South
- Brown Passage
- Chatham Sound – North
- Portland Inlet
- Portland Canal

Marine vessel traffic passing through these fences was enveloped to use data from busiest year (either 2019 or 2021) and scaled up for non-AIS, using the ratio described in the NSA reports (see Appendix E.1 for further details). The data is presented as yearly average movements in Table 7.11–8 and as weekly average movements in Table 7.11–9.

Table 7.11–8 – Average Number of Vessel Movements by Vessel Type, yearly, along the Marine Shipping Route, 2019 and 2021

Vessel Type	Dixon Entrance – West	Triple Islands – West	Triple Islands – North	Triple Islands – South	Brown Passage	Chatham Sound – North	Portland Inlet	Portland Canal
Passenger Vessels	5	65	374	339	60	218	0	0
Tugs and Barges	4	137	315	325	146	516	56	50
Deep Sea Cargo Ships	424	655	28	456	958	81	31	29
Deep Sea Tanker Vessels	72	106	1	12	117	0	0	0
Military and Government Vessels	7	8	10	17	139	36	4	3
Commercial Fishing Vessels	205	1,065	480	330	1,175	2,580	15	5
Recreational Vessels	21	42	140	84	56	3,794	7	0

Table 7.11–8 – Average Number of Vessel Movements by Vessel Type, yearly, along the Marine Shipping Route, 2019 and 2021

Vessel Type	Dixon Entrance – West	Triple Islands – West	Triple Islands – North	Triple Islands – South	Brown Passage	Chatham Sound – North	Portland Inlet	Portland Canal
(Pleasure Craft)								
Other	5	10	7	14	14	42	5	5
Total	**743**	**2,088**	**1,355**	**1,577**	**2,665**	**7,267**	**118**	**92**

NOTE:
Other includes dredgers, dive vessels, heavy-lift, buoy-laying vessels, cable-laying vessels

SOURCE: Westmar Advisors 2022a

Table 7.11–9 – Average Number of Vessel Movements by Vessel Type, weekly, along the Marine Shipping Route, 2019 and 2021

Vessel Type	Dixon Entrance – West	Triple Islands – West	Triple Islands – North	Triple Islands – South	Brown Passage	Chatham Sound – North	Portland Inlet	Portland Canal
Passenger Vessels	0.1	1.3	7.2	6.5	1.2	4.2	0.0	0.0
Tugs and Barges	0.1	2.6	6.1	6.3	2.8	9.9	1.1	1.0
Deep Sea Cargo Ships	8.2	12.6	0.5	8.8	18.4	1.6	0.6	0.6
Deep Sea Tanker Vessels	1.4	2.0	0.0	0.2	2.3	0.0	0.0	0.0
Military and Government Vessels	0.1	0.2	0.2	0.3	2.7	0.7	0.1	0.1
Commercial Fishing Vessels	3.9	20.5	9.2	6.3	22.6	49.6	0.3	0.1
Recreational Vessels (Pleasure Craft)	0.4	0.8	2.7	1.6	1.1	73.0	0.1	0.0
Other	0.1	0.2	0.1	0.3	0.3	0.8	0.1	0.1
Total	**14.3**	**40.2**	**26.0**	**30.3**	**51.4**	**139.8**	**2.3**	**1.9**

NOTE:
Other includes dredgers, dive vessels, heavy-lift, buoy-laying vessels, cable-laying vessels

SOURCE: Westmar Advisors 2022a

7.11.5.2.5.2 Non-Automatic Identification System Data

Transport Canada's National Aerial Surveillance Program survey provided information regarding non-AIS vessel traffic on BC's north coast. This survey was conducted from May 2019 to April 2020. It consisted of 25 surveillance flights in the Prince Rupert area, using an aircraft equipped to photograph vessels and determine whether vessels were using AIS data. Non-AIS marine vessel traffic, such as commercial fishing vessels and recreational vessels, has been scaled up 5-7X as it was found that the overall non-AIS-to-AIS ratio was 5:1 for commercial fishing vessels and 7:1 for recreational vessels.

7.11.5.2.6 Incidental Observations/Data Summary

Incidental observations and data on marine vessel activity in the Portland Canal and Portland Inlet were collected during marine fish and marine mammal research conducted for the Project's EA (see Section 7.09 Marine Resources). There was one observation in the month of February, five in March, seventeen in June, eighteen in July, and six in November. Observations primarily consisted of commercial fishing vessels, recreational fishing vessels, and recreational vessels (38 out of 51 observations). The commercial and recreational fishing vessels consisted of gillnetters, prawn trappers, and sport fishers. There were six float planes and two helicopters (including one medevac) observed, all of which were in the air. Four commercial vessels were observed, including one deep-sea vessel (i.e., one freighter), two tugs (i.e., Schmitt Tugboats), and one water taxi. There was also one DFO vessel observed.

7.11.5.2.7 Protected Areas

The BC parks and protected areas system has over 1,000 protected areas, covering over 14 million hectares or 14.4% of the province (BC Parks 2021; see Section 7.11.5.2.9). The BC parks and protected areas system includes ecological reserves, provincial parks, conservancies, recreation, and protected areas established under the *Environment and Land Use Act* (BC Parks 2021).

7.11.5.2.7.1 Conservancies

There are 158 conservancies in the province, seven of which are located within the RAA: the Ksi Xãanmaas Conservancy, Winter Inlet Conservancy, Wales Harbour Conservancy, Manzanita Cove Conservancy, Kts'mkta'ani/Union Lake Conservancy, Zumtela Bay Conservancy, and Lucy Islands Conservancy (BC Parks 2021). Conservancies are Crown lands set aside for the protection and maintenance of their biological diversity and natural environments, the preservation and maintenance of social, ceremonial, and cultural uses of Indigenous Nations, the protection and maintenance of their recreational values, and the development and use of natural resources in a manner consistent with the previously stated purposes (BC Parks 2021). Some conservancies are accessed by travelling through the marine environment or have views of the marine environment and are therefore included in a discussion of marine use.

7.11.5.2.7.2 Marine Protected Areas

In Canada, a Marine Protected Area (**MPA**) is part of the marine environment that is legally protected and managed to conserve and protect marine species and populations and the diversity of ecosystems that marine organisms depend on (DFO 2021a). There are no MPAs in the LAA, RAA, or OWAA. The nearest

MPA is the Hecate Strait/Queen Charlotte Sound Glass Sponge Reefs MPA, located north and south of the entrance to Douglas Channel.

7.11.5.2.8 Fisheries

Marine commercial fishing occurs in six of the ten Canadian provinces and three territories (DFO 2008). Nova Scotia, Newfoundland and Labrador, and BC are the three provinces where fishing has the greatest value, followed by New Brunswick, Prince Edward Island, and Quebec (DFO 2008). Indigenous, commercial, and recreational fisheries in PFMAs 3, 4, 101, and 104 are important to the BC economy and to its residents and Indigenous peoples (see Appendix 7.11A for further information on fisheries landings).

7.11.5.2.8.1 Indigenous Fisheries and Boating Routes

The northwest coast region is widely known for its abundant marine resources. These marine resources are central to the lives of coastal Indigenous peoples (Lepofsky and Caldwell 2013). Indigenous Nations' inherent Aboriginal fishing rights and Treaty rights are protected under the Canadian Constitution. Continued access to healthy populations of fish, shellfish, marine plants, and other forms of nutrition are critical to the well-being of Indigenous Nations. Aboriginal rights to harvest fish, shellfish, and aquatic plants are recognized and affirmed in accordance with section 35(1) of the *Constitution Act, 1982.* Indigenous Nations harvesting these marine resources for Food, Social, Ceremonial (**FSC**) purposes are subject to measures necessary for conservation and public safety.

Indigenous Nations' fisheries have both cultural and economic importance (NCSFNSS and GoBC 2015). They enhance community food security and support cultural practices and social structures (NCSFNSS and GoBC 2015). Indigenous Nations that intersect or are in proximity to components to the Project have cultural ties to the commercial fishery on the north coast and continue to value participation in all aspects of commercial fisheries (NCSFNSS and GoBC 2015). The relation of Indigenous Nations to their marine environment is a strong and critical component of the north coast Indigenous heritage (NCSFNSS and GoBC 2015). For example, north coast Indigenous Nations' societal structures and economic systems is closely tied to marine resource abundance (NCSFNSS and GoBC 2015). Indigenous Nations conduct Indigenous, commercial, and recreational fisheries throughout the LAA, RAA, and OWAA. In addition to standard commercial fishing gear types, Indigenous fishers use other harvesting techniques such as shoreline harvesting (i.e., harvesting species from the shore at low tide).

The marine harvesting areas for the following Indigenous Groups are intersected or are in proximity to components of the Project:

- Nisga'a Nation
- Lax Kw'alaams Band
- Metlakatla First Nation
- Kitsumkalum First Nation
- Kitselas First Nation
- Gitxaała Nation

- Gitga'at First Nation
- Haida Nation
- Métis Nation of BC

Two DFO Programs, the Allocation Transfer Program and Pacific Integrated Commercial Fishery Initiative, use relinquished commercial license eligibilities from fish harvesters on a voluntary basis to re-issue access to eligible First Nation organizations as communal commercial licenses. For example, because of these programs, there are currently 34 communal commercial crab by trap license eligibilities that provide economic opportunities to First Nations through participation in the commercial fishery (DFO 2022a).

There are a large variety of other marine fish, invertebrates, plants, and mammals that are important to the lives of northwest coastal Indigenous peoples and to their diets (Lepofsky and Caldwell 2013). Key species harvested are listed in Table 7.11–10.

Table 7.11–10 – Species of Consumptive or Non-Consumptive Importance to Indigenous Nations

Finfish	Invertebrates	Marine Plants	Marine Mammals
Bullhead	Abalone	Kelp (bull, giant)	Dall's porpoise
Cod (Pacific, rock, black)	Barnacles (Gooseneck)	Seaweed (dulse seaweed, early seaweed and laver seaweed)	Killer whales
Eulachon	Chitons (black, gumboot)	Eelgrass	Harbour porpoise
Flounder (arrowtooth and starry flounder)	Clams (butter, littleneck, Manila, horse, razor)	Wild sea asparagus	Harbour seal
Halibut	Cockles (Nuttall's cockles)	-	Humpback whale
Pacific Herring (and roe)	Crab	-	Steller sea lions
Lingcod	Geoduck	-	Gray whale
Rockfish (black, Bocaccio, Cabezon, red, rough-eye, canary, yelloweye, China, copper, dusky, redbanded, silvergray, Tiger, vermillion, quillback, yellowtail, widow)	Mussels (blue and California mussels)	-	Sperm whale
Salmon (chinook, chum, coho, pink, sockeye, steelhead)	Octopus	-	Minke whale
Steelhead	Prawn (spot prawn)	-	
Trout (cutthroat,)	Scallops (purple-hinged rock, rock, weathervane)	-	Fur seal
Shellfish	Sea anemone	-	Pacific white-sided dolphin
Dolly Varden	Sea cucumbers	-	

Table 7.11–10 – Species of Consumptive or Non-Consumptive Importance to Indigenous Nations

Finfish	Invertebrates	Marine Plants	Marine Mammals
Sculpin	Sea prunes	-	Blue whale
Sablefish	Sea urchins (green sea, purple, red sea)	-	-
Pacific Spiny Dogfish	Squid	-	-
Skate (longnose, big skate)	Oysters (Japanese and rock Oysters)		
Spotted ratfish	Sea star		
Groundfish	Limpets		
Red Snapper	Snails (purple, red turban)		
Shark (basking, blue, six-grill shark)	Crab (red king, red snapped, golden king, red rock, tanner, box, spider)		
Sole (butter, lemon, rock)	Shrimps		
Mackerel	Turtles (sea turtles, leatherback)		
Needlefish			
Pacific Ocean perch			
Pacific saury			
Pacific Tomcod			
Pilchard			
Smelt			
Sunfish			
Shortspine thornyhead			
Varden Char			

NOTE:
Species of consumptive and/or non-consumptive to Indigenous Nations includes, but is not limited to, the species listed above.

SOURCE: Cedar 2021a; Cedar 2021b, Cedar 2021c; Cedar 2021d; Cedar 2021e; Gitga'at Nation 2011; Gitxaała Nation 2022; Kitselas First Nation 2019; Kitselas First Nation 2022; Kitsumkalum First Nation 2015; Metlakatla First Nation 2014; NCSFNSS and GoBC 2015; NFWD 2020

The marine waters of the region serve as marine navigation routes for Indigenous Nations, connecting Stewart, Hyder, Kitsault, Gingolx, and the Nisga'a Villages to communities and ports to the south. For centuries, the Nass River was the primary means of connecting Gingolx to the Nisga'a Villages upriver.

Nisga'a Nation

The K'alii Aksim Lisims (the Nass River) is one of the healthiest river systems in the world and the location of spawning grounds for the five species of Pacific salmon, steelhead, and eulachon as well as other resident species of fish (NFWD 2020). The Nass is located near the border of Alaska and is one of BC's greatest Pacific salmon rivers, comparable only to the Fraser and Skeena rivers in the size of the watershed and the abundance, diversity, and health of the fishery. The river flows from the coast mountains to Portland Inlet, before flowing into the north Pacific Ocean via Dixon Entrance, north of Prince Rupert.

The NLG and the Canadian government co-manage the Nass salmon fishery to preserve the resource, provide for Nisga'a citizens, and support a modern, sustainable fishery (NFWD 2020). Significant economic, cultural, and social value near the Site and marine waters of the region are derived from the harvest of marine resources. Marine mammals present in the area include harbour seals, harbour porpoises, Steller sea lions, Dall's porpoises, humpback whales, and killer whales (NCSFNSS and GoBC 2015).

Under the Nisga'a Treaty the Nisga'a have rights to harvest fish, which include shellfish and marine mammals, aquatic plants, and migratory birds within the marine waters of the Nass Area (NCSFNSS and GoBC 2015). The Nisga'a Treaty also establishes bivalve harvesting areas in several locations, including Observatory Inlet, within which Nisga'a citizens have the right to harvest bivalves (i.e., littleneck clams, butter clams, horse clams, cockles, mussels, and manila clams) for domestic purposes (NCSFNSS and GoBC 2015). Commercial harvesting of intertidal bivalves is not permitted in these areas.

Within the Nass Area, harvest by Nisga'a citizens occurs in the general commercial fisheries, Nisga'a commercial fisheries for salmon (as per the Harvest Agreement), and Nisga'a domestic fisheries for FSC purposes. Domestic fisheries serve an important economic role in that harvests for domestic purposes offset the cost of food that would otherwise have to be purchased. Commercial fishing in the Portland Inlet and at the mouth of the Nass River is primarily focused on salmon. The Nisga'a commercial salmon fleet typically fish in Portland Inlet in an area loosely bound by Trefusis Point (10-mile point) in the SE to Scow Bay in the NE to Ramsden Point in the NW to Crag Point in the SW and throughout Nass and Iceberg Bay.

According to the NFWD reports, fishwheel, gillnets, and seines are used as the primary fishing methods to catch sockeye, chinook, coho, pink, chum salmon, and steelhead by the Nisga'a communities, with the occasional use of angling for chinook, coho, and pink salmon. The salmon fishing activity occurs within the marine waters of the Nass Area and in the Nass River and its confluents (NFWD 2019). Salmon fishing is generally done using gillnets. Gill nets are normally set outside of the channel in the Portland Canal, near Wales Island and between Lax Kw'alaams and Prince Rupert (Stewart 2022a, pers. comm.).

The Nisga'a eulachon fishing technique consists of fishing nets and occurs on the traditional harvest area between Red Bluff and Fishery Bay (Nass River; NFWD 2020). This fishery is one of the most important for Nisga'a communities. The arrival of this species signals the end of winter and the beginning of the harvest season. The products of the harvest include fresh, dried, smoked, salted, and frozen whole fish. The

greatest product from the eulachon harvest is the oil extracted from this fish which has a cultural, economic, nutritional, and social value (COSEWIC 2013). The Nisga'a eulachon fishery occurs in the spring (i.e., March) and fishers primarily fish for eulachon in Fishery Bay (Stewart 2022a, pers. comm.). Generally, other fishers such as shrimp trawlers are discouraged from fishing during the eulachon fishing season as their vessels break up schools of fish (Stewart 2022a, pers. comm.). Eulachon, or oolichan, is strictly a local, subsistence fishery and it indicates the beginning of the year (i.e., Hoobiyee) for Nisga'a people (Stewart 2022a, pers. comm.).

The Nisga'a marine harvesting activities primarily occurs out of Gingolx with the most reported harvested species being Dungeness crab, Pacific halibut, salmon, sablefish, red rockfish, Pacific cod, lingcod, Nuttall's cockle, and clams (NFWD 2020). Other catches in smaller quantities (sometimes as by-catch) include Pacific spiny dogfish, longnose skate, big skate, spotted ratfish, tiger rockfish, rough eye rockfish, octopus, and seaweed (NFWD 2020). Subsistence fisheries tend to take place from PFMA 3-12 and northwards (Stewart 2022a, pers. comm.). Across from Whiskey Bay, in Dog Fish Bay, fishing locations for chum and pink salmon, halibut, and blue mussels were identified (Stewart 2022a, pers. comm.). Dungeness crab is caught using traps and occurs primarily at Iceberg Bay and Observatory Inlet (Nass estuary). Other crab species were reported to be part of commercial fisheries in the area such as red king crab, golden king crab, red rock crab, and tanner crab. Crab fishing was also identified to take place near Gingolx and the Site (Stewart 2022a, pers. comm.). The gold king crab was exploited in the area prior to 1986 (NFWD 2019; NFWD 2020). The Nisga'a community's prawn/shrimp harvest consists of spot prawns and occurs at Iceberg Bay (Echo Cove), Portland Inlet, Wales Passage, Winter Inlet, and Pearse Canal employing traps at shallow and deeper depths (NFWD 2020). The bivalve harvest (for domestic purposes only) occurs at Winter Inlet, Nasoga Gulf, Perry Bay, and Aiskew Point (upper Observatory Inlet), and includes Nuttall's cockle and other species of clams and mussels (NFWD 2020). Pacific halibut, sablefish, red snapper, Pacific cod, and lingcod are harvested through hook and line and longlining and occur in the Portland Canal (NFWD 2020). Buoys mark both ends of the nets and the rest of the gear is submerged under water (Stewart 2022a, pers. comm.). Nisga'a Nation expressed concerns about potential halibut and salmon fishing along the eastern shore of Pearse Island (Nisga'a Nation 2022).

Fishing activity has decreased over the last 20 years (Stewart 2022a, pers. comm.). There used to be about 1,500 fishing vessels in the area, but younger people are not interested in the fishing industry and are moving away from the fisheries sector (Stewart 2022a, pers. comm.).

Lax Kw'alaams Band

The most populated Lax Kw'alaams village is Lax Kw'alaams IR 1, located at Port Simpson on the Tsimshian Peninsula, approximately 30 km northwest of Prince Rupert, at the mouth of the Portland Canal (Lax Kw'alaams Band 2023; Section 12.0). For millennia, members of Lax Kw'alaams Band have relied heavily on the marine environment and its marine resources for cultural prosperity, economic, and subsistence purposes and the Nation's deep cultural and historic connection with the ocean and its resources continues today (Cedar 2021a; Lax Kw'alaams Band 2023). Lax Kw'alaams community members operate a salmon fishing fleet of approximately 70 boats. Lax Kw'alaams Band own the Coast Tsimshian

Fisheries Ltd. and its processing facility, Coast Tsimshian Seafoods (CT Seafood n.d.). The facility employs over 250 members per year. The community-owned company is one of the largest employers in Lax Kw'alaams and plays a key role in supporting the fishing industry of the northern waters in BC (CT Seafood n.d.).

Lax Kw'alaams Band's marine harvesting activities encompass fishing, crabbing, prawning, and hunting activities (Lax Kw'alaams Band 2023). The salmon fishing season (coho, pink, and sockeye) occurs from June to October and is the primary marine resource for Lax Kw'alaams (Cedar 2021a). Other fish that are typically caught by Lax Kw'alaams peoples include groundfish such as lingcod, Pacific halibut, Pacific herring, red snapper, rock cod, and yelloweye rockfish (Cedar 2021a). The groundfish fishing seasons occurs from spring to fall (Cedar 2021a). Seaweed, and herring roe harvested along with seaweed, are used for dietary and medicinal purposes, as well as ceremonial and spiritual purposes (Cedar 2021a). Lax Kw'alaams Band's foreshore harvesting activities encompass the gathering of resources such as crustaceans, molluscs, and seaweeds (Lax Kw'alaams Band 2023). Seaweed and herring roe are typically harvested through the spring and summer (Cedar 2021a). Shellfish harvesting is also common currently; Lax Kw'alaams peoples harvest butter clam, chiton, cockle, crab, geoduck, northern abalone, octopus, rock scallop, and sea cucumber (Cedar 2021a; Lax Kw'alaams Band 2023). Hunting activities within Lax Kw'alaams territorial waters include the harvest of waterfowl, such as ducks, geese, and swans, and marine mammals such as seals and sealions (Lax Kw'alaams Band 2023). Marine mammals are typically harvested by Lax Kw'alaams members during the winter, generally from November through to February (Cedar 2021a). Lax Kw'alaams Band reported that their members "practice foreshore harvesting seasonally and throughout the year, depending on species, to support family-wide food security and contribute towards winter food stores. Some foreshore resources, such as seaweed, are required in large amounts, to ensure there is enough to share with family and extended relations for the year, and to ensure use for long-standing historical trading relationships with neighbouring communities" (Lax Kw'alaams Band 2023:27). Lax Kw'alaams Band Indigenous Knowledge and Traditional Land Use Study participants identified locations of importance for marine harvesting, which include fishing sites, water routes traveled to harvest, and identified habitats, such as spawning areas and migration routes; additional information regarding Lax Kw'alaams Band's marine harvesting, consumption, and associated cultural and commercial activities are described in Section 12.0.

Metlakatla First Nation

Few members of Metlakatla First Nation (approximately 94) reside in the remote Metlakatla Village located on the Tsimshian Peninsula approximately 5 km north of Prince Rupert (BCAFN 2022; Section 13.0). Most members reside off-reserve as Metlakatla Village is only accessible by airplane or boat. Metlakatla First Nation member's living on reserve therefore have no year-round access to a service center and experience a higher cost of transportation.

Marine harvesting includes fishing for a range of marine species, as well as harvesting of crab and herring roe on kelp (Metlakatla First Nation 2022b). Foreshore harvesting includes harvesting of shellfish, seaweed, and other resources in intertidal areas (Metlakatla First Nation 2022b). Metlakatla First Nation

identified 17 marine harvesting sites (or values) within the Project footprint, and 30 sites along the marine shipping route and materials and supply shipping route (Metlakatla First Nation 2022b). Marine harvesting values include areas used for harvesting chinook, chum, coho, pink and sockeye salmon, catch sites for halibut and steelhead trout, camps used for fishing, general fishing areas of value and harvesting locations for crab and abalone (Metlakatla First Nation 2022b). Metlakatla First Nation identified 1 foreshore harvesting site within the Project footprint, and 14 along the marine shipping route and materials and supply shipping route (Metlakatla First Nation 2022b). Foreshore values include seaweed harvesting locations, areas used for the collection of black chitons, blue mussels, clams, purple sea urchins, and sea cucumber (Metlakatla First Nation 2022b).

Metlakatla First Nation have reported a deep cultural and spiritual connection with salmon, which has evolved over generations due to the reliance on the abundance of salmon as a means of subsistence and livelihood (Metlakatla First Nation 2014). Through the summer and into autumn, from June to October, Coast Tsimshian harvest the five species of Pacific salmon in the Skeena watershed during the salmon run (Cedar 2021a). Halibut and other groundfish and small pelagic species such as lingcod, Pacific cod, Pacific herring, red snapper, and rockfish are caught during the spring months (Metlakatla First Nation 2014). Harvesting Skeena eulachon is important to Metlakatla First Nation for subsistence purposes and to produce eulachon oil (Metlakatla First Nation 2014). Eulachon stocks have decreased along the south and central coasts due to the cumulative impacts of shrimp trawling, loss of habitat due to industrial activities (e.g., dredging and logging), climate change, and shoreline pollution (Metlakatla First Nation 2014). Seaweed and herring roe are typically harvested through the spring and summer (Cedar 2021a). Shellfish harvesting is also common currently; Metlakatla peoples harvest butter clam, chiton, cockle, crab, geoduck, northern abalone, octopus, rock scallop, and sea cucumber (Cedar 2021a). Marine mammals are harvested by Metlakatla peoples but only typically during winter, from November through to February (Cedar 2021a). Crab, one of the most harvested and consumed shellfish species by Metlakatla First Nation members, is in decline in terms of population and quality (Cedar 2021a).

Foreshore harvesting for species such as shellfish and seaweed are also considered vital practices that Metlakatla First Nation “cannot go without” (Metlakatla First Nation 2022b:33). The well-being of the Metlakatla First Nation is therefore tied to the well-being of the natural environment (Metlakatla First Nation 2014). Access to resources for food, social, and ceremonial purposes is vital to the Metlakatla people (Metlakatla First Nation 2014). The importance of these resources was reflected in a Community Needs Assessment, which demonstrated that Metlakatla First Nation members are not getting access to the range or number of traditional foods they previously had access to or would prefer to be eating, leading to concerns for food security (Metlakatla First Nation 2014).

Metlakatla First Nation reported that marine harvesting remains a central pillar for the community as it these activities are fundamental for income generation and health for many Nation members (Metlakatla First Nation 2022b). Metlakatla First Nation has always relied on fisheries for employment. As of 2014, 17.1% of residents were employed by fisheries (Metlakatla First Nation 2014). Many fishers became unemployed or seasonally employed (Metlakatla First Nation 2014). The younger generation of Metlakatla First Nation members are emigrating to urban centres where there are more economic and

educational opportunities (Metlakatla First Nation 2014). Metlakatla First Nation has a shellfish pilot project and remain interested in new and emerging aquaculture opportunities of species such as northern abalone, geoduck, and marine plants (Metlakatla First Nation 2014).

Marine transportation is of concern to Metlakatla First Nation, especially impacts to Metlakatla Pass and the Tree Knob Island group, identified as important core harvesting areas. Increased traffic of marine vessels can create safety issues along marine transportation corridors and increase pollution and turbidity of waters, which negatively impact water and sediment quality and marine organisms (Metlakatla First Nation 2014). Additional information regarding Metlakatla First Nation marine harvesting, consumption, and associated cultural and commercial activities are described in Section 13 of the Application. 13.0.

Kitsumkalum First Nation

Approximately 30% of Kitsumkalum First Nation members reside at Kitsumkalum village, which is located a short distance west of Terrace, situated where Kitsumkalum River flows into the Skeena River (CIRNAC 2023b). Approximately 70% of Kitsumkalum First Nation's registered population live throughout cities in BC, primarily Terrace, Prince Rupert and Port Edward (CIRNAC 2023a; Kitsumkalum First Nation 2023). Kitsumkalum First Nation maintains a deep intimate connection with the waters and marine resources within their *laxyuup* (traditional territory), and continue to harvest and fish for consumption, economic, subsistence, and trade purposes (Kitsumkalum First Nation 2020, 2023). Kitsumkalum First Nation fish and harvest marine resources in patterns that follow seasonal variations for availability and productivity, also known as seasonal rounds (Kitsumkalum Fist Nation 2023). Seasonal awareness involves deep connections with the physical environment, evident in the extensive trails and water routes harvesters moved through (and continue to use) to access cultural harvesting sites, the placenames throughout the Nation's laxyuup, and the use of techniques and knowledge accumulated and evolving since immemorial (Kitsumkalum Fist Nation 2020, 2023).

Kitsumkalum First Nation reported 30 subsistence values along the marine shipping route and materials and supply shipping route including fishing and gathering areas, which represent decades of an individual or group subsistence activity carried out in a resource-rich area (Kitsumkalum First Natin 2023). Subsistence Values intersected by the marine shipping route and materials and supply shipping route include fish/shellfish harvesting areas (butter clams, cockles, crabs, prawns, halibut, cod, salmon, steelhead, rockfish, abalone, and red snapper), and seaweed harvesting areas (Kitsumkalum First Nation 2023). Kitsumkalum First Nation also reported Wildlife/Ecological Values within and along the marine shipping route and materials and supply shipping route; these are areas where important marine life (including whales and seals) has already been adversely impacted by marine traffic and pollution (Kitsumkalum First Natin 2023). Kitsumkalum First Nation also indicated that the marine shipping route and materials and supply shipping route and surrounding area is highly productive for halibut, rockfish, lingcod, snapper, and salmon. Salmon was identified by Kitsumkalum First Nation as a keystone species and reported to be vital to the ecological health of the marine environment along the marine shipping

route and materials and supply shipping route, as the species supports the vitality of other species in the area (Kitsumkalum First Nation 2023).

Kitsumkalum First Nation reported that their commercial fishing activities provide economic security and food security/sovereignty for the community through the distribution of food fish which are caught as bycatch during commercial fishing to community members at no cost (Kitsumkalum First Nation 2022, 2023). Importantly, the Nation related that these fishing practices are also in keeping with Kitsumkalum's rights to commercial fishing, ways of knowing, and understandings of environmental stewardship (Kitsumkalum First Nation 2022, 2023).

Kitsumkalum First Nation identified several important access and travel routes and harvesting sites and sacred places and heritage sites located along the marine shipping route and materials and supply shipping route; intertidal areas containing eelgrass beds are especially important cultural sites to Kitsumkalum First Nation (Kitsumkalum First Nation 2023). Additional information regarding Kitsumkalum First Nation marine harvesting, consumption, and associated cultural and commercial activities are described in Section 14.0.

Kitselas First Nation

Members of Kitselas First Nation reside in the Village of Gitaus and the Village of Kulspai year-round; Gitaus is approximately 20 km from the city of Terrace (Kitselas First Nation 2020). Kitselas First Nation has occupied their traditional territory for approximately 5,000 years and continue to harvest and fish marine resources along the north coast and northwest river systems for consumption, economic, subsistence, trade, and other purposes (Kitselas First Nation 2020). Over generations Kitselas First Nation developed traditional economies and harvesting patterns based on the seasonal availability of resources, which they refer to as seasonal rounds. The Kitselas people have lived and made use of the area of Port Essington and the Ecstall River near the mouth of the Skeena River for generations (Kitselas First Nation 2022).

The seasonal round is founded on generational accumulation of Indigenous knowledge obtained by intimate relationships and direct observation and interaction with the local surrounding environments, including weather, tides, and conditions of water necessary for navigation and fishing. This knowledge is shared among families, or 'house groups' (i.e., wilp), inheriting the traditional harvesting areas to which the knowledge evolved (Kitselas First Nation 2020). Seasonal round patterns change over time in response to several factors, including modern technologies, government legislation, industrial and urban development, settlement and resource harvesting by outsiders, and climate change (Kitselas First Nation 2022). Traditionally, house groups had harvest areas, or house territories, in which they would harvest traditional foods; however, many of these areas are no longer accessible due to the previously stated challenges (Kitselas First Nation 2022).

Species that are commonly harvested during the seasonal round include northern abalone, butter clams, cockles, crabs, flounder, halibut, herring, herring eggs, lingcod, octopus, eulachon, prawns, rockfish, salmon (chinook, chum, coho, pink, sockeye), seaweed, sea cucumbers, sea urchin, harbour seals, and sea lions, as well as marine birds such as black ducks, mallards, and seagull eggs

(Kitselas First Nation 2020). Seals are often hunted in the channels and passages between the islands at the mouth of the Skeena River because they haul out on the sandbars there (Kitselas First Nation 2022). It was noted that Kitselas community members rely on the access and harvest of marine resources year-round, and not just during the peak salmon fishing season in the summer (Kitselas First Nation 2022). For example, seaweed, herring eggs, shellfish, and halibut are harvested in the spring (Kitselas First Nation 2022). The spring is also used to repair nets and restock fishers' fishing supplies (Kitselas First Nation 2022).

Kitselas First Nation members most commonly fish and harvest marine species along the outer coastline and marine shipping route and materials and supply shipping route for commercial and personal consumption (Kitselas First Nation 2020). Motorized transportation (e.g., fishing vessels or other pleasure craft) have allowed Kitselas people to access many parts of the coast for activities including fishing, clam and cockle harvesting, and collecting seagull eggs in hours or days instead of weeks or months as done before accessible, motorized transportation (Kitselas First Nation 2022). Important marine harvesting areas identified by Kitselas First Nation include Anger Island, the north side of Campania Island, the east side of Banks Island, Browning Entrance, Ferrant Island, Gill Island, Goschen Island, Gurd Island, Lelu Island, McCauley Island, Nepean Sound, Otter Channel, the west side of Pitt Island, Porcher Island, the Principe Channel, the west side of Stephens Island, and Triple Island. Areas identified as key harvesting areas that may be affected by Project-related vessel traffic include the waters of Chatham Sound, which includes the outer coastal waters between Dundas Island and the Tsimshian Peninsula, located south-west of the Project location, and transportation routes in and around Pearse Island (Kitselas First Nation 2020). Many of the small islands off the northern end of Porcher Island and south of Stephens Island are key areas for harvesting nearshore species including herring and varied shellfish and crabs as well as collecting seagull eggs from nests on rocks and cliffs (Kitselas First Nation 2022).

In the Kitselas First Nation Traditional Use and Occupancy Study for the Project (2022), numerous sites located along the marine shipping route and materials and supply shipping route and the outer coast of BC were all identified as preferred areas for family and community harvesting and for transfer of cultural knowledge. The small islands off the northern end of Porcher Island and south of Stephens Island are key areas for harvesting nearshore species including herring and varied shellfish and crab as well as collecting seagull eggs form nests on rocks and cliffs (Kitselas First Nation 2022). Chatham Sound was identified as a key area for harvesting salmon, halibut, and various other marine resources (Kitselas First Nation 2022).

Kitselas people use multiple fishing areas and techniques to harvest marine resources. For example, herring eggs are collected on seaweed or branches set in spawning areas at Big Vay and the north end of Porcher Island (Kitselas First Nation 2022). Crab and prawn are harvested by trap setting or pots, usually placed in sheltered bays or channels (Kitselas First Nation 2022). Harvested species are consumed during Kitselas First Nation community gatherings and events such as potlach, weddings, and naming ceremonies. Often, harvested resources are shared with community members who are unable to harvest resources on their own (Kitselas First Nation 2020). Many members of Kitselas First Nation rely on access to traditional foods, not only due to the cultural perspective, but to increase access to nutritious food sources and offset food insecurity. In the Kitselas First Nation Community Well-Being Risk Report for the

Project (2022), 100% of residents indicated that their household members consume traditional food, and that 90% their household's diet consists of traditional food. Due to the alienation of Kitselas community members from traditional harvesting areas, in combination with the rising costs associated with purchasing and operating a fishing vessel, there are only a few people remaining in the community with access to fishing boats (Kitselas First Nation 2022). Those with access to fishing vessels are relied upon by other Kitselas First Nation members, particularly Elders, for food and ceremonial purposes (Kitselas First Nation 2022).

Kitselas community members use travel routes including, but not limited to, the passages behind Smith Island and through Inverness Slough, near Lelu Island, and along the coast, inside of Digby Island, through Metlakatla Pass and then along the coastline; travel routes are influenced significantly by the shift in tides and weather (Kitselas First Nation 2022). Undisrupted access to travel routes to harvesting routes from Prince Rupert to Port Edward have been cited as a high priority for Kitselas people who have concerns about increased marine traffic as well as additional development throughout the Prince Rupert Harbour region (Kitselas First Nation 2022). These concerns are compounded by the fact that many Kitselas community members no longer have the capacity to engage in extensive coastal resource harvesting due to financial and regulatory barriers, which have historically and presently been a challenge (Kitselas First Nation 2022). These restrictions mean that Kitselas community members, especially Elders, rely on fewer people to provide ceremonial and food resources to the community (Kitselas First Nation 2022).

Kitselas people have emphasized the importance of seasonal and weather-dependent anchorages, in areas including Smith Island, Croasdaile Island, Kennedy Island, Chalmers Anchorage, Lawson Harbour, the Kinahan Islands, Hunt Inlet, Refuge Bay, Arthur Island, Welcome Harbour, Pearl Harbour, the northern end of Stephens Island, Dundas Island, Brundige Inlet, Wales Island, Somerville Bay, Whiskey Bay, Manzanita Cove, Kincolith, Devils Island, Boston Islands, Work Channel, and Red Bluff in the Nass River (Kitselas First Nation 2022).

Kitselas people primarily use travel in the marine environment for recreational purposes, participating in cultural activities (e.g., harvesting, hunting, and fishing), and visiting family and friends (Kitselas First Nation 2022). Kitselas' connection to the marine environment is one of its most important determinants of health. Access to traditional environments and participation in cultural activities has many benefits to health and wellness (Kitselas First Nation 2022). Numerous physical, emotional, spiritual, and mental health benefits are associated with practicing traditional marine-based activities. For example, it increases physical activity and consumption of healthier diets, And it improves mental health and one's connection to their culture and identity (Kitselas First Nation 2022). Research conducted by Kitselas First Nation in 2014 indicated that when access to traditional environments was restricted, members of a Northern BC First Nation reported a few adverse health outcomes such as increased family stress, mental health issues, and substance use.

Increased population and expanding industrial activities in the Prince Rupert Harbour region and Chatham Sound, as well as elsewhere within Kitselas traditional territory, has forced Kitselas people to

travel further to harvest marine resources (Kitselas First Nations 2022). The overall increases in regional populations and increased travelling, vehicle traffic on and off-land, marine vessels, and shipping routes within and surrounding Kitselas traditional territory and travel routes has affected the ability of Kitselas First Nation members from accessing and navigating preferred travel routes. Delays along travel routes, often caused by non-Indigenous people and activities they partake in such as recreational fishing, have resulted in decreased resources and resource accessibility (Kitselas First Nation 2020; Kitselas First Nation 2022). Other projects within the area have also negatively affected Kitselas traveling routes along the outer coastal waters; however, routes are still accessed for harvesting whenever opportunities are available (Kitselas First Nation 2020). Additional information regarding Kitselas First Nation marine harvesting, consumption, and associated cultural and commercial activities are described in Section 15.0.

Gitxaała Nation

Some members of Gitxaała live at the village of Lach Klan (Dolphin Island), (Cedar 2021b). Prince Rupert, located approximately 55 km north of Lach Klan, is the nearest city offering full-service groceries and other amenities accessed by Gitxaała Nation members and the majority of Gitxaała people live off reserve, primarily in Prince Rupert and surrounding areas, and elsewhere in BC (Cedar 2021b; Section 16.0). Many of Gitxaała Nation's reserve lands are located at ancient (and continuously used) Gitxaała village sites and fishing camps (Cedar 2021b).

Harvesting resources is important for Gitxaała Nation for the purposes of consumption, trading, sharing economy, well-being, and cultural and ceremonial purposes, comprised of highly complex protocols that are guided by *ayaawx,* and follow seasonal patterns, resource management practices, and stewardship (Cedar 2021b). Gitxaała Nation consider all five species of salmon (chinook, chum, coho, pink, sockeye), steelhead trout, rock fish (black cod, lingcod, and rock cod), Pacific herring and herring roe, Pacific halibut, red snapper, crab (Dungeness and king), shrimp and prawns, as well as northern abalone, clams (manila and butter), cockles, mussels (blue and California), octopus, sea urchin (red and green), scallops and barnacles, sea cucumbers, sea prunes, kelp, and sea grass as culturally critical species for consumption (Cedar 2021b). Gitxaała Nation also continue to harvest the following marine resources within Gitxaała territory: chitons, seagull eggs, shark, and squid (Cedar 2021b).

Access and travel routes including trails, marine navigation routes, and traplines are important to Gitxaała Nation because they are the ways in which Gitxaała Nation members access important places including harvesting and hunting sites, camps and villages, ceremonial, or spiritual areas (Vopak 2021b). Approximately 118 travel routes have been identified in Gitxaała Nation territory, which include routes for travelling in various weather conditions (Vopak 2021b). Gitxaała Nation travel most regularly from the village site at Lach Klan to Prince Rupert, and in and around Ridley Island including along the west of the Ridley Island to Digby Island, from Smith and Ridley islands to Prince Rupert, along the coast of Digby Island through Chatham Sound, from Prince Rupert to Inverness Passage outside of Ridley and Lelu Islands, from Smith Island to Ridley Island, from Porpoise Harbour to Ridley Island (in high tide), also along Lelu Island and Ridley Island (Vopak 2021b).

Travel routes and waterway travel, as well as fishing and harvesting along the travel routes and waterways, is highly dependent on weather conditions (Vopak 2021b). Tides within Gitxaała territory can be strong, and rough travel routes have been identified along the west coast of Ridley Island and south of Lelu Island through to the Porpoise Channel (Vopak 2021b). The areas between Kinahan and south Digby Island are also identified by Gitxaała Nation to have strong tides (Vopak 2021b). When the weather becomes rough, Gitxaała Nation members tend to travel close to the shores along Ridley and Lelu Islands (Vopal 2021b). Particular care must also be taken when traveling through the Inverness Passage and Flora Banks to the Skeena River, as the waters can be low and contain jagged rocks and sand bars (Vopak 2021b).

The ability of Gitxaała Nation to access the marine environment, and quality and quantity of preferred resources, is crucial for the maintenance of Gitxaała cultural identity, well-being, and economy (Cedar 2021b). Trading is particularly important to maintain relationships with other Indigenous Nations and remains an important part of Gitxaała Nation cultural identity at present (Cedar 2021b).

Increasing vessel traffic throughout Gitxaała territorial waters have been known to interfere with Gitxaała harvesting practices due to changes in sensory experiences (noise, smell, wake), as well as changes to the health of the waters and resources and dispersal of contaminants from increasing activities in the area (Cedar 2021b). As a result, Gitxaała Nation members have experienced some alienation of preferred harvesting areas and cultural and sacred places because of the impacts of activities within Gitxaała territory (Cedar 2021b). Additional information regarding Gitxaała Nation marine harvesting, consumption, and associated cultural and commercial activities are described in Section 16.0.

Gitga'at First Nation

Some members of Gitga'at First Nation reside at the remote Village of Txalgiu (Hartley Bay) year round; the village is only accessible via boat or float plane (BCAFN 2021; Section 17.0). The majority of Gitga'at people live off reserve, mainly in Prince Rupert; however, Nation members also live in Terrace, Kitimat, on Vancouver Island, and in Vancouver and beyond (Section 17.0). Gitga'at First Nation members continue to visit and occupy historic villages sites and their other reserve lands in their territory to manage and harvest resources (Coast Funds 2021; BCAFN 2021).

The Gitga'at Oceans and Lands Department (**GOLD**) is responsible for upholding the Nation's values and territory-based practices in all engagements with industrial proponents proposing developments within Gitga'at territory (Gitga'at First Nation 2017). GOLD has indicated that the fundamental nature of harvesting is linked to Gitga'at cultural identity and well-being, and that the Gitga'at First Nation has worked to broaden and deepen their cultural connection and territorial stewardship through improved technology and access, as well as Gitga'at food sovereignty and food security (Cedar 2021c). The Gitga'at First Nation's well-being is intricately connected to the health of the lands, waters, and resources in their traditional territory and the Nation actively works to sustain the abundance and richness of their territory (BCAFN 2021).

In 2021, 73% of Gitga'at households reported harvesting traditional food and 90% of household members who live in Hartley Bay reported harvesting traditional food (Cedar 2021c). The Gitga'at First Nation

harvest a variety of marine resources including Pacific salmon, Pacific herring and herring roe, halibut, lingcod, steelhead, eulachon, red snapper, cockles, crabs, northern abalone, sea urchins, sea cucumbers, mussels, geoduck, chitons, shrimp, and other shellfish, seabird eggs, sea lion, and harbour seal (Cedar 2021c).

Approximately 90% of food consumed by Gitga'a Nation members living in Hartley Bay is harvested from the land and marine environment (Coast Funds 2021). Marine resources are of vital importance to the Gitga'at First Nation members' cultural identity, health, and well-being and is part of their economic core, which is centered on the lands and waters of their traditional territory (Cedar 2021c). Some marine resources such as seaweed, Pacific halibut, salmon, and cockles are traded among Gitga'at First Nation members and members of neighbouring Indigenous communities (Cedar 2021c).

Gitga'at First Nation identified 570 Aquatic Resources Traditional Use Sites within the marine supply and 76 Land Resources Traditional Use Sites along the marine shipping route and materials and supply shipping route (Gitga'at First Nation 2022). Chatham Sound and the Prince Rupert Harbour are important terrestrial and marine resource harvesting areas for Gitga'at First Nation that are transected by the marine shipping route and materials and supply shipping route (Gitga'at First Nation 2022). Gitga'at First Nation access many land-based resources via waterways, often while they are out harvesting aquatic resources; Gitga'at members will often anchor in sheltered bays or channels and foray onto land to collect berries, plant materials or to hunt (Gitga'at First Nation 2022). Waterways represent a crucial means of access to land-based resources for Gitga'at First Nation, as many land based resource harvesting sites within their territory are "otherwise impossible to access" (Gitga'at First Nation 2022). Additional information regarding Gitga'at First Nation marine harvesting, consumption, and associated cultural and commercial activities are described in Section 17.0.

Haida Nation

Haida Nation has occupied their territory for millennia (CHN 2018; CHN 2021) and, according to Haida Nation, "the seamless sea-to-mountaintop connection is an integral part of Haida heritage and cultural identity" (CHN 2013). The Haida Gwaii archipelago occupies a unique location and encompasses three regional oceanographic domains: the oceanic west coast, the eastern coast, and Dixon Entrance. These three are connected and play a role in the biological diversity of both in marine and terrestrial environments of Haida Gwaii (CHN 2011).

Haida knowledge of the land and ocean has ensured Haida's continued success through the generations by the passing of intergenerational knowledge of fishing grounds and harvesting methods (CHN 2011).

Haida people continue to thrive through harvesting and managing the abundant natural resources in their territory (HaiCo n.d.). Wild salmon, halibut, clams, scallops, and seaweed are some of the culturally important staples that are continually harvested from the land and sea that help sustain Haida people and their economies (HaiCo n.d.). However, there are over 150 culturally important species throughout Haida Gwaii and surrounding waters that continue to be harvested by Haida people today (CHN 2013).

Several species are harvested and have cultural significance throughout Haida Gwaii and Haida territorial waters, including in the vicinity of the open water marine shipping route (CHN 2013).

Fish and related marine species that are harvested or have cultural significance include arrowtooth flounder, basking shark, big skate, black rockfish, blue shark, bocaccio rockfish, butter sole, cabezon rockfish, canary rockfish, China rockfish, chum salmon, coho salmon, copper rockfish, cutthroat trout, spiny dogfish, dusky rockfish, Pacific halibut, Pacific herring, lemon sole, leatherback turtle, lingcod, longnose skate, mackerel, needlefish, octopus, Pacific cod, Pacific ocean perch, Pacific sanddab, Pacific saury, Pacific tomcod, pilchards, pink salmon, quillback rockfish, ratfish, redbanded rockfish, rock sole, sablefish, black cod, sea cucumber, sea star, sea turtles, silvergray rockfish, six-gill shark, smelt, sockeye salmon, spring salmon, starry flounder, steelhead trout, sunfish, tiger rockfish, Varden char, vermillion rockfish, shortspine thornyhead, widow rockfish, yelloweye rockfish, and yellowtail rockfish (CHN 2013).

Shellfish species that are harvested or have cultural significance include: northern abalone, black chiton, blue mussel, box crab, butter clam, California mussel, cockles, Dungeness crab, gooseneck barnacle, green sea urchin, gumboot chiton, horse clam, Japanese oyster, limpets, native littleneck clam, purple olive snails, purple sea urchin, purple-hinged rock scallop, razor clam, red rock crab, red sea urchin, red turban snails, rock oysters, spider crab, spot prawn, shrimp, tanner crab, and weathervane scallop (CHN 2013).

Sea-mammal species that are harvested or have cultural significance include: blue whale, Dall's porpoise, fur seal, gray whales, harbour porpoise, harbour seal, humpback whale, killer whale, minke whales, Pacific white-sided dolphin, sea lion, and sperm whale (CHN 2013).

Plant species that are harvested or have cultural significance include bull kelp, dulse seaweed, early seaweed, eelgrass, giant kelp, laver seaweed, and wild sea asparagus (CHN 2013).

All the species listed above are important to Haida Nation for subsistence, spiritual, cultural, trade, and commercial reasons (CHN 2013). Haida heritage and cultural identity is inseparable from the laws and customs surrounding harvesting; therefore, harvesting "is more than an activity to obtain sustenance" (CHN 2013). When Haida citizens are out harvesting in their territorial lands and waters they share traditional knowledge between all citizens present, ensuring the transmissions of traditional knowledge through generations (CHN 2013).

Haida Nation relies on the uninterrupted use of and access to their sacred and culturally important sites (includes harvesting sites) and landscape features for their citizens' physical and mental health, well-being, cultural identity, and cultural practices (Cedar 2021d). Haida Nation shares cultural knowledge and gains experience through direct interaction with their territory, including sacred and culturally important sites and landscape features. These sites are often visited when Haida Nation are harvesting resources, travelling to visit neighboring communities, and in preparation for community events (feasts, potlatches, and other ceremonies) (Cedar 2021d). Additional information regarding Haida Nation marine harvesting, consumption, and associated cultural and commercial activities are described in Section 18.2.1.

Métis Nation of British Columbia

Marine harvesting is integral to Métis culture as it is intimately linked to Métis citizens' health and wellness (Métis Nation British Columbia 2023). Métis families have specific harvesting areas that have been used by generations in the vicinity of the Project (Métis Nation British Columbia 2023). Métis people actively harvest culturally important fish species such as salmon, Pacific herring, eulachon, rockfish, and regional variants of trout and char species in the vicinity of the Project (Métis Nation British Columbia 2019). Other species harvested by Métis Nation British Columbia that may be within the vicinity of the Project include marine mammals currently listed under the federal *Species at Risk Act* and provincial protections (Cedar 2021e). Métis Nation British Columbia reported that the region has been well-studied for various natural resources, and that a holistic consideration of the cumulative impacts of developments along and off the coast is a priority concern (Métis Nation British Columbia 2019). Additional information regarding Métis Nation British Columbia marine harvesting, consumption, and associated cultural and commercial activities are described in Section 19.0

7.11.5.2.8.2 Commercial Fisheries

Fisheries and Oceans Canada (DFO) manages marine fisheries using spatially defined management areas called FMAs or in the Pacific region, PFMAs. The same PFMAs and sub-areas may be used for several different fisheries. Unique spatial boundaries may apply to certain fisheries such as groundfish fisheries, which use groundfish management areas that are much larger spatial areas or herring fisheries, which use statistical areas. Commercial fishing is regulated and managed by the federal government under the *Canada Shipping Act, 2001, Fisheries Act, Oceans Act,* and *Species at Risk Act* (NCSFNSS and GoBC 2015).

The north coast area includes tidal waters stretching from the Alaskan boundary in the north to Cape Caution in the south and incorporates the non-tidal waters that flow into this area (DFO 2018). The RAA lies within DFO's PFMAs 3 (Portland Inlet), 4 (Chatham Sound and Porcher Island), 101 (the open water north of Haida Gwaii), and 104 (the open water between Rose Point and Chatham Sound). The Project's marine shipping (transit) route and materials and supply shipping route crosses through the following PFMA sub-areas (Figure 7.11–18):

- Sub-area 3-2, 3-3, 3-7, 3-12, and 3-17
- Sub-area 4-1, 4-5, 4-9, and 4-13
- Sub-area 101-3, 101-6, and 101-10
- Sub-area 104-1, 104-2, and 104-4

Where available, PFMA data for each fishery assessed was broken down to the sub-area level.

Four broad categories of commercial fisheries occur in the LAA and RAA, for which a range of techniques, gear types, and vessels are used (Table 7.11–11).

Table 7.11–11 – Commercial Fisheries

Fishery Sector	Target Species	Gear Types/Techniques Used
Salmon	Chinook (*Oncorhynchus tshawytscha*), Chum (*O. keta*), Coho (*O. kisutch*), Pink (*O. gorbuscha*), Sockeye (*O. nerka*)	Seine, Gillnet, Troll
Groundfish	Pacific Halibut (*Hippoglossus stenolepis*), Lingcod (*Ophiodon elongatus*), Pacific Spiny Dogfish (*Squalus suckleyi*), Rockfish (*Sebastes* spp.), Sablefish (*Anoplopoma fimbria*)	Trawl, Hook and Line
Small Pelagic Fish	Pacific Herring (*Clupea pallasii*)	Seine, Gillnet, Other
Invertebrates	Geoduck (*Panopea generosa*), Horse Clam (*Tresus capax*), Red Sea Urchin (*Strongylocentrotus franciscanus*), Sea Cucumber (*Holothuroidea*), Shrimp (*Caridea* spp.), Prawn (*Dendrobranchiata* spp.), Dungeness Crab (*Metacarcinus magister*), Octopus (*Octopus* spp.)	Dive, Trawl, Trap

SOURCE: DFO 2020a; DFO 2020b; DFO 2021b; DFO 2021c; DFO 2021g; DFO 2022a; DFO 2022b; DFO 2022d

Commercial fisheries are defined by target species and by gear type and are managed by annual quotas and by restricting fishing activities (e.g., by specifying openings and closures). DFO also specifies certain parameters for gear types and techniques used such as mesh size or the number of hook sizes that are permitted. Commercial fisheries occur year-round, though DFO manages specific timing windows (openings, closures) for distinct species depending on migration habits and standing stock biomass estimates. These timing windows can vary from year to year, and in some years, there are no openings for certain species for reasons such as conservation, safety, and contamination (i.e., biotoxin and/or sanitary closures).

Openings and Closures

Fisheries and Oceans Canada (DFO) manage commercial fisheries' openings and closures. Commercial fisheries occur year-round, anywhere along the coast. Commercial openings and closures are dependent on factors such as local run timing, distribution, and stock strength and are subject to closures for conservation, safety, and contamination. Table 7.11–12 presents the average commercial fishing harvesting seasons for the various species found in the RAA based on DFO's Fishery Notices. During some years, some fisheries have limited openings (e.g., only open for hours or days). In a focus group with some Nisga'a Elders, it was noted that it is stressful for commercial fishers during these limited openings (Nisga'a Nation 2022).

Table 7.11–12 – Commercial Fishing Harvesting Seasons in British Columbia

Fishery Sector/ Target Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Salmon												
Chinook	■	■	■	■	■				■	■	■	
Chum							■	■	■	■	■	
Coho							■	■		■	■	
Pink							■	■				
Sockeye						■	■	■				
Groundfish												
Groundfish Trawl	■	■	■	■	■	■	■	■	■	■	■	■
Halibut		■	■	■	■	■	■	■	■	■	■	
Lingcod					■	■	■	■	■	■	■	
Rockfish		■	■	■	■	■	■	■	■	■	■	
Small Pelagic												
Herring			■	■	■							
Invertebrate												
Geoduck and Horse Clam	■	■	■	■	■	■	■	■	■	■	■	■
Red Sea Urchin	■	■	■	■	■	■	■	■	■	■	■	■
Sea Cucumber										■	■	
Shrimp	■	■	■			■	■	■	■	■	■	■
Prawn and Shrimp					■	■	■					
Crab	■	■	■	■	■	■	■	■	■	■	■	■

NOTE:
Commercial fishing harvesting seasons may change; seasons are influenced by factors such as fisheries cycles.

SOURCE: DFO 2020a; DFO 2020b; DFO 2021b; DFO 2021c; DFO 2021g; DFO 2022a; DFO 2022d; DFO 2022k

Salmon Fisheries

Pacific Salmon are primarily harvested using three fishing methods: seining, gillnetting, and trolling (DFO 2021e; Figure 7.11–19). All methods are considered active fishing methods as fishers are required by law to be on-Site while fishing gear is deployed.

Fishers using seine gear use large nets to encircle the fish before closing the bottom of the net (pursing) and then scooping the fish out with a smaller dip net (brailing). Seine nets are set from fishing vessels with the assistance of a small skiff (DFO 2021e). Non-target species can be identified and released. Seiners catch sockeye, pink, and chum salmon and account for approximately 50% of the total commercial harvest in the province (DFO 2021e).

Gillnets are attached to small vessels, situated mainly at the mouth of, or in rivers, and are continually tended (DFO 2021e). Gillnets are set typically set perpendicular to shore (BC EAO 2006). Salmon swim towards these nets and become entangled in the nets by their gills. The nets are regulated by length, depth, and mesh size and they are set close to shore and hauled frequently to collect the salmon (DFO 2021e). Fishers can target certain salmon species and sizes by changing the mesh size and the way the nets are suspended (DFO 2021e). Gillnetters harvest all five species of Pacific Salmon, but mainly target sockeye and chum salmon in coastal rivers. Gillnetters account for approximately 25% of the total commercial harvest in the province (DFO 2021e). The number of gillnetters fishing in the area may increase depending on whether there are fishing opportunities available on the Skeena River (BC EAO 2006).

Fishers using troll gear use hooks and lines with different lures to catch various salmon species. The lines are spread out on long poles that extend over the sides of the vessel. Fishers use various methods to locate, identify, and target certain salmon species (DFO 2021e). These methods include changing the type of lure used, the way the poles are arranged, boat speed, water depth, and using on-board electronic systems (DFO 2021e). Fish caught are reeled in one-by-one. Trollers harvest all five species of Pacific Salmon and account for approximately 25% of the total commercial harvest in the province (DFO 2021e).

Commercial salmon fisheries openings can occur anywhere along the coast depending on local run timing (from May to October), distribution, and stock strength (DFO 2019; DFO 2021f). The commercial salmon gillnet and troll fisheries have declined from 2017 to 2021 (see Appendix 7.11A for a summary of salmon landings). To help manage declining salmon stocks, DFO chose to implement commercial salmon fishery closures under the Pacific Salmon Strategy Initiative. These closures began in 2021 commercial fishing season and included Area C (Gillnet) and Area F (Troll) closures.

Groundfish Fisheries

The groundfish fishery is a multispecies fishery and multi-gear type fishery, made up of seven different fishery sectors: trawl, halibut, sablefish, lingcod, dogfish, and rockfish (inside and outside) (DFO 2021c; Figure 7.11–20). In 2007, the commercial groundfish fisheries were the largest component of the fish harvesting sector, responsible for approximately 76% of all BC wild seafood landings and about 39% of their total value (DFO 2021c). The commercial groundfish fisheries provided about 49% of all direct processing employment hours in 2016 in BC (DFO 2021c). The real landed value of the commercial groundfish fisheries in BC was stable between 2009 and 2013, and then increased by approximately 55% between 2014 and 2017 (DFO 2021c). This increase was the result of an increase in the total landed value of the commercial groundfish trawl fishery of all the of the BC groundfish trawl fisheries, totaling 89% over the same time (DFO 2021c). The landed value of the groundfish fisheries declined by approximately 20%, from $194.2 million in 2017 to $155.4 million in 2019, due to a 30% reduction in landed value of the halibut fishery (DFO 2021c; see Appendix 7.11A for a summary of groundfish landings).

Approximately 95% of groundfish species are captured in the trawl fishery (DFO 2021c). There are two types of trawling methods: mid-water trawl and bottom trawl (DFO 2021c). There are over 200 species that are caught in the trawl fishery, with approximately 70 of those species landed. The hook and line gear type (e.g., longline, handline) targets halibut, black cod, spiny dogfish, lingcod, inshore rockfish (primarily yelloweye, quillback, tiger, China), and slope rockfish (primarily rough eye and redbanded), and often use squid as bait (DFO 2021c).

A typical longline is 400 m long (called a skate) and is fished along a specific depth contour (Aurora LNG 2017b). Multiple skates of gear can be connected and fished as one long continuous set (still marked at the surface by a buoy at either end of the line (Aurora LNG 2017b). Groundfish Management Areas are named alphanumerically and are comprised of multiple PFMAs and sub-areas (DFO 2021c). The RAA and OWAA overlaps with PFMAs 3, 4, 101, and 104, which are part of the larger Groundfish Management Area 5D (DFO 2021c).

Indigenous participation in commercial groundfish fisheries may occur through communal commercial licenses, or as organization (e.g., commercial fishing enterprises) or individual ownership of licenses and vessels (DFO 2021c).

Hake remains one of the most important groundfish export species and the high level of wages paid to the processing sector personnels is associated with high volume of landings processed annually for export markets (DFO 2021c). In 2019, hake processing brought the highest total value of wages paid out to round processing sector personnels ($26.4 million) (DFO 2021c).

Small Pelagic Fisheries

The small pelagic fisheries primarily target Pacific herring. The fishing boundaries used to manage Pacific herring are different than the standard PFMAs in that the boundaries are classed into stock assessment regions and sections (Hay and McCarter 2013; Figure 7.11–21). Stock assessment regions define a broad area and are subdivided into multiple sections, referred to as statistical areas (Hay and McCarter 2013). The RAA overlaps the Prince Rupert stock assessment region and statistical areas 031, 032, 033, 041, 042, and 043 and the Haida Gwaii stock assessment region and statistical areas 011 and 012 (Hay and McCarter 2013). The Pacific herring fishery is divided into subfisheries, caught using various gear types, which include roe herring (seine and gillnet), spawn-on-kelp (other gear such as skiffs, net pens, tree boughs, and kelp blades), food and bait (seine), and special use (seine) (Hay and McCarter 2013).

In 2013, the Committee on the Status of Endangered Wildlife in Canada assessed and designated the Nass/Skeen River population of eulachon as Special Concern (Oceana n.d.). There is not currently a commercial eulachon fishery, which closed in 2004 due to depleted stocks (DFO 2022i).

Invertebrate Fisheries

For the invertebrate dive fisheries, divers harvest species by hand and underwater tools. Self-Contained Underwater Breathing Apparatus (**SCUBA**) divers are limited by the depths they can safely access and as such most fisheries occur at a depth of 20 m or less (Figure 7.11–22). Divers harvesting geoduck and horse clams operate hand-held, manual water nozzles (DFO 2022d). Divers harvesting red sea urchins use short aluminum hand rakes to scoop urchins into large mesh bags (DFO 2020a). Invertebrate fisheries in PFMAs 3, 4, 101, and 104 include fisheries for geoduck and horse clams, red sea urchins, and sea cucumbers. Invertebrate dive fisheries do not occur in PFMAs 3 and 4, but rather occur on a rotational basis. For example, from 2016-2020, there were no invertebrate dive fisheries' openings in 2016 and 2019 (see Appendix 7.11A for a summary of invertebrate landings). There were no invertebrate (dive) fisheries that occurred in PFMA 104, no prawn (trap) fisheries, and limited shrimp (trawl) fisheries in PFMA 104 (one in 2016 with one vessel).

The remaining invertebrate fisheries include shrimp, prawn, and Dungeness crab. Prawn and shrimp are harvested using trap and trawl gear (Figure 7.11–23). Multiple traps are usually set on a groundline (called a 'string of traps') with single buoys marking each end at the surface (Aurora LNG 2017b). Trawling is done using nets that are dragged over the sea floor (Aurora LNG 2017b). Dungeness crabs are harvested using trap gear (Aurora LNG 2017b). Dungeness crab traps are checked once per day and are deployed in areas with sandy bottoms at depths ranging from 5 to 100 m (Aurora LNG 2017b). Commercial fishing grounds for Dungeness crab are located nearshore. There is one commercial fishing ground for Dungeness crab located near the Site and another in Nass Bay (Figure 7.11–24; see Appendix 7.11A for a summary of invertebrate landings).

Incidental observations and data were collected during marine fish, marine mammal, remotely operated underwater vehicle, and intertidal surveys, which were conducted along the marine shipping route and materials and supply shipping route. Incidental observations and data included observations of marine fishing activity. In July 2021, there was fishing gear (i.e., prawn traps) observed near the Site. In March 2022 and July, buoys and tires, assumed to be marking fishing gear (i.e., traps), were observed near the Site.

7.11.5.2.8.3 Recreational Fisheries

Recreational fishing is a leisure activity, enjoyed by local and non-local residents, that may also provide sustenance for personal use. These activities are beneficial to the participants and contributed directly and indirectly to the economy through fishery-related expenditures. Recreational fishing continues to be important to the BC economy, but its growth rate is slowing (DFO 2022a). Fisheries and Oceans Canada (DFO) is responsible for regulating sport fishing in tidal waters and regulates the sector under the *Fisheries Act*. Fisheries and Oceans Canada (DFO) is responsible for setting regulations for the type, number, and size of fish that can be caught and retained, the gear that can be used, and the areas that can be fished. Recreational fisheries are managed through specific openings and closures and retention limits.

BC Tidal Waters Sport Fishing Licenses are required for the recreational harvest of all species of fish, including shellfish, and a Salmon Conservation Stamp is required for the recreational harvest of salmon

(juvenile or adult). The most important recreational fishing species in BC are Pacific salmon and halibut, but bottom fish and shellfish are also harvested (GoBC n.d.). The 2019/2020 recreational fishing season saw a 30% decrease in the number of licenses sold to resident anglers, but a 55% increase in licenses sold to non-resident anglers (DFO 2022a). In 2020/2021, there were 238,600 active adult anglers participating in BC's tidal waters recreational fishery (DFO 2020a; DFO 2021g). In 2020/2021, most (90%) of active adult anglers were BC residents and the remainder were Canadian residents from the various other provinces and territories (DFO 2020a; DFO 2021g). Due to the COVID-19 pandemic and its related travel restrictions, there was no participation in the recreational fishery from visitors from outside of Canada, which caused the number of licenses sold to non-resident anglers to decrease by 71% (DFO 2020a; DFO 2021g; DFO 2022a). This resulted in a small uptake (7%) of licenses sold to resident anglers (DFO 2022a).

Several recreational fisheries occur throughout the RAA, including salmon, groundfish, shrimp, prawn, and crab (Figure 7.11–25). Salmon are harvested recreationally in Chatham Sound, south of Dodge Cove, and surrounding Triple Island (Figure 7.11–25). Recreational fishing grounds for groundfish are found throughout the RAA, particularly in Dixon Entrance and Chatham Sound (Figure 7.11–25). Prawn and shrimp are harvested recreationally in Portland Canal, Portland Inlet, and south of Dundas Island, surrounding Dunira Island (Figure 7.11–25). Recreational fishing grounds for crab include the Portland Canal, alongside the US-Canada border, and near the Site as well as in sheltered areas in the RAA (Figure 7.11–25).

The recreational harvest of eulachon is closed coastwide (DFO 2022i). Declines are speculated to be due to dredging, overfishing, coastal development, damming of river system, logging, erosion, and other land use practices that degrade water quality and the broader consequences of climate change (Oceana n.d.). Eulachon are typically only harvested by Indigenous Nations for FSC purposes (DFO 2022i). Eulachon oils are extracted from the fish for "grease" production (Oceana n.d.). Eulachon are harvested as they enter fresh water to spawn (e.g., rivers, estuaries). Typically, eulachon are harvested by drift net (e.g., gillnet), but additional gear types such as dip nets or eulachon rakes may be authorized in traditional fishing areas upon request (DFO 2022i; Oceana n.d.).

Recreational fishing opportunities are a big draw for tourists (Gingolx n.d.). The season for Chinook salmon starts in mid-June and finishes in September as Coho salmon seasons starts. Halibut fishing is year-round, and crabbing takes place from September to February (Gingolx n.d.).

Tidal Waters licenses include access to numerous species, so the number of recreational harvesters taking advantage of the daily bag limits for dive fisheries such as geoduck, red sea urchin, and sea cucumber is unknown (DFO 2021g; DFO 2022d). Fishing effort by recreational harvesters targeting dive fisheries is thought to be minimal due to the general inaccessibility (DFO 2021g; DFO 2022d). Invertebrate/shellfish fisheries may be closed due to sanitary or Paralytic Shellfish Poisoning closures (GoBC n.d.).

Fishing techniques used in the recreational fishery include trolling, and casting with bait, lures, and artificial flies (DFO 2019). Boats are most used, but anglers also fish from piers, shores, or beaches (DFO 2019).

The Internet Recreational Effort and Catch (**iREC**) reporting program is a mandatory program in which all BC tidal water sport fishing license holders must report their fishing effort and catch for specific months (DFO 2022e). The iREC program helps inform fisheries management decisions made by DFO (DFO 2022e; see Appendix 7.11A for a summary of recreational fish landings).

7.11.5.2.8.4 Aquaculture Operations

The federal and provincial governments work together to manage and regulate the aquaculture sector. DFO is responsible for regulating, monitoring, and licensing finfish and shellfish aquaculture operations in BC (NCSFNSS and GoBC 2015). The BC Ministry of Forestry, Lands and Natural Resource Operations is responsible for authorizing the occupation of provincial Crown land associated with aquaculture facilities and for other approvals necessary for the culture of aquatic plants (NCSFNSS and GoBC 2015).

In 2008, the provincial government suspended the issuance of new tenures for finfish aquaculture in tidal waters north of Aristazabal Island, located northwest of Klemtu (NCSFNSS and GoBC 2015). Indigenous Nations on the north coast oppose lifting the moratorium and there is limited support for the expansion of finfish aquaculture on the north coast, and instead place interest on the development of the shellfish and marine plant aquaculture sector (NCSFNSS and GoBC 2015). There are currently no finfish aquaculture operations located in the LAA or RAA.

The NCMP identified Dunira Island as a Special Management Zone, designated for shellfish aquaculture. The area maintains the ecological conditions for sustainable shellfish aquaculture activities in an area with appropriate characteristics (NCSFNSS and GoBC 2015).

There are five licensed shellfish aquaculture facilities and one licensed shellfish hatchery that are situated in PFMA 4, which are maintained by two licence holders. The sites are in Humpback Bay, NE Porcher Island; Digby Island, Chatham Sound; Pike Island; Naden Islets; Stephen's Passage; and Wolfe Island (Figure 7.11–26). The two culture methods used include intertidal culture and deep water suspended culture. The licensed species include Japanese scallop, Pacific scallop, spiny scallop, pink scallop, littleneck clam, Manila clam, butter clam, eastern blue mussel, Gallo mussel, weathervane scallop, Pacific oyster, Nuttall's cockle, giant rock scallop, western blue mussel, and geoduck. The closest facility is approximately 10 km from the marine shipping route (Westmar Advisors 2022a). There are currently no aquaculture facilities located in the Nass Area, or the LAA.

Licensed aquaculture facilities are considered private property. Under the *Fisheries Act*, fishing within an aquaculture facility already under federal license (PAR aquaculture license) is prohibited unless otherwise permitted by the occupant under the license (DFO 2021g). The Department recommends that commercial and recreational harvesters familiarize themselves with the location of aquaculture tenures in fishing areas and that permission be sought from the aquaculturist for access (DFO 2021g). There is significant interest in expanding aquaculture in BC, to include species such as sea cucumber (DFO 2021g). Given the range of issues and potential uncertainty regarding sea cucumber aquaculture, DFO is not currently accepting new applications for sea cucumber in the marine environment (DFO 2021g).

7.11.5.2.9 Marine-Based Tourism and Recreation

Northern BC is one of six tourism regions in BC. In 2017, the region represented 5% of provincial overnight visitation and 4% of related spending (DestinationBC 2018). BC and Albertan residents were the top two domestic markets, with BC residents making up the largest share of overnight visitation (76%) and spending (56%) in northern BC (DestinationBC 2018; Symphony Tourism Services 2022).

There are over 60 provincial, national, and marine parks, and wildlife refuges that offer access to globally unique ecosystems and priceless cultural heritage sites (DestinationBC 2018). Tourists are most likely to visit the region in the summer months (i.e., July to September); however, US tourists tend to visit more in the spring months (i.e., April to June) (DestinationBC 2018; Symphony Tourism Services 2022). Overnight travelers who spend one or more nights in northern BC took part in several outdoor activities during their trip, including boating, wildlife viewing, visiting provincial and national parks, fishing, hiking, and camping. Cultural activities included visiting historic sites, museums, and art galleries (DestinationBC 2018).

The BC government declared a provincial state of emergency on Wednesday March 18, 2020 because of the COVID-19 global pandemic, another on July 20, 2021 because of severe wildfire activity, and another on November 17, 2021 because of severe provincial flooding. Due to the various provincial states of emergency, the tourism sector was heavily impacted over 2020 and 2021. For example, in 2019, northern BC had an average of 859,300 domestic visitors to the region (Symphony Tourism Services 2022). This number fell to 775,900 in 2020 and 732,300 in 2021 (Symphony Tourism Services 2022).

Marine-based tourism is a major economic driver within the north and central coast (PNCIMA Initiative 2017). Many tourists are attracted by sport fishing and many tourists visit sport fishing lodges (PNCIMA Initiative 2017). It was estimated that 60 sport fishing lodges operate along the north and central coast and generate approximately $20 million annually and employ close to 1,000 individuals (PNCIMA Initiative 2017).

Tourism opportunities in the region provide a unique combination of natural beauty, rich cultural experiences, and historical features (NCSFNSS and GoBC 2015). Anyox, a small company-owned mining town located on the shores of Granby Bay in the coastal Observatory Inlet, provides opportunities for historical tourism (NCSFNSS and GoBC 2015). There are commercial and recreational *Land Act* tenures in the adjacent terrestrial areas (NCSFNSS and GoBC 2015). Indigenous Nations on the north coast have an interest in defining emerging tourism products that incorporate aspects of ecotourism and cultural tourism (NCSFNSS and GoBC 2015). Indigenous Nations see the marine recreation and tourism sector as an opportunity to diversify the economy while also conserving natural resources (NCSFNSS and GoBC 2015). The Metlakatla First Nation has interests in developing opportunities for sustainable recreation and tourism in the marine environment (NCSFNSS and GoBC 2015).

Marine-based tourism (e.g., whale watching, bear viewing, pocket cruises, and kayak adventures, as well as a known fishing lodge on Pearse Canal) and non-commercial recreational users use the Portland Canal, Pearse Canal, and Portland Inlet area, primarily in the summer season. The Khutzeymateen Provincial Park (Khutzeymateen/K'tsim-a-deen Grizzly Sanctuary), located 45 km northeast of Prince Rupert, is accessible by marine transportation only (BC Parks 2022). The Khutzeymateen Provincial Park is primarily accessed

by visitors from May to September and is a destination known for its wildlife viewing as it offers incredible opportunities to view grizzly bears in their natural habitat (BC Parks 2022). These tourism and recreation activities have historically had unhindered and unrestricted access within Portland and Pearse Canals. The Hidden Inlet LLC fishing lodge, located on the west side of the Pearse Canal, in Alaska, approximately 14 km southwest of Wil Milit, is the nearest commercial recreation property to the Site. Operating out of Gingolx, approximately 15 km east of Wil Milit, Northern Sunrise Charters is a commercial recreation fishing and sightseeing business that offers guided fishing and wildlife viewing tours. Within 25 km of the Site, no other commercial recreation enterprises have yet been identified. Kaien Sportfishing Charters, Kinda Catchy Charters, Killin' Time Fishing Charters, and Livin' the Dream Charters are all charter companies that operate out of Prince Rupert.

Tourism opportunities in Gingolx consist of panoramic views, hiking trails, fishing, crabbing, kayaking, canoeing, wildlife watching, and a rich cultural history (Gingolx n.d.). Tourists travel to Gingolx to visit its tribal smoke houses and to watch the preparation of traditional foods (Gingolx n.d.). Gingolx has previously hosted 'Crabfest,' an annual celebration that highlights its music, seafood, and Nisga'a hospitality. However, this event has not occurred since 2011 (Gingolx n.d.).

The province is responsible for authorizing public and commercial tenures including fishing lodges, tidal sports fishing camps, and guided nature viewing. Marine recreation and tourism activities are supported by infrastructure such as anchorages, public and private marinas and moorage facilities, and service facilities (NCSFNSS and GoBC 2015).

The NCMP identifies two Special Management Zones in the RAA, allocated for recreational and tourism activities: Wales Island and Somerville Island.

Residents and visitors of the District of Stewart value access to the marine environment for recreational purposes (NCSFNSS and GoBC 2015). Recreational boating and fishing are two marine-based recreational activities that occur in the area (NCSFNSS and GoBC 2015). The Bear River in BC and the Salmon River in Alaska flow into the Portland Canal adjacent to the District of Stewart (NCSFNSS and GoBC 2015). Both rivers are fed by glaciers and support salmon runs (NCSFNSS and GoBC 2015).

The Tsimshian Peninsula is a key area for tourism (NCSFNSS and GoBC 2015). There are lodges adjacent to this area in Work Channel and Wales Harbour (NCSFNSS and GoBC 2015). The Dolphins North Lodge is located in Work Channel and the Eagle Pointe Lodge is located on Wales Island in the Inside Passage. These lodges are accessible by floatplane, which departs from Prince Rupert, from mid-May to September. The Haa-Nee-Naa Lodge, located on Dundas Island, is accessible on a fly-in or boat-in basis. Mariners commonly transit through this area to travel to the Khutzeymateen Provincial Park, a popular area for wildlife viewing (NCSFNSS and GoBC 2015).

There are a couple of coastal camping locations and recreational boating destinations within the RAA, which are located on the southwestern end of Wales Island (Figure 7.11–27). Marine users may travel through the RAA to reach other coastal campsites and recreational boating destinations such as coastal camping locations and recreational boating destinations located near Hunts Inlet, southwest of Alice Arm and Kitsault, near the Gingietl Creek Ecological Reserve, and on Haida Gwaii, near the Tow Hill

Ecological Reserve (Figure 7.11–27). The Kitson Island Marine Park is home to one popular coastal camping location. It is located south of the Triple Island Pilot Boarding Station and on the southeast side of Kitson Island is a sandy beach, which is a popular day use destination for people from Prince Rupert and the surrounding area for beach activities, picnicking, and short hikes, and a popular coastal camping location for kayakers travelling between Prince Rupert and Porcher Island (Aurora LNG 2017b). Backcountry camping is permitted at that location (Aurora LNG 2017b).

There is one SCUBA dive location located within the RAA, near the Triple Island Pilot Boarding Station, and two SCUBA dive locations located in the open water area (Figure 7.11–27).

The Hidden Inlet Fishing Resort is located to the west of Pearse Island, on the Portland Canal (Figure 7.11–27). This fly-in or boat-in resort is open year-round and hosts several recreational activities including boating, sightseeing, and guided saltwater fishing. The guided saltwater fishing tours tend to target various salmon species, halibut, shrimp, and crab.

7.11.5.2.10 Aesthetic Conditions

The Project's location at Wil Milit is in a remote wilderness area and, other than some logging several decades ago, it has been primarily used by the Nisga'a for their purposes. The aesthetic conditions are described in three categories: visual quality, acoustics, and ambient light.

7.11.5.2.10.1 Visual Quality

Visual quality is described as the potential for a landscape to produce varying degrees of satisfaction among viewers. Alterations to the natural environment can affect visual quality. The province of BC recognized that visual resources have inherent value and developed the VLI, which maps the visible topography from public use areas (i.e., communities, recreational areas, highways, and waterways) (GoBC 2022). The most sensitive landscapes in BC are usually steep, forested slopes, exposed to many views, while the least sensitive landscapes are typically low in relief, more remote, and with few viewers or viewing opportunities (GoBC 2022).

The province of BC's VLI identifies the most visible and sensitive landscapes within the province (GoBC 2022). The VLI maps the visible topography from public-use areas (e.g., communities, recreational areas, highways, and waterways) (GoBC 2022). The VLI is divided into Visual Sensitivity Units (**VSUs**), which are rated according to their sensitivity to human-made alteration (Appendix 7.11A). The Project's marine shipping (transit) route and materials and supply shipping route ranges between moderate to high sensitivity (Figure 7.11–28). Rated VSUs also have Visual Quality Objectives (**VQOs**), which indicate the degree of human-caused alteration expected (Figure 7.11–29; Appendix 7.11A). The VSU for Wil Milit on Pearse Island is moderate and the VQO is listed as "modification[3]". A review of the landscape using Googl Earth Pro found evidence of forestry practices (e.g., logging) on Pearse Island and along the marine shipping route and materials and supply shipping route.

[3] 7-20% anthropogenic alteration (GoBC 2022).

The North Coast Land and Resource Management Plan (**LRMP**) identifies four large and distinct areas or zones in the north coast region: Inside Passage, Highway 16 Corridor, Douglas Channel and Portland Canal (Adair et al. n.d.). The Portland Canal is the only zone within the Project's RAA, and its overlap with the RAA is limited as the Portland Canal is located northeast of the Site (Adair et al. n.d.). Viewpoints along the marine shipping route and materials and supply shipping route were identified and categorized as foreground, midground, or background based on their distance from the marine shipping route and materials and supply shipping route (Table 7.11–13; Figure 7.11–30).

Table 7.11–13 – Viewpoints and Viewpoint Importance – Project Site and Marine Shipping Route

Viewpoint	Description	Distance[1]	Project Components
Project Site			
1a. Gingolx	Indigenous Nations Community	Background	Workforce vessel route – option[2]
Marine Shipping Route			
1b. Triple Island	Tourism/Recreation *Heritage Lighthouse Protection Act* Traditional use area	Foreground	Marine shipping route
2b. Stephens Island	Conservancy Tourism/Recreation Traditional use area	Mid-ground	Marine shipping route
3b. Melville Island	Conservancy Tourism/Recreation Traditional use area	Mid-ground	Marine shipping route
4b. Lucy Islands	Conservancy Tourism/Recreation	Mid-ground	Marine shipping route
5b. Tugwell Island	Traditional use area	Mid-ground	Marine shipping route
6b. Rachael Islands	Biodiversity Tourism/Recreation Mining Traditional use area	Mid-ground	Materials and supply shipping route
7b. Kinahan Islands (north)	Tourism/Recreation Traditional use area	Foreground	Materials and supply shipping route
8b. Kaien Island (west)	Traditional use area	Foreground	Materials and supply shipping route
9b. Prince Rupert	Tourism/Recreation Residential area	Foreground	Materials and supply shipping route Workforce vessel route – option[2]
10b. Metlakatla	Indigenous Nation Community	Background	Marine shipping route Materials and supply shipping route

Table 7.11–13 – Viewpoints and Viewpoint Importance – Project Site and Marine Shipping Route

Viewpoint	Description	Distance[1]	Project Components
11b. Lax Kw'alaams	Indigenous Nation Community	Midground (or Background)	Marine shipping route Materials and supply shipping route
12b. Finlayson Island	Tourism/Recreation Traditional use area	Foreground (or Midground)	Marine shipping route Materials and supply shipping route
13b. Hogan Island	Tourism/Recreation Traditional use area	Foreground (or Midground)	Marine shipping route Materials and supply shipping route
14b. Wales Island	Tourism/Recreation Traditional use area	Foreground (or Midground)	Marine shipping route Materials and supply shipping route
15b. Somerville Island	Tourism/Recreation Traditional use area	Foreground (or Midground)	Marine shipping route Materials and supply shipping route
16b. Pearse Island	Tourism/Recreation Traditional use area	Foreground (or Midground)	Marine shipping route Materials and supply shipping route

NOTES:

[1] Distance is an indicator of view importance (i.e., prominence/change of view).

[2] The Project's workforce will be transferred to the Site from either Gingolx, Port Edward, or Prince Rupert.

Foreground refers to views of Project components that are 0 to 1 km from viewpoint.

Mid-ground refers to views of Project components that are 1 to 8 km from viewpoint.

Background refers to views of Project components that are beyond 8 km from viewpoint.

SOURCE: Aurora LNG 2017a, LNG Canada 2014a

7.11.5.2.10.2 Ambient Light

The Site and the marine shipping (transit) route and materials and supply shipping route are intrinsically dark at night due to the ruralness of the area, ranging from natural to rural (intrinsically dark to rural, or intrinsically dark to low brightness) based on classifications from the International Commission on Illumination guidelines for light trespass and glare (CIE 2017). Where residential communities or industrial activities are present ambient light levels are assumed to range from rural to urban (low to high brightness) (CIE 2017). However, Gingolx is a small, rural community and therefore, ambient light levels are assumed to range from natural to rural (CIE 2017). Currently, there is no light being emitted from industrial, commercial, or residential developments at or near the Site. Ambient light levels are the Site can be categorized as natural (CIE 2017). Some light is visible due to passing vessels. Marine shipping lighting requirements are mandated by the *Canada Shipping Act, 2001* and its associated Collision Regulations.

7.11.5.2.10.3 Acoustics

Most of the marine shipping (transit) route and materials and supply shipping route is along non-populated areas, typically dominated by natural sounds (e.g., wind, waves) along with noise from passing vessels. In areas were residential communities or industrial activities are present (e.g., Prince Rupert) the acoustic environment may include some anthropogenic sounds such as marine traffic, air traffic, vehicular traffic, and industrial activities.

Section 7.03 Acoustics describes the baseline daytime (L_d), nighttime (L_n) and day-night (L_{dn}) sound levels for all the noise sensitive residential receptors in this assessment as per BC Oil and Gas Commission (**BC OGC**) noise guideline (BC OGC 2021).

The Acoustic Technical Data Report provides additional details on the determination of baseline sound levels (Appendix 7.3A).

7.11.5.3 Summary of Baseline Information on Subpopulations for Gender Based Analysis Plus

Subpopulations were identified through community engagement and through a literature review of relevant projects. Indigenous persons were identified as the only subpopulation of concerns with respect to potential for disproportionate effects on marine use for the following reasons:

- Indigenous persons have more complex marine use needs because they rely on the natural environment to provide resources for food, social, and ceremonial purposes
- Indigenous persons rely on harvested foods for a considerable proportion of their diet. Domestic fisheries (i.e., FSC fisheries) offset the cost of food that would otherwise have to be purchased. Many members of Indigenous Nations rely heavily on access to traditional foods, not only due to the cultural perspective, but to increase access to nutritious food sources and offset the food insecurity
- Many members of Indigenous Nations rely on fisheries for employment. For example, as of 2014 for Metlakatla First Nation, 17.1% of residents were employed by fisheries, a number which continues to decrease as fishers become unemployed or seasonally employed as fisheries decline
- Access to the marine environment and its marine resources is especially important in northern rural and remote communities, where food considered non-local may have considerable costs associated with it. Food costs are often two to three times higher in communities more than 50 km from an urban centre (FNFNES 2019). Living in rural, remote, and Indigenous communities often means travelling some distance to access healthy, nutritious food (FNFNES 2019)

7.11.6 Selection of Potential Effects and Indicators/Measurable Parameters

The potential effects for marine use identified in Table 7.11–14 was determined by the AIR. For each effect in Table 7.11–14, effect pathways and indicators/measurable parameters have been identified to facilitate the quantitative or qualitative measurement of change in Project-specific and cumulative effects potentially caused by the Project.

Where possible, the assessment of potential effects on marine use used measurable parameters that are quantifiable. However, not all effects pathways can be quantified. Therefore, some effects are predicted qualitatively using a mixed methods approach that incorporates observed information, experiential information obtained from Key Person Interviews, published information, and professional judgment.

Table 7.11–14 – Potential Effects, Effects Pathways and Indicators/Measurable Parameters for Marine Use

Potential Effect	Effect Pathway	Indicator and/or Measurable Parameter(s) and Units of Measurement
Change in marine navigation	▪ There is potential for Project activities to interfere with navigable waters. For example, in-water construction activities (e.g., pile driving) and the operation of the marine terminal (e.g., arrival and departure of LNGC or NGL product vessels) may necessitate commercial and recreational marine vessels that currently use the shipping route to make adjustments to their navigational routes.	▪ Proportion of the navigable waterway affected by Project construction and infrastructure. ▪ Shipping traffic along the shipping routes (ships per year). ▪ Perceived navigation safety. ▪ Marine accidents (as per the Navigation Safety Assessment and as assessed in Section 9.0). ▪ Conflict with other users, including local recreational users and commercial users, etc.
Change in marine fisheries and other uses	▪ An increase in vessel traffic and type (e.g., the addition of LNGC transiting along the shipping route) may affect when Indigenous, commercial, and recreational fishers can use the waters within the shipping lane. ▪ An increase in vessel traffic and type may affect existing recreational and tourism activities such as visitor frequency and access near the shipping lane.	▪ Shipping traffic along the shipping routes (ships per year). ▪ Potential or risk of an interaction between LNGC and NGL product vessel transits and ongoing fisheries and marine use in consideration of: • Attribute data on fisheries (e.g., target species, fishing gear types, harvest volume, frequency, and access). • Attribute data on other uses (e.g., recreational boating routes, marine park locations, visitor frequency, and access). • Identification and information on diverse subgroups that may experience disproportionate effects.

Table 7.11–14 – Potential Effects, Effects Pathways and Indicators/Measurable Parameters for Marine Use

Potential Effect	Effect Pathway	Indicator and/or Measurable Parameter(s) and Units of Measurement
Change in aesthetic conditions	▪ Marine shipping and marine transportation activities may affect the visual quality experienced by other marine users near the shipping lane. ▪ An increase in noise and light levels associated with construction activities in or adjacent to Portland Canal and marine vessel traffic along the marine shipping (transit) route and materials and supply shipping route during operations may affect marine fisheries and the quality of the experience for marine users (e.g., sense of place).	▪ Changes in visual quality, shipping-related noise, and ambient light. ▪ Identification and information on diverse subgroups that may experience disproportionate effects.

7.11.6.1 Project Marine Use Interactions

Table 6.4-1, Section 6.4, identifies the potential interactions between the Project's components and physical activities with marine use. Interactions that have been identified (ranked as 1 or 2) are carried forward and assessed within this section. Each of the effects interactions are discussed in detail, in the context of effects pathways, mitigation/enhancement, and residual effects.

Table 7.11–15 – Project Activities and Physical Works

Project Activities and Physical Works	Potential Project Effects		
	Change in marine navigation	Change in marine fisheries and other uses	Change in aesthetic conditions
Construction			
Procurement of labour, goods, and services	0	0	0
Site preparation and clearing	0	0	0
Construction of temporary and permanent land-based infrastructure (includes transmission line within the TLAA)	0	0	0
Construction of temporary and permanent marine-based infrastructure (includes transmission line within the TLAA)	2	1	1
Marine transport of workforce and construction materials to the Site	1	2	2

Table 7.11–15 – Project Activities and Physical Works

Project Activities and Physical Works	Potential Project Effects		
	Change in marine navigation	Change in marine fisheries and other uses	Change in aesthetic conditions
Land transportation of workforce and construction materials from Terrace to Gingolx or Prince Rupert (for marine transport to Site)	0	0	0
Waste management	1	1	1
Operation			
Procurement of labour, goods, and services	0	0	0
Natural gas pre-treatment, liquefaction, storage and offloading of LNG and NGL products (condensate) at the FLNG barges (includes storage of NGLs)	1	1	1
LNG carrier and NGL product carrier loading	1	1	1
Marine shipping and transportation (include tugoat) to Site	1	2	2
Land transportation of workforce to Gingolx or Prince Rupert (for marine transport to Site)	0	0	0
Facility and infrastructure maintenance (includes transmission line within TLAA)	1	1	1
Waste management	1	1	1
Temporary on-Site power generation on barges	0	0	0
Decommissioning			
Procurement of labour, goods and services	0	0	0
Decommissioning or re-purposing of land-based infrastructure (includes transmission line within the TLAA)	0	0	0
Decommissioning of marine-based infrastructure (includes transmission line within the TLAA)	1	1	1
Land transportation of workforce to Gingolx or Prince Rupert (for marine transport to Site)	0	0	0
Marine transport of decommissioned infrastructure	1	1	1
Waste management	0	0	0

NOTES:

0 = Negligible or no effect expected; no further consideration warranted

1 = Potential adverse effect that warrants consideration, and requires mitigation through current legal or policy management, best management practice(s) and/or Project-specific mitigation.

2 = Potential adverse effect of particular importance or concern that warrants further detailed assessment.

Only activities with an interaction of 1, 2 or + for at least one interaction are shown.

1

Potential changes to marine use will result from the construction and decommissioning of temporary and permanent marine-based infrastructure and marine shipping and marine transportation-related activities during all Project phases, including the transportation of workforce and materials to Site; loading and transportation of LNGCs and NGL product carriers; transportation of decommissioned infrastructure; and transportation of waste. As indicated in Table 7.11–14, the assessment of aesthetic conditions in marine use focuses only on shipping-related noise. Land-based noise is assessed in Section 7.03 Acoustics. The procurement of labour, goods, and services; construction of temporary and permanent land-based infrastructure; transportation of workforce and construction materials on land; and other land-based activities are not expected to have an effect on marine use as they are land-based activities and, therefore, have been ranked as 0 and have not been considered further in the assessment of residual and cumulative effects. The potential effects of land-based activities, such as those previously listed, have been assessed in Section 7.10 Employment and Economy, Section 7.12 Infrastructure and Services, and Section 7.13 Community Health and Wellness.

7.11.6.1.1 Project Interactions on Diverse Subgroups for Gender Based Analysis

Activities that can affect access to marine harvesting areas, or access to terrestrial harvesting and hunting areas via marine routes, could have disproportionate adverse effects on Indigenous persons who rely on harvested foods for a considerable proportion of their diet. Project interactions on Indigenous persons can include the building of temporary and permanent marine-based infrastructure, Project-related shipping and marine transportation activities, and the decommissioning of marine-based activities.

7.11.7 Assessment of Residual Effects

7.11.7.1 Assessment Methods

The assessment of marine use examines effects of the Project on:

- Change in marine navigation
- Change in marine fisheries and other uses
- Change in aesthetic conditions

This section describes the analytical methods and assumptions used in the assessment of marine use, effect mechanisms, applicable mitigation measures, and characterization and likelihood of residual effects for each Project effect.

7.11.7.1.1 Analytical Assessment Techniques

The assessment of marine use involves both quantitative and qualitative methods. It included quantifying the marine shipping traffic along the marine shipping (transit) route and materials and supply shipping route per year and calculating the percentage increase attributable to Project-related vessels. Marine shipping traffic was quantified and categorized according to vessel type using GIS software, which analyzed AIS data from BOEM/NOAA's MarineCadastre website and using the results of the NSA. Marine shipping traffic was quantified using vessel movements. For example, the Project is expected to have 140-160 LNGCs call on the marine terminal per year, meaning there will be 280-320 LNGC movements per year. Spatial analysis was also used to quantify the nature and extend of marine use activity in the LAA and RAA and its potential to interact with Project activities.

7.11.7.1.1.1 Marine Navigation

The assessment of marine navigation involved calculating the proportion of the navigable waterway affected by Project infrastructure. The width of the channel where Project infrastructure will be located was calculated using GIS software as well as using Google Earth Pro. This information was used to calculate the proportion of the navigable waterway that will be affected by the Project infrastructure.

7.11.7.1.1.2 Marine Fisheries and Other Uses

This section describes the analytical assessment methods and assumptions used in the assessment of effects on marine fisheries and other uses.

The assessment of marine fisheries evaluates the potential for Project-related marine shipping activities to interfere with or reduce fishing activities, including Indigenous, commercial, and recreational fishing activities. This included calculating the proportion of the fisheries area affected by the marine shipping (transit) route and materials and supply shipping route and the likelihood of an interaction. Project-related marine shipping activities that can interfere with fishing activities were assumed to meet the following two conditions:

- The target fishery's fishing ground overlaps or intersects the marine shipping (transit) route and materials and supply shipping route
- The target fishery's gear type and/or technique used enables an interaction with marine shipping vessels or Project-related vessels

For marine fisheries where these two conditions are met, further assessment was conducted. Table 7.11–16 summarizes the various marine fisheries and indicates their potential to interact with marine shipping and marine transportation activities.

Table 7.11–16 – Summary of Potential Marine Fishery-Marine Shipping Activity Interactions

Target Fishery	Gear Type or Technique Used	Fishing Grounds Overlap or Intersects the Marine Shipping Routes[1]	Fishing Gear type or Technique Enables an Interaction	Potential for Interaction (Yes/No)
Commercial and Indigenous Fisheries				
Salmon	Seine, Gillnet, Troll	Yes[2]	Yes	Yes[2]
Groundfish	Trawl (e.g., mid-water and bottom trawl), Hook and Line (e.g., longline, handline)	Yes[3]	Yes[4]	Yes[3]
Pacific Herring	Seine, Gillnet, Other (e.g., skiffs, net pens, tree boughs, kelp blades)	No	Yes	No
Eulachon	Gillnet, Other (e.g., dipnets, eulachon rakes)	No	Yes	No
Geoduck and Horse Clams	Dive	Yes	No	No
Red Sea Urchin	Dive	Yes[5]	No	No
Sea Cucumber	Dive	No	No	No
Octopus	Dive	Yes	No	No
Shrimp and Prawn	Trawl, Trap	Yes[6]	Yes[6]	Yes[6]
Dungeness Crab	Trap	Yes	No	No
Recreational Fisheries				
Salmon	Rod and Reel	Yes	Yes	Yes
Groundfish	Rod and Reel	Yes	Yes	Yes
Shrimp and Prawn	Trap	Yes	No	No
Crab	Trap	Yes	No	No

NOTES:

[1] Expected marine shipping (transit) route – including both the open water shipping route and marine shipping route – as well as the materials and supply shipping route

[2] Seine and Gillnet; marine shipping (transit) route and materials and supply shipping route

[3] Trawl only; open water marine shipping route only

[4] Trawl only

[5] Expected marine shipping route and materials and supply shipping route only

[6] Shrimp Trawl only

SOURCES: DFO 2022f; DFO 2022g; DFO 2020b; DFO 2022h

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The Project and its related shipping activities may result in an interaction with the commercial salmon fisheries, groundfish (trawl) and shrimp (trawl), and the recreational salmon and groundfish fisheries based on the fisheries' locations (i.e., overlap with the Site or marine shipping (transit) route and materials and supply shipping route) and/or gear type and technique used. For example, dive fisheries such as the geoduck and horse clam, red sea urchin, sea cucumber, and octopus fisheries are limited by the depths SCUBA divers can reach (i.e., 20 m or less). Project-related vessels will travel in water at depths that exceed the limitations of SCUBA divers. Marine fisheries with fishing activities that do not overlap with the marine shipping (transit) route and materials and supply shipping route, such as the eulachon fishery, and marine fisheries, which use a gear type and/or technique that does not enable an interaction with Project-related vessels, such as the dive and trap fisheries for invertebrates, including prawn and shrimp fisheries that use trapping gear, are therefore not expected to be adversely affected by an increase in Project-related vessels. These fisheries were not included further in the assessment of marine fisheries.

7.11.7.1.1.3 Aesthetic Conditions

This section describes the analytical assessment methods and assumptions used in the assessment of other marine uses as they pertain to aesthetic conditions.

7.11.7.1.1.3.1 Visual Quality

A viewshed analysis was conducted using GIS (see the results of the viewshed analysis on Figure 7.11–30). The marine infrastructure will not be visible from residential areas, such as Gingolx, the nearest Nisga'a Village to the Site, or Lax Kw'alaams located at the mouth of the Portland Canal. Project marine infrastructure and Project-related marine shipping and marine transportation activities may be visible by marine users navigating along the Project's marine shipping (transit) route and materials and supply shipping route and from viewpoints where these routes are visible. Google Earth Pro imagery was used in combination with a GIS analysis to identify viewpoints of interest, or priority viewpoints.

A review of the potential residual effects to visual quality was conducted using the preparation of Project renderings. The renderings provide a spatially accurate representation of the proposed marine infrastructure from the perspective of an individual transiting through the Portland Canal. The renderings are based on preliminary design information, which is subject to change.

7.11.7.1.1.3.2 Acoustics

The acoustics assessment completed in Section 7.3 Acoustics included use of a quantitative model to assess the potential changes in acoustics, including in relation to shipping-related noise along the Project's marine shipping (transit) route and materials and supply shipping route The results of these analyses were incorporated into the assessment of marine fisheries and other uses to understand how this sub-component may be affected by a Project related change in noise levels.

7.11.7.1.1.3.3 Ambient Lighting

Effects of the Project on ambient light levels are assessed qualitatively based on the definitions of environmental zones developed by the International Commission on Illumination and in consideration of the following types of lighting effects (CIE 2017):

- Light spill (trespass) – light spilling beyond the boundary of the property on which lights are located (i.e., sometimes shining through windows/curtains affecting sleep)
- Glare – uncomfortable brightness of a high beam light source when viewed against a darker background (i.e., may affect safety by affecting the vision of people operating vehicles or vessels)
- Sky glow – the pink or orange glow that is seen for kms around towns and cities caused by the scattering of artificial light by airborne dust and water droplets (e.g., the LNG facility flare)

Ambient light conditions are described based on four environment zone definitions – natural (intrinsically dark), rural (low brightness), suburban (medium brightness), and urban (high brightness).

The nearest residents are in Gingolx, approximately 15 km away from the marine terminal at Wil Milit. At this distance, Project lighting will not cause measurable change in ambient light conditions at receptor locations and will therefore only be assessed qualitatively. A day-time visual rendering of the Project, taken from a bird's eye view perspective, was prepared to illustrate its appearance during the day.

7.11.7.1.2 Residual Effects Characterization

Table 7.11–17 presents definitions and criteria that are used to characterize the residual effects on marine use.

Table 7.11–17 – Characterization of Residual Effects

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in measurable parameters or the valued component relative to existing conditions.	**No Measurable Change –** no measurable change in the effect can be noted. **Low –** a measurable change but marine use can continue at current levels, and/or only relatively small areas of navigable waters are affected. **Moderate –** measurable change but marine use can continue, though at a lower activity level and/or displace. Moderate areas of navigable waters are affected. **High –** measurable change of existing conditions such that marine use cannot continue or are completely displaced. Large areas of navigable waters are affected.
Geographic Extent	The geographic area in which a residual effect occurs.	**Project footprint –** residual effects are restricted to the Project footprint. **LAA –** residual effects extend into the LAA. **RAA –** residual effects extend into the RAA. **OWAA –** residual effects extend from the LAA or RAA into the OWAA.

Table 7.11–17 – Characterization of Residual Effects

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable –** seasonal aspects are unlikely to affect residual effects on marine use. **Applicable –** seasonal aspects may affect residual effects on marine use.
Duration	The time required until the measurable parameter or the valued component returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived.	**Short-term –** the residual effect is restricted to no more than the duration of the construction phase (3 years) or the duration of the decommissioning phase (12 months). **Medium-term –**the residual effect extends through the operation phase (40 years). **Long-term –** the residual effect extends beyond the life of the project (> 40 years).
Reversibility	Pertains to whether a measurable parameter or the valued component can return to its existing condition after the project activity ceases.	**Reversible –** the residual effect is likely to be reversed after activity completion and reclamation. **Irreversible –** the residual effect is unlikely to be reversed.
Frequency	How often the residual effect occurs and how often during the Project or in a specific phase.	**Single event –** effect occurs once. **Multiple irregular event –** occurs at no set schedule. **Multiple regular event –** occurs at regular intervals. **Continuous –** occurs continuously.
Affected Subpopulations	The distribution of the effect amongst the population of affected people.	**Evenly distributed –** the effect will be experienced by any or all subpopulations. **Disproportionally distributed –** the effect will be experienced only by certain subpopulations or experienced more acutely by certain subpopulations.

Table 7.11–17 – Characterization of Residual Effects

<table>
<tr><th>Characterization</th><th>Description</th><th>Quantitative Measure or Definition of Qualitative Categories</th></tr>
<tr><td>Risk (likelihood and consequences)</td><td>Assesses the likelihood and consequences of the potential residual effect. Likelihood is the probability of the residual effect occurring and should consider many factors. Consequence is the potential outcome of the residual effect.
Risk is the interaction between likelihood and consequence (see risk rating table).</td><td>
Consequences: are assessed as minor, moderate or major based primarily on a combination of Magnitude and Geographic Extent as:
<table>
<tr><td colspan="2"></td><td>Geographic Extent*</td><td></td></tr>
<tr><td colspan="2"></td><td>Project Footprint or LAA</td><td>RAA and OWAA</td></tr>
<tr><td rowspan="4">Magnitude</td><td>No Measurable Change</td><td>Minor</td><td>Minor</td></tr>
<tr><td>Low</td><td>Minor</td><td>Minor or Moderate</td></tr>
<tr><td>Moderate</td><td>Minor or Moderate</td><td>Moderate</td></tr>
<tr><td>High</td><td>Moderate or Major</td><td>Major</td></tr>
<tr><td colspan="4">*Where relevant, Duration is also taken into consideration (e.g., a high Magnitude event within the LAA may be Moderate or Major in Consequence and Duration could be considered)</td></tr>
</table>
Likelihood: as defined in the Risk table below
Risk:
Low: Low risk/uncertainty of effect prediction
Moderate: Moderate risk/uncertainty of impact prediction
High: High risk/uncertainty of impact prediction
<table>
<tr><td colspan="2"></td><td colspan="3">Consequence</td></tr>
<tr><td colspan="2"></td><td>Major</td><td>Moderate</td><td>Minor</td></tr>
<tr><td rowspan="3">Likelihood</td><td>High (>80% chance)</td><td>High</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Medium (40-80% chance)</td><td>High</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Low (<40% chance)</td><td>Moderate</td><td>Low</td><td>Low</td></tr>
</table>
</td></tr>
</table>

Table 7.11–17 – Characterization of Residual Effects

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Uncertainty	The degree of uncertainty as assessed for the data and methods including potential effectiveness of mitigation that have been used in the assessment of effects.	**Low** – good understanding of the pathway to effect(s) on marine use due to the Project activities and/or physical works and sufficient data is available to support the assessment. Uncertainty associated with data is low. The effectiveness of the selected mitigation is expected to be moderate to high. Overall, uncertainty in the predicted residual effect is low. **Moderate** – potential uncertainty associated with the pathway to effect(s) on marine use due to the Project activities and/or physical works, e.g., due to unknown external variables or incomplete data. Potential for uncertainty associated with data and/or modelling. The effectiveness of mitigation is expected to be moderate to low. Uncertainty in the predicted residual effect is considered moderate. **High** – poor understanding of the pathway to effect(s) on marine use due to the Project activities and/or physical works. May be unknown external variables and/or data for the Project is incomplete. Modelling results may vary considerably with inputs. The effectiveness of the mitigation may be expected to be low or is unproven. Overall, there is a high degree of uncertainty associated with the predicted residual effect.

7.11.7.2 Assessment of Change in Marine Navigation

This section describes the effect pathways, mitigation and enhancement measures, Project residual effects, and likelihood of Project residual effects as they pertain to change in marine navigation.

7.11.7.2.1 Project Pathways

The assessment of change in marine navigation considered the proportion of the navigable waterway affected by the Project during the construction, operation, and decommissioning of the marine terminal and from additional marine shipping traffic. All phases of the Project and their associated marine shipping activities can affect marine navigation through a reduction in area available for marine users to navigate or through potential risks or perceived risks to navigation. The Project-related activities that have the potential to influence marine navigation are discussed below.

Marine Infrastructure

The Project's marine terminal will consist of the following marine components: two floating LNG production, storage, and off-loading facilities (FLNGs), floating accommodations (i.e., floatel) during the construction phase, a personnel dock, material off-loading facility (MOF) (with potential tug berths), and two jetties and platforms (one connecting each FLNG to the shore). FLNG facilities are fundamentally different from land-based LNG facilities in that FLNG facilities are designed and constructed in ship fabrication yards and then towed into position at the Site. The FLNG facilities will include FLNG mooring

systems (e.g., chains and anchors), ATON, berthing and mooring systems, and marine loading arms to connect to and transfer LNG to the LNGCs (Westmar Advisors 2022c). The MOF will include power barge berths, a roll-on/roll-off (Ro-Ro) berth, a load-on/load-off (Lo-Lo) berth, and guide piles (adjacent to the Ro-Ro berth) (Westmar Advisors 2022c). The NSA describes the key components of the marine terminal in further detail (see Appendix E for further details). The marine footprint for the Project will be within the proposed Water Lot in Portland Canal and is expected to be approximately 19 ha.

A safety zone established using signage or a safety vessel monitoring the area, will be implemented around the Project's marine components. The safety zone would inform the public of the dangers or risks of the area and they can travel through the zone at their own risk. The safety zone would be implemented in coordination with Transport Canada and its Navigation Protection Program. If signage is used, and requires the use of buoys, approval would be needed pursuant to the *Canadian Navigable Waters Act* due to the inclusion of floating structures. These approvals would be in addition to the required Navigation Protection Program approvals and authorizations of other Project-related marine infrastructure. The safety zone will not restrict marine users from navigating in the area.

Marine Shipping and Marine Transportation

During the construction phase, construction materials, supplies, and equipment will be transported to the Site by barge or vessel along materials and supply shipping routes from Gingolx, Prince Rupert, or other coastal ports, such as Vancouver. Most onshore infrastructure will be constructed at an off-Site location and then barged to, and installed at, the Site.

Due to the remoteness of the Site, the construction workers will be housed in a floatel near the Site. The floatel will provide self-contained electrical power, communications, potable water supply, and waste containment systems. Sewage and grey water will be managed and contained within the floatel, then pumped into suitable storage facilities and barged to the BC mainland to a permitted wastewater treatment facility. Sewage and grey water will only be barged during the construction phase. During construction, solid wastes (e.g., construction wastes, solid domestic wastes, and regulated hazardous materials) and hazardous wastes (e.g., waste lubricating oils and minor miscellaneous wastes) will also be contained and barged to the BC mainland to permitted disposal facilities.

During operation, solid wastes (e.g., domestic wastes, paper and cardboard wastes, and wood and scrap metal originating from maintenance activities), liquid wastes (if any), and hazardous wastes (e.g., mercury removed during the feed gas treatment process, wastewater treatment facility biological sludge, and waste catalyst and absorbents) will be contained and barged to the BC mainland to permitted disposal facilities.

Discharges and wastes during decommissioning are expected to be similar to those associated with construction as both Project phases will rely on similar types of equipment.

For this assessment, it is assumed that materials will be transported by barge from Prince Rupert to the Site. A trip from Prince Rupert to Pearse Island would cover 119 km and take an average of eight hours. It is expected that a barge can provide material to the Site in one day, and be offloaded and return the next day, thus a two-day round trip is a minimum expectation. It has been estimated that there will be approximately 228 barge trips over the entire construction phase.

Construction workers will be transported to the Site via marine craft from Prince Rupert or Gingolx. Gingolx is closer – approximately 15 km from the Site – but may require infrastructure improvements to be a logistics support location for the Project. Prince Rupert is farther away – approximately 119 km from the Site - but can provide logistics support without improvements.

LNG carriers (LNGCs) and NGL product carriers will be owned, insured, and operated by third parties. LNGCs calling upon the Project's marine terminal will normally range in size from 140,000 to 180,000 cubic metres (m^3). The facility will be designed to received larger LNGCs with a nominal capacity up to 217,000 m^3, such as the Q Flex series. The design draft of these LNGCs range from 11.4 m to 12.5 m when the LNGCs are fully loaded. These LNGCs may be escorted by a tug for a portion (or all of) the route. Condensate will be loaded on a periodic basis onto conventional NGL product vessels. The present estimate of LNG shipments per year is between 140 and 160, depending on the size of the LNGCs used and the total LNG produced by the Project. Condensate export will be conducted by third party shippers who will load condensate from the Site, depart the Site, and then follow the same marine shipping (transit) route as LNGCs. Condensate export will be conducted from the Site to potential receiving points in Washington State or ports further away. Condensate will not be off-loaded through the Port of Prince Rupert and moved inland by rail. NGL product carriers are expected to call on the marine terminal 8 to 12 times per year and are anticipated to have a nominal capacity range of 5,000 to 30,000 m^3.

From the Site to the Triple Island Boarding Station, LNGCs are anticipated to travel at speeds up to 14 knots (25.9 km/hour) and from the Triple Island Boarding Station to the 12 nm limit, at a typical speed of 16 knots (29.6 km/hour). However, vessels travelling from the Triple Island Boarding Station to the 12 nm limit can travel to speeds up to 19.5 knots (36.1 km/hour), but typically do not. Vessel speeds will be determined by the vessel's vessel Master and an experienced BC Coast Pilot.

There will be no planned anchoring of LNGCs during routine operations (Westmar Advisors 2022c). During inclement weather LNGCs may remain at the marine terminal (if departing) or delay their arrival at the Triple Island Pilot Boarding Station to reduce the risk of a marine accident or occurrence and to reduce the potential likelihood of requiring an anchorage (Westmar Advisors 2022c). LNGC arrival will be timed to avoid anchoring once it has entered Canadian waters (Westmar Advisors 2022c).

7.11.7.2.2 Mitigation and Enhancement Measures

Mitigation and enhancement measures were selected based on provincial and federal regulations and policies, on management practices and guidelines, and relevant peer-reviewed literature. Mitigation was selected to address Project interactions that affect marine navigation during all Project phases. Table 7.11–18 provides a summary of the mitigation and enhancement measures to avoid or reduce effects to marine navigation.

Table 7.11–18 – Mitigation and Enhancement Measures Proposed to Avoid or Reduce Effects to Marine Navigation

Mitigation/Mitigation Mechanism	Rationale for Selection	Expected Success/Risks and Uncertainty	Timing	Management and/or Compensation Plans
Mitigation 7.11-1: In consultation with Transport Canada, Canadian Coast Guard and BC Coast Pilots, identify and install appropriate ATON within the marine Project footprint. **Mitigation Mechanism:** The installation of appropriate ATON will promote safe marine navigation. ATON will be installed in coordination with the applicable regulatory bodies such as the Canadian Coast Guard and Transport Canada.	This mitigation measure was selected based on its effectiveness to mitigation potential changes to marine navigation and its inclusion as a mitigation measure for similar projects in the region (Aurora LNG 2017b; LNG Canada 2014b).	**Expected Success:** There is a high likelihood of success associated with this mitigation measure because there is a long history of ATON being used to help guide marine traffic in Canada and throughout the world. **Risk and Uncertainty:** There is little uncertainty of the effectiveness of this mitigation measure; however, ATON are subject to damage, failure, and dislocation (CCG 2011). The CCG's Notices to Shipping and robust repair replacement process minimizes the risk to ATON of damage, failure, and dislocation. ATON along the marine shipping route can be approved and installed by the CCG to support general shipping. Any Project specific requirements (i.e., on approaches to the marine terminal) will be designed and installed by the Project. Marine terminal specific ATONs need to be recommended by the BC Coast Pilots through their review of the routing and marine terminal configuration. All installations would be reviewed by the CCG to ensure compliance with the International Association of Lighthouse Authorities.	**Project Phase:** All phases **Effectiveness:** This mitigation measure is effective in the long-term as it will be applicable to all phases of the Project.	N/A
Mitigation 7.11-2: Establish an operational buffer zone around the Project marine infrastructure. **Mitigation Mechanism:** An operational buffer zone around the Project's marine components will be established through signage or a safety vessel monitoring the area and will be used to inform the public of the dangers or risks of the area.	This mitigation measure was selected based on its effectiveness to mitigate potential changes to marine navigation and its inclusion as a mitigation measure for similar projects in the region (Aurora LNG 2017b; Cedar 2021f; LNG Canada 2014b).	**Expected Success:** There is a low to medium likelihood of success associated with this mitigation measure as the Project cannot strictly enforce its safety zone, it can only inform the public of the dangers or risks of the area, and it requires the participation of third parties (i.e., other marine users). **Risk and Uncertainty:** There is some uncertainty of the effectiveness of this mitigation measure because marine users may choose to enter the safety zone, after being informed of the dangers or risks of the area.	**Project Phase:** All phases **Effectiveness:** This mitigation measure is effective in the long-term as it will be applicable to all phases of the Project.	N/A
Mitigation 7.11-3: Develop a Terminal Operations Manual and include information specific to the Project's marine operations and relevant risk mitigation measures. **Mitigation Mechanism:** The Terminal Operations Manual will be developed, in compliance with the standard template developed by the International Harbour Masters Association and include information specific to the Project's marine operations and risk mitigation measures. The Terminal Operations Manual will also include speed profiles for Project-related vessels travelling along the marine shipping (transit) route and materials and supply shipping route.	This mitigation is an industry standard (PRPA 2020a; Port of Vancouver 2022) and was identified during the NSA process (Westmar Advisors 2022b).	**Expected Success:** There is a medium likelihood of success associated with this mitigation measure. Terminal Operations Manual contains localized practices and procedures, designed to promote safe and efficient marine navigation and are standard practice for ports with commercial and industrial activity (PRPA 2020a; Port of Vancouver 2022). The Terminal Operations Manual will be completed with the input of the PPA and BC Coast Pilots during the Full Mission Bridge Simulation process. It will be restricted to detailed instructions in the vicinity of the marine terminal and may include generic information for activities outside of the marine terminal's command and control. Speed profiles outside of the marine terminal limits fall under federal regulatory regimes. Vessel speeds will be decided by the vessel's vessel master and an experienced BC Coast Pilot. **Risk and Uncertainty:** This some uncertainty of the effectiveness of this mitigation measure because it is uncertain whether marine users will be aware of and/or utilize the Terminal Operations Manual. The Project will work with the PPA and BC Coast Pilots in the development of the speed profiles and tug requirements for Project-related vessels.	**Project Phase:** All phases **Effectiveness:** This mitigation measure is effective in the long-term because it is applicable to all phases of the Project.	Ksi Lisims LNG Terminal Operations Manual

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7.11.7.2.3 Project Residual Effect

This section describes the Project residual effects on marine navigation throughout the construction, operation, and decommissioning phases of the Project. Project residual effects are discussed as they pertain to marine infrastructure.

Marine Infrastructure

Project marine components, which will result in new marine infrastructure, include the FLNGs, personnel dock, jetties, access platforms, MOF, and power barges. Construction of the marine components will result in new marine infrastructure extending between 150 and 372 m into the navigable channel (Table 7.11–19). The channel width is between 3,219 and 3,536 m, depending on the location of the specific Project component. Given the width of the channel and length of Project Components portions of the Portland Canal will be reduced by between approximately 4.8 and 11% due to the presence of Project infrastructure, therefore 90-95% of the navigable channel (i.e., Portland Canal) will remain available for marine navigation. The safety zone will extend into the channel beyond each marine component, occupying a portion of the channel width but this will not impede traffic.

Table 7.11–19 – Estimated Dimensions of the Project's Marine Components

	Project Component			
	FLNG 1	**FLNG 2**	**Personnel Dock**	**MOF**
Total Length[1,2] (m) of Project Component	**372[3]**	**264[3]**	**150**	**213**
Channel Width (m) at location of Project Component	**3,536**	**3,547**	**3,219**	**3,357**
% of the Channel Occupied by the Project Component	**11%**	**7%**	**5%**	**6%**

NOTES:

1 The total width does not consider the additional width associated with the safety zone. The safety zone is not intended to impede marine navigation, but to educate marine users of the potential risks associated with navigating through the area while the Project is actively participating in construction and operation-related activities.

2 Total length is the total width of the greatest intrusion into the channel.

3 The length of the FLNG facilities consider the width of LNGCs (i.e., 50 m), which will berth alongside the FLNG facilities.

The TERMPOL guidelines for one-way vessel operations requires the channel width to be a minimum of at least four times the design vessel's breath, and two-way vessel operations requires the channel width to be a minimum of at least seven times the design vessel's breadth (Transport Canada 2015; Transport Canada 2018). The remaining proportion of the navigable channel available for marine users is sufficient for navigation according to these guidelines. To increase safe marine navigation, appropriate ATON will be installed under the direction of the CCG. The eventual decommissioning of the Project or extension of operating life (after a minimum of 30 years) is described in general terms, at this time. It is anticipated that decommissioning planning will result in the development of a decommissioning plan in

consultation with the Nisga'a Nation. Decommissioning is expected to take one year and require a small workforce. Specifically, it may include:

- Dismantling and/or recycling ancillary facility equipment and infrastructure
- Repurposing onshore and in-water Project infrastructure to another NLG authorized use (e.g., repurpose permanent workforce accommodation into a tourism facility)
- Reclamation of the anthropogenically-altered portion of the onshore and marine areas to restore ecological values and function as required in the lease with the NLG
- If no longer needed, third-party pipeline provider purging their buried sub-sea floor pipelines of residual natural gas and leaving in place

Upon decommissioning of the Project, the area will be restored as required by NLG and/or per the applicable agreements with the Nisga'a Nation and/or as prescribed in operating permits.

The proposed marine terminal location is partially recessed into a natural bay, meaning there will be no conflict between berths and passing vessel traffic (Westmar Advisors 2022c). The residual effects on marine navigation from the Project's marine components will be adverse, but low in magnitude as current marine navigation activities will be able to continue at current levels and only a small area of navigable waters will be affected. The residual effects of marine infrastructure on marine navigation will be restricted mostly to the Project footprint and will begin during the construction phase but be mostly restricted to the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term). Although the residual effects will be continuous while the marine components are in place (i.e., through the operation phase), the residual effects will be reversible upon decommissioning the Project. The Project will work with marine users to establish and implement effective methods of communication, to communicate its anticipated Project-related activities and physical works in the marine environment. There is a low risk and uncertainty of impact predicted. The Project will develop and implement a Project-specific environmental management plan that outlines specific monitoring and mitigation measures tied to Project-related activities and physical works, which will also incorporate marine safety and emergency measure plans. The locations and detailed specifications will be developed during Front-End Engineering and Design (**FEED**).

Marine Shipping and Marine Transportation

LNGCs are anticipated to enter Canadian waters from the west through Dixon Entrance north of Haida Gwaii and travel to a designated location west of, but near to, Triple Island, where it will pick up a BC Coast Pilot. LNGCs will be piloted between Triple Island and the Project's marine terminal by BC Coast Pilots to support the safe inbound and outbound transits of LNGCs, consistent with applicable marine navigation laws and regulations. With a BC Coast Pilot onboard, LNGCs will travel east, south of the Dundas Island group and then travel north through Chatham Sound, Main Passage, through Portland Inlet and then northeast into Portland Canal. The Project's actual marine shipping (transit) route and/or procedures for LNGCs may change, informed by future engagements with Indigenous communities, government agencies, and stakeholders. As the marine shipping (transit) route follows a path currently

being used by cargo ships accessing the Port of Stewart, no new focal points or marine navigational hazards will be created (Westmar Advisors 2022a).

The width of the narrowest section of the marine shipping (transit) route and materials and supply shipping route is approximately 2,800 m, and the width of the largest Project-related vessels, the LNGCs, is approximately 50 m. Given the width of the narrowest section of the shipping routes, the LNGCs will occupy approximately 2% of the channel width in Portland Canal. Between the Site and the Triple Island Boarding Station, LNGCs are anticipated to travel at speeds up to 14 knots (25.9 km/hour) and from the Triple Island Boarding Station to the 12 nm limit, LNGCs are anticipated to travel a typical speed of 16 knots (29.6 km/hour). Based on these anticipated speeds and the estimated lengths of the marine shipping route and open water marine shipping route, LNGCs will take between 9 and 16 hours (5-8 hours for the marine shipping route and 5-8 hours for the open water marine shipping route) for one-way of transit. LNGCs are not anticipated to anchor anywhere along the marine shipping (transit) route unless otherwise directed by another agency (e.g., the BC Coast Pilots, CCG, or PPA), and will remain underway, or in movement, until it reaches the Site.

The eventual decommissioning of the Project or extension of operating life (after a minimum of 30 years) is described in general terms at this time. It is anticipated that decommissioning planning will result in the development of a decommissioning plan in consultation with the Nisga'a Nation. Decommissioning is expected to take one year and require a small workforce. Specifically, it may include:

- Moving the FLNGs to a Canadian or foreign shipyard for refurbishing or salvage
- Transporting and disposal or recycling of equipment and materials

The residual effects of marine shipping and marine transportation on marine navigation will be adverse, but low in magnitude as current marine navigation activities will be able to continue at current levels, and only a small area of navigable waters will be affected as LNGCs will remain underway. The vessels using the marine terminal will not change regional traffic patterns (Westmar Advisors 2022a). Some marine users may choose not to navigate in the area due to the potential or perceived risks to navigation. The preferred route through Chatham Sound is currently being used by vessels of similar size and the route through Portland Inlet and Portland Canal is currently being used by cargo ships, travelling to Stewart (Westmar Advisors 2022a). As there are currently about 21 large, piloted vessels passing through Brown Passage per week, the Project's LNGCs would represent an approximate 14% increase in large vessel traffic, contributing an average of three additional vessels per week (Westmar Advisors 2022a). Project-related vessel traffic will also cross paths with vessels leaving Prince Rupert and heading north around Dundas Island at an acute angle in Chatham Sound; however, there is ample width and depth in Chatham Sound to safely accommodate all vessel types. The increase in Project-related large vessel traffic is considerable relative to the current state of large vessel traffic in the Portland Inlet and Portland Canal (approximately one large, piloted vessel per week), but is still light compared to other routes in the region and other ports along the north coast of BC (e.g., Prince Rupert and Kitimat) (Westmar Advisors 2022a). The residual effects of marine shipping and marine transportation on marine navigation are considered low in magnitude as the marine shipping (transit) route and materials and supply shipping route has the

capacity to accommodate Project-related marine shipping and marine transportation activities, while retaining capacity for growth (Westmar Advisors 2022a). All Project-related vessels will be equipped as required by SOLAS Chapter IV (Radio Communications) and Chapter V (Safety of Navigation) and operated in compliance with the International Radio Regulations by Standards for Training and Certification of Watchkeepers, 1995, qualified persons (Westmar Advisors 2022d). Under the *Canada Shipping Act, 2001* and the SOLAS Chapter V, Project-related vessels, which meet the requirements, will need to be fitted with an AIS transponder (Westmar Advisors 2022c). The AIS transponder automatically provides information about the vessel it is tethered to, including information on its location, vessel identity and specifics, course, speed, and status (Westmar Advisors 2022c). The residual effects will be restricted mostly to the Project LAA, specifically the Project's marine shipping route and materials and supply shipping route and marine terminal, and will begin during the construction phase but be mostly restricted to the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term). Marine shipping will also occur in the OWAA. The residual effects will be reversible at the end of the operation phase when many marine shipping operations have ceased. There is a low risk and uncertainty of impact predicted. Project-related vessels will be piloted by a vessel Master and at least one BC Coast Pilot, under the direction of the *Pilotage Act*. The BC Coast Pilots will determine safe speed profiles and routes for each passage. A Terminal Operations Manual will be developed, in compliance with the standard template developed by the International Harbour Masters Association and include information specific to the Project's marine operations and risk mitigation measures, including the use of close escort and berthing tugs (Westmar Advisors 2022b). The Terminal Operations Manual will also include recommended speed profiles for Project-related vessels travelling along the marine shipping (transit) route (Westmar Advisors 2022b). The Terminal Operations Manual will be completed with the input of the PPA and BC Coast Pilots during the Full Mission Bridge Simulation process (i.e., Phase 2 of the NSA). Speed profiles and tug requirements will be developed during the subsequent phases of Project development and in cooperation with the PPA and BC Coast Pilots (Westmar Advisors 2022b).

Section 9.0 Malfunctions and Accidents provides an assessment of marine accidents. A LNGC or vessel grounding, collision, or allision may result in effects to marine navigation because emergency response efforts may block navigable waters for other vessels and Indigenous Nations' use until the LNGC or NGL product carrier can be removed. However, the effect on marine navigation is expected to be short-term and last only until the vessel is released from its location (i.e., hours to days). A grounding, collision, or allision that results in the release of marine diesel or bunker fuel could affect fisheries through contamination and bioaccumulation, which may result in avoidance of harvesting areas, or a formal restriction on harvesting in the affected area. In most cases, the impacts to a harvesting area are expected to be reversible within a few years following clean-up activities. The effects of a LNGC or vessel collision or grounding in the open water (i.e., the OWAA) is likely to affect fewer marine users, as the area is larger with no islands or confined channels, and more space to navigate around an incident.

7.11.7.2.4 Likelihood of Residual Effect

The likelihood of a residual effect occurring was assessed for marine navigation. Likelihood refers to the probability of a residual effect occurring to marine navigation. Likelihood is determined based on an understanding of the potential effect and the likely effectiveness of available mitigation measures to reduce or avoid the residual effect on marine navigation. The residual effects on marine navigation are categorized as low, as adverse interactions between the Project and marine navigation can largely be avoided or mitigated.

7.11.7.3 Assessment of Change in Marine Fisheries and Other Uses

This section describes the effect pathways, mitigation and enhancement measures, Project residual effects, and likelihood of Project residual effects as they pertain to change in marine fisheries and other uses.

7.11.7.3.1 Project Pathways

The assessment of change in marine fisheries and other uses considered marine use activities such as Indigenous, commercial, and recreational fisheries, and marine-based tourism and recreational activities affected by Project activities. The Project activities include the construction, operation, and decommissioning of the marine terminal and the additional marine shipping and marine transportation activities along the marine shipping (transit) route and materials and supply shipping route. All phases of the Project and their associated marine shipping-related and marine transportation activities have the potential to interact with marine fisheries and other uses, including marine-based tourism and recreation activities. As described in Section 7.11.7.1.1.2, the Project and its related shipping activities may result in an interaction with the commercial salmon fisheries, groundfish (trawl) and shrimp (trawl), and the recreational salmon and groundfish fisheries.

Marine Infrastructure

For a description of Project activities that will result in new marine infrastructure and have the potential to interfere with marine fisheries and other uses, refer to Project residual effects for marine navigation (Section 7.11.7.2).

Marine Shipping and Marine Transportation

For a description of Project activities that will result in additional marine shipping and marine transportation activities along the marine shipping (transit) route and materials and supply shipping route and have the potential to interfere with marine fisheries and other uses, refer to Project residual effects for marine navigation (Section 7.11.7.3).

7.11.7.3.2 Mitigation and Enhancement Measures

Mitigation and enhancement measures were selected based on provincial and federal regulations and policies, on management practices and guidelines, and relevant peer-reviewed literature. Mitigation was selected to address Project interactions that affect marine fisheries and other uses during all Project phases. Table 7.11–20 provides a summary of the mitigation and enhancement measures to avoid or reduce effects to marine fisheries and other uses.

Table 7.11–20 – Mitigation and Enhancement Measures Proposed to Avoid or Reduce Effects to Marine Fisheries and Other Uses

Mitigation/Mitigation Mechanism	Rationale for Selection	Expected Success/Risks and Uncertainty	Timing	Management and/or Compensation Plans
Mitigation 7.11-1: In consultation with Transport Canada, CCG, and BC Coast Pilots, identify and install appropriate ATON within the marine Project footprint. **Mitigation Mechanism:** The installation of appropriate ATON will promote safe marine navigation. ATON will be installed in coordination with the applicable regulatory bodies such as the Canadian Coast Guard and Transport Canada.	This mitigation measure was selected based on its effectiveness to mitigation potential changes to marine navigation and its inclusion as a mitigation measure for similar projects in the region (Aurora LNG 2017b; LNG Canada 2014b).	**Expected Success:** There is a high likelihood of success associated with this mitigation measure because there is a long history of ATON being used to help guide marine traffic in Canada and throughout the world. **Risk and Uncertainty:** There is little uncertainty of the effectiveness of this mitigation measure; however, ATON are subject to damage, failure, and dislocation (CCG 2011). The CCG's Notices to Shipping and robust repair replacement process minimizes the risk to ATON of damage, failure, and dislocation. ATON along the marine shipping (transit) route can be approved and installed by the CCG to support general shipping. Any Project-specific requirements (i.e., on approaches to the marine terminal) will be designed and installed by the Project. Marine terminal specific ATONs need to be recommended by the BC Coast Pilots through their review of the routing and marine terminal configuration. All installations would be reviewed by the CCG to ensure compliance with the International Association of Lighthouse Authorities.	**Project Phase:** All phases **Effectiveness:** This mitigation measure is effective in the long-term as it will be applicable to all phases of the Project.	N/A

Table 7.11–20 – Mitigation and Enhancement Measures Proposed to Avoid or Reduce Effects to Marine Fisheries and Other Uses

Mitigation/Mitigation Mechanism	Rationale for Selection	Expected Success/Risks and Uncertainty	Timing	Management and/or Compensation Plans
Mitigation 7.11-3: Develop a Terminal Operations Manual and include information specific to the Project's marine operations and risk mitigation measures. **Mitigation Mechanism:** The Terminal Operations Manual will be developed, in compliance with the standard template developed by the International Harbour Masters Association and include information specific to the Project's marine operations and risk mitigation measures. The Terminal Operations Manual will also include recommended speed profiles for Project-related vessels travelling along the marine shipping (transit) route.	This mitigation is an industry standard (PRPA 2020a; Port of Vancouver 2022) and was identified during the NSA process (Westmar Advisors 2022b).	**Expected Success:** There is a medium likelihood of success associated with this mitigation measure. Terminal Operations Manual contains localized practices and procedures, designed to promote safe and efficient marine navigation and are standard practice for ports with commercial and industrial activity (PRPA 2020a; Port of Vancouver 2022). The Terminal Operations Manual will be completed with the input of the PPA and BC Coast Pilots during the Full Mission Bridge Simulation process (i.e., during Phase 2 of the NSA). It will be restricted to detailed instructions in the vicinity of the marine terminal and may include generic information for activities outside of the marine terminal's command and control. Speed profiles outside of the marine terminal limits fall under federal regulatory regimes. Vessel speeds will be decided by the vessel's vessel master and an experienced BC Coast Pilot.	**Project Phase:** All phases **Effectiveness:** This mitigation measure is effective in the long-term because it is applicable to all phases of the Project.	Ksi Lisims LNG Terminal Operations Manual

Table 7.11–20 – Mitigation and Enhancement Measures Proposed to Avoid or Reduce Effects to Marine Fisheries and Other Uses

Mitigation/Mitigation Mechanism	Rationale for Selection	Expected Success/Risks and Uncertainty	Timing	Management and/or Compensation Plans
		Risk and Uncertainty: There is some uncertainty of the effectiveness of this mitigation measure because while the Terminal Operations Manual will be understood by other commercial and industrial marine users, it is unlikely that other marine users (i.e., recreational marine users) will be aware of and/or utilize the Terminal Operations Manual. The Project will work with the PPA and BC Coast Pilots in the development of the speed profiles and tug requirements for Project-related vessels.		

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7.11.7.3.3 Gender Based Analysis Plus Considerations for Impact Management

In consideration of GBA Plus, those of Indigenous identity may experience disproportionate effects from the Project as Indigenous persons rely on the natural environment to provide resources for food, social, and ceremonial purposes, and adverse residual effects on Indigenous persons may occur if safe access to the natural environment and/or access to quality marine resources is impeded or reduced. The Proponent is committed to working with Indigenous Nations to explore opportunities to further mitigate adverse effects to Indigenous Nations' interests and enhance Project benefits and will continue to work with Indigenous Nations to develop a shared understanding of how the Project may affect their Indigenous interests (see Sections 11.0 to 19.0 for further details).

7.11.7.3.4 Project Residual Effect

This section describes the Project residual effects on marine fisheries and other uses throughout the construction, operation, and decommissioning phases of the Project. Project residual effects are discussed as they pertain to marine infrastructure and marine shipping.

Marine Infrastructure

The Water Lot site where the Project will be located was selected with NLG support and with consideration of key fishing areas. There is one safe anchorage location in Whiskey Bay near the Site. However, the Project does not plan to construct its marine components in Whiskey Bay or block access to it but will inform the public if valid public safety concerns arise. Located at, or near, the Site are commercial and recreational, and presumably Indigenous, fishing grounds for crab and salmon (net fisheries only such as gillnets and seine nets). Minimal marine-based tourism and recreational activities, such as coastal campsite locations, recreational boating destinations, and SCUBA dive sites, were identified near the Site. There was also minimal recreational boating activity located near the Site. However, due to the limitations of AIS data this may be an underestimate of the actual recreational boating activity (Figure 7.11–13). These conclusions are supported by the NSA, which found little evidence of fishing and recreational vessel activity near the Site (Westmar Advisors 2022a).

For a description of Project decommissioning activities that will result in the dismantling of marine infrastructure and have the potential to interfere with marine fisheries and other uses, refer to Project residual effects for marine navigation (Section 7.11.7.2).

In consideration of the limited marine use activities that take place at or near the Site, the residual effects of marine infrastructure on marine fisheries and marine-based tourism and recreation from the Project's marine components will be adverse but low in magnitude, as current activities will be able to continue at current levels and only a small area of the marine fisheries and other use areas will be affected. The residual effects will be restricted to the Project footprint. The residual effects will begin during the construction phase but will be restricted mostly to the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term), and will be reversible upon decommissioning of the Project. There is a low risk and uncertainty of impact predicted.

Marine Shipping and Marine Transportation

There will be approximately 280 to 320 LNGC movements and 16 to 24 NGL product carrier movements per year. Three suitably equipped tugboats will typically be used to safely assist berthing and unberthing LNGCs. Tugboat moorage at the Site or at a nearby location (e.g., Gingolx harbour) will be determined prior to commercial operations and informed by the Project's engagement with regulatory authorities and local Indigenous communities.

It has been estimated that there will be approximately 228 barge trips over the entire construction phase. Other small vessel movements will include the movement of the Project workforce, which will be transported to the Site via marine craft from Prince Rupert or Gingolx.

As there are currently about 9,090 deep sea bulk carriers and deep-sea cargo/tanker vessel movements per year through the RAA, the Project's LNGCs will result in a 3-4% increase in large commercial vessel traffic along the marine shipping (transit) route per year. Overall, there are currently 51,600 vessel movements per year in the RAA and the Project will contribute an additional 296-344 large vessel movements per year, resulting from 148-172 LNGCs and NGL product carriers navigating along the marine shipping (transit) route. The additional marine shipping traffic from the Project's LNGCs and other Project-related vessels (i.e., NGL product carriers) will result in an average of 0.3% increase in vessel traffic along the marine shipping (transit) route per year.

Both LNGCs and NGL product carriers will berth alongside the FLNGs to load LNG and condensate, respectively. LNG and NGL will be loaded using a system commonly referred to as STS transfer, thereby eliminating separate berths used for the loading of LNGCs and NGL product carriers. Preliminary vessel approach, berthing, and departure maneuvers will be identified during the early stage of the detailed engineering design. Vessel approach, berthing, departure, and tug requirements (number, type, bollard pull) will be determined using Full Mission Bridge Navigation Simulation testing with the PPA and BC Coast Pilots, as needed. Project-related vessels will be piloted by a vessel Master and at least one BC Coast Pilot, under the direction of the *Pilotage Act*. The BC Coast Pilots will determine safe speed profiles and routes for each passage. A Terminal Operations Manual will be developed, in compliance with the standard template developed by the International Harbour Masters Association and will include information specific to the Project's marine operations and risk mitigation measures, including the use of tugs (Westmar Advisors 2022b). The Terminal Operations Manual will also include recommended speed profiles for Project-related vessels travelling along the marine shipping (transit) route (Westmar Advisors 2022b). Speed profiles and tug requirements will be developed during the subsequent phases of Project development and in cooperation with the PPA and BC Coast Pilots (Westmar Advisors 2022b).

For a description of Project decommissioning activities that will result in marine shipping and marine transportation activities and have the potential to interfere with marine fisheries and other uses, refer to Project residual effects for marine navigation (Section 7.11.7.3).

Marine Fisheries

In the event of an interaction between a Project-related vessel and Indigenous, commercial, or recreational marine fishing activities, fishers may be temporarily displaced. For example, if a large vessel such as an LNGC cannot safely alter its course to avoid fishing activities, the larger, less maneuverable vessel will require the smaller, more maneuverable vessel to stop its fishing activities and alter its course. In consideration of existing conditions, it is predicted that an interaction with net fishing activities will result in the largest amount of lost fishing time and therefore, the largest disturbance. A prediction of an interaction between the Project and commercial fisheries was conducted based on the fisheries' locations (i.e., overlap with the Site or marine shipping (transit) route and materials and supply shipping route) and/or the gear type and/or technique used to conduct the fishery (Section 7.11.7.3).

Salmon Fisheries

Indigenous, commercial, and recreational salmon fishing occurs throughout the LAA and RAA. Net gear types (i.e., seine and gillnet) are used primarily along the Project's expected marine shipping route and materials and supply shipping route while troll gear types are used primarily along the Project's open water marine shipping route. Troll fishing in the RAA occurs mostly in Dixon Entrance, north of Haida Gwaii (Figure 7.11–19). Both Indigenous and commercial fishers that are using trolling gear, are using gear types that are highly maneuverable as maneuverability and precision are required by troll fishing vessels to catch fish. Troll fishing vessels are always 'underway' throughout their fishing process. They change their boat speed and water depth using on-board electronic systems and maintain the ability to change course, if required. Similarly, recreational salmon fishers tend to use small, highly maneuverable vessels and maintain the ability to change course, if required. Recreational salmon fishing in the LAA and RAA occurs mostly close to shore and around Triple Island (Figure 7.11–25). As commercial troll and recreational fishing gear and vessels are highly maneuverable, it is expected that these fishers will be able to alter their fishing activities should an interaction between a Project-related vessel occur and resume their fishing activities after the Project-related vessel has passed.

Net fishing (i.e., seine and gillnet) in the LAA occurs mostly close to shore (Figure 7.11–19; BC EAO 2006; see Section 7.11.7.3.5). Seine nets are set from fishing vessels with the assistance of a small skiff. Gillnets are attached to small vessels and tend to be situated at the mouth of, or in, rivers or set close to shore and are continually tended. The most congested area in the Portland Canal, in terms of marine vessel traffic, tends to be between Mylor Peninsula and the northern tip of Somerville Island (BC EAO 2006). However, AIS data indicates that the overall volume of marine traffic in Portland Inlet and Portland Canal is low, with most of the marine traffic being attributed to cargo ships and tugs, heading to Stewart (an average of fewer than two vessels per week). If an interaction between a Project-related vessel and net fishing activities should occur, the interaction may result in a loss of or reduction in fishing activities as fishers may have to retrieve and reset their nets.

Groundfish Fisheries

Indigenous, commercial, and recreational groundfish fishing occurs throughout the RAA, particularly along the Project's open water marine shipping route. Trawl fishing in the RAA occurs mostly in Dixon Entrance, north of Haida Gwaii (Figure 7.11–20). Trawl fishing vessels are always 'underway' throughout their fishing process. They maintain the ability to change course, if required. Recreational groundfish fishing in the LAA and RAA occurs mostly in Chatham Sound and Dixon Entrance (Figure 7.11–25). Similarly, recreational groundfish fishers tend to use small, highly maneuverable vessels and maintain the ability to change course, if required. As commercial trawl and recreational fishing gear and vessels are highly maneuverable, it is expected that these fishers will be able to alter their fishing activities should an interaction between a Project-related vessel occur and resume their fishing activities after the Project-related vessel has passed.

Invertebrate Fisheries

Commercial and Indigenous invertebrate (shrimp trawl only) fishing occurs throughout the RAA, particularly along the Project's expected marine shipping route and materials and supply shipping route. Trawl fishing is particularly present in Chatham Sound and at the entrance to Portland Inlet (Figure 7.11–23). Trawl fishing vessels are always 'underway' throughout their fishing process. They maintain the ability to change course, if required. As commercial trawl fishing gear and vessels are highly maneuverable, it is expected that these fishers will be able to alter their fishing activities should an interaction between a Project-related vessel occur and resume their fishing activities after the Project-related vessel has passed.

Marine Fisheries – Summary

The residual effects on marine fisheries from the Project's marine shipping and marine transportation activities will be adverse but low to medium in magnitude, as there will be a measurable change, but marine use can continue at current levels or, in some cases, at a slightly lower activity level due to displacement. Project residual adverse effects will be focused on the Indigenous and commercial salmon fishery using net fishing gear types, as there are limited openings (e.g., some fisheries may only be open for hours at a time) and an interaction between a Project-related vessel and net fishing activities could lead to a loss of, or reduction in, fishing activities if the fishers are required to retrieve and reset their nets. Interactions between Project-related vessels and Indigenous and commercial fishers using trawl gear types to fish for groundfish, and shrimp may also experience a loss of or reduction in fishing activities, but to a lesser extent than salmon net fisheries, as their gear is more maneuverable. LNGCs associated with the Project will respect speed profiles applicable to the operation of the Project, subject to navigational safety, to prevent or reduce the risk of collisions between LNGCs and NLG product vessels and marine vessels and marine mammals, fishers, and other marine users. The Project will also work with fishers and other marine users to establish and implement effective methods to communicate its anticipated Project--related activities and physical works in the marine environment. The residual effects will be restricted to the Project's marine shipping (transit) route, including the open water marine shipping route, and will begin during the construction phase but will be restricted mostly to the operation phase, which

will be a minimum of 30 years following completion of construction and commissioning (i.e., long-term). The residual effects will occur at multiple regular events, about 296-344 large vessel movements per year (an average of 6-7 vessel passes per week) and will be reversible upon decommissioning the Project. Project residual effects will be more apparent during key fishing seasons, primarily in the summer months (i.e., July and August).

Marine-Based Tourism and Recreation

Marine-based tourism and recreation sites such as anchorages, coastal campsites, dive sites, and marinas located throughout the LAA and the RAA will likely not be affected by Project-related marine shipping. Most recreational boating routes are located close to shore where the conditions of the marine environment are more stable (e.g., wave heights), with limited overlap with the marine shipping (transit) route. However, marine users may interact with Project-related vessels if access to these sites requires the marine user to transit along or across the Project's marine shipping (transit) route.

Brown Passage is a focal point of potential interaction or intersection with Project-related vessels and marine shipping-related activity, as most of the regional marine vessel traffic travelling east-west passes through this area. Triple Island, which is where the Triple Island Pilot Boarding Station is located, was identified by the PRPA and the NSA as a specific area of concern (Dillon Consulting 2020; Westmar Advisors 2022a). There is a high volume of traffic in the vicinity of Triple Island that does not carry AIS, including fishing and small recreational vessels (Dillon Consulting 2020). Marine users accessing this area may interact with Project-related vessels that are required to visit the Triple Island Pilot Boarding Station. Chatham Sound was also identified as a focal point of potential interaction or intersection with Project-related vessels and marine shipping-related activity (Westmar Advisors 2022a). Vessels such as tugs, fishing, sailing, and pleasure craft move north-south through Chatham Sound and move to and from Prince Rupert in the east, towards Dundas Island on the west side (Westmar Advisors 2022a). The Spire Ledge entrance to the Prince Rupert harbour, which intersects the materials and supply shipping route, was also identified as a specific area of concern (Dillon Consulting 2020). This area is also a popular recreational fishing spot, especially in the winter, which results in small vessel traffic congestion (Dillon Consulting 2020). Smaller vessels often cut corners when making their way into the harbour, which poses a risk to large commercial shipping vessels entering and leaving the harbour as smaller vessels within their turning radius pose a risk of an accident (Dillon Consulting 2020). Smaller vessels regularly cut off larger vessels, which have no room to maneuver (Dillon Consulting 2020). Marine users departing the harbour may interact with Project-related vessels that are required to use the materials and supply shipping route.

In the event of an interaction between a Project-related vessel and marine-based tourism and recreation activities, marine users may be temporarily displaced. For example, if a large vessel such as an LNGC cannot safely alter its course to avoid marine-based tourism and recreation activities, the larger, less maneuverable vessel will require the smaller, more maneuverable vessel to alter its course. The NSA found that the highest likelihood of an interaction between Project-related vessels and fishing, sailing, or pleasure craft would be in Chatham Sound (Westmar Advisors 2022a). However, fishing, sailing, pleasure

craft, and other marine tourism and recreational-related activities are currently co-existing with greater volumes of large vessel traffic in the southern part of Chatham Sound, near Prince Rupert (Westmar Advisors 2022). LNGCs associated with the Project will respect speed profiles applicable to the operation of the Project, subject to navigational safety, to prevent or reduce the risk of collisions between LNGCs and NLG product vessels and marine vessels and marine mammals, fishers, and other marine users. The residual effects on marine-based tourism and recreation from the Project's marine shipping and marine transportation activities will be adverse, but low to medium in magnitude as there will be a measurable change, but marine use can continue at current levels or in some cases, at a slightly lower activity level due to displacement. The residual effects will be restricted to the Project's marine shipping (transit) route, including the open water marine shipping route, and will begin during the construction phase but will be restricted mostly to the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term). The residual effects will occur at multiple regular events, about 296-344 large vessel movements per year (an average of 6-7 vessel passes per week) and will be reversible upon decommissioning the Project. Project residual effects will be more apparent during key marine-based tourism and recreational seasons, primarily in the summer months when weather conditions are favourable (i.e., July and August). The Project will develop and implement a Project-specific environmental management plan that outlines specific monitoring and mitigation measures tied to Project-related activities and physical works, which will also incorporate marine safety and emergency measure plans. There is a low risk and uncertainty of impact predicted.

7.11.7.3.5 Effects on Diverse Subgroups identified through Gender Based Analysis Plus

Indigenous Communities

Indigenous food security is affected by the availability and accessibility of both market and country food, with traditional harvesting practices crucial to Indigenous peoples' health (Shafiee et al. 2022). Research conducted by the University of British Columbia found that coastal Indigenous peoples around the world share a similar connection to marine ecosystems. This connection assists in the conservation of their cultural heritage and supports their food sovereignty (i.e., the right to define and access healthy and culturally appropriate food) (Cisneros-Montemayor et al. 2016). This research also found that coastal Indigenous peoples eat, on average, 15 times more marine resources (i.e., seafood) than non-Indigenous peoples that live in the same country (Cisneros-Montemayor et al. 2016). Reduced interactions with marine ecosystems and access to fish may result in or exacerbate the loss of cultural transmission, language, and physical communities, and as such may be disproportionately affected by the Project and its associated activities (Cisneros-Montemayor et al. 2016). For example, the Kitselas First Nation noted that if Project-related activities, such as marine shipping, contribute to unsafe travel conditions or to perceived risks to health and safety, then Kitselas community members who seek to access the marine environment may choose not to. Kitselas community members' decision not to access the marine environment due to unsafe travel conditions or perceived risks to health and safety may then lead to several health implications associated with reduced or barred access to important cultural and marine resource harvesting sites (Kitselas First Nation 2022). Their connection to marine ecosystems makes coastal Indigenous peoples more vulnerable to changes that affect their fishing and harvesting practices,

such as declines in coastal marine fish populations, climate change, pollution, and multi-scale social-economic dynamics (Cisneros-Montemayor et al. 2016).

The general presence of vessels and increased number of vessels on the water may result in Indigenous communities having (Transport Canada 2022b):

- Increased community concerns
- Increased fear for safety on the water, which may affect community members' mental and physical health
- Decreased consumption and quality of marine resources
- Decreased fishing opportunities
- Decreased access to hunting opportunities
- Decreased access to cultural sites such as conservancies[4]
- Decreased access to trade and traditional journey routes
- Decreased transmission of cultural, knowledge, and family ties
- Decreased tourism opportunities

The exercise or practice of Indigenous rights and interests may be affected by Project-related marine traffic, as the general presence of LNGCs may result in avoidance of harvested shoreline resources, resulting in reduced opportunities to access important cultural areas and practice. Access to marine resources is important to those of Indigenous identity, not only for subsistence purposes but for their physical and mental well-being. For example, Kitselas First Nation noted there are numerous physical, emotional, spiritual, and mental health benefits associated with practicing traditional marine-based activities (Kitselas First Nation 2022). These include increased physical activity, consumption of healthier diets, improved mental health and motivation, and a stronger connection to an individual's culture and identity (Kitselas First Nation 2022). Kitselas First Nation have noted that approximately 30% of Kitselas community members travel in the marine territory at least once per year and 74% of Kitselas community members indicated that their household would like to spend more time in the marine environment (Kitselas First Nation 2022). Some Indigenous Nations have expressed their concern for the potential residual and cumulative effects of increased industrial development and the associated marine vessel traffic in the PRPA, as it may decrease Indigenous Nations' members' ability to access and harvest resources in the quantities needed (Firelight 2022; Inglis Consulting 2022; Kitselas First Nation 2022). Likewise, the Nisga'a nation have expressed concerns regarding the potential for interruptions to commercial fishers operating in the Portland Canal due to increased vessel traffic travelling to Stewart, particularly in regard to potential interactions between longlines (set for halibut fishing activities) being

[4] Conservancies are Crown lands set aside for the protection and maintenance of their biological diversity and natural environments; the preservation and maintenance of social, ceremonial, and cultural uses of Indigenous Nations; the protection and maintenance of their recreational values; and the development of use of natural resources in a manner consistent with the previously stated purposes (BC Parks 2021).

used within the Portland Canal and country food fishing and harvesting activities within the Portland Canal and the northern shoreline of Pearse Island (Nisga'a Nation 2022).

Members of Indigenous Nations implement sustainable seasonal resource harvesting strategies, sometimes referred to as "seasonal rounds" (Cedar 2022). Harvesting schedules are founded on the Indigenous Nations' members' intimate knowledge of the marine resources within their territories (Cedar 2022). Information on harvesting schedules is transmitted across generations and shared among families that inherit access to harvesting areas (Cedar 2022). Harvesting areas and schedules have been impacted by climate change, environmental change, and industrial changes, but the general resources harvested, and areas visited remain central to the cultural, identity, economies, health and well-being, and governance systems of present Indigenous Nations (Cedar 2022). For example, Kitselas First Nations families traditionally have traditional harvesting areas (i.e., house territories), which are still known to community members today but not accessed due to changes in the marine environment (Kitselas First Nation 2022).

Results from the Nisga'a Social, Economic, Resource Use, and Cultural (**SERC**) Survey indicate the frequency of Nisga'a citizens harvesting activities (Appendix 11A). Overall, women participate in harvesting activities less than men and the highest percentage of respondents participate in harvesting freshwater species and the lowest percentage participate in harvesting land-based animals (Appendix 11A). Overall, at least once a year, 31.8% of respondents reported picking berries and other plants, 27% hunted land-based animals, 31.6% hunted fish or other species from the ocean, and 41.4% hunted fish or other species in freshwater (Appendix 11A). The Nisga'a SERC Survey indicated that 58.8% of respondents anticipated that the Project would affect hunting, fishing and harvesting activities. In turn, this could affect the frequency and type of country foods consumed by workers and the diet and nutrition of workers, their families, and community members.

The general presence of vessels and increased number of vessels on the water may impact shoreline harvesting (e.g., invertebrates, marine vegetation harvesting) practices if vessel wake waves interfere with, or are perceived to interfere with, shoreline harvesting practices (Cedar 2022). For example, in the Kitselas First Nation's Community Well-being Risk Report for the Project (2022), it is stated that Kitselas community members are concerned about the increase in marine traffic related to the Project in addition to the increase in marine traffic associated with other existing and proposed projects in the region, as it could pose safety and accessibility risks for Kitselas community members. Kitselas First Nation emphasized the importance of feeling safe and secure while shoreline fishing or harvesting near large vessels and their associated wakes (Kitselas First Nation 2022).

Invertebrate, or shellfish, harvesting takes place from fall to winter (i.e., September to December). The harvest of shellfish occurs on land on protected sandy beaches, and during the lowest low tides (e.g., king tides). The harvest of seaweed occurs in May along rocky promontories during low tide when it is exposed and easily accessible. Kelp is harvested from nearshore areas from a vessel. The modelled maximum wave height at 100 m from the sailing line of an LNGC travelling at 14 knots was estimated at 0.7 m, based on the Kitimat Ship Wake Study (Oceanic Consulting 2014). The height of wake waves

generated by Project-related vessels will be well within the range of natural wave conditions, and in some cases will be less severe than waves created naturally by weather. For example, the highest wake wave recorded at the Site between September 2021 and February 2022, which occurred during a northerly storm, was 0.8 m (Westmar Advisors 2022c).

Wake wave heights at the shore from LNGCs and escort tugs increase as the speed of the vessels increase and decrease as the distance of the vessel from the shoreline increases (Cedar 2022; FitzGerald et al. 2011; LNG Canada 2015; Oceanic Consulting 2014). Confined or narrow waterways are more affected by vessel wake waves because the vessel-induced wave energy does not dissipate before it reaches shore (Cedar 2022). The narrowest section of the marine shipping (transit) route is approximately 2,800 m. For Project--related vessels transiting confined or narrow waterways (i.e., along the marine shipping route), vessels are not anticipated to exceed 14 knots and are expected to transit along the centre of the channel, or as advised by the vessel Master, BC Coast Pilots, CCG, and PPA, further decreasing Project-related vessels' wake effects. See Section 7.09 Marine Resources and Section 11.0-19.0 Indigenous Assessments for more information on the effects of wake and wash on the marine environment.

7.11.7.3.6 Likelihood of Residual Effect

The likelihood of a residual effect occurring was assessed for marine fisheries and other uses. Likelihood refers to the probability of a residual effect occurring to marine fisheries and other uses. Likelihood is determined based on an understanding of the potential effect and the likely effectiveness of available mitigation measures to reduce or avoid the residual effect on marine fisheries and other uses. The residual effects on marine fisheries and other uses are categorized as low to medium as adverse interactions between the Project and marine fisheries and other uses can largely be avoided or mitigated, but some adverse interactions may be difficult to avoid or mitigate and some adverse residual effects may occur.

7.11.7.3.6.1 Likelihood of Residual Effect on Subpopulations/Diverse Subgroups

The residual effects on marine fisheries and other uses on subpopulations/diverse subgroups are categorized as low to medium, as adverse interactions between the Project and marine fisheries and other uses can largely be avoided or mitigated, but some adverse interactions may be difficult to avoid or mitigate and some adverse residual effects may occur.

7.11.7.4 Assessment of Change in Aesthetic Conditions

This section describes the effect pathways, mitigation and enhancement measures, Project residual effects, and likelihood of Project residual effects as they pertain to change in aesthetic conditions.

7.11.7.4.1 Project Pathways

The assessment of change in aesthetic conditions considered the visual quality and ambient lighting conditions affected by the Project during the construction, operation, and decommissioning of the marine terminal and the visual quality and acoustic conditions affected by the additional marine shipping and marine transportation activities along the marine shipping (transit) route and materials and supply shipping route. The acoustic conditions affected by the Project during the construction, operation, and decommissioning of the marine terminal are assessed in Section 7.03 Acoustics; as indicated in

Table 7.11–14, the assessment of the change in aesthetic conditions focuses on shipping-related noise only. All phases of the Project and its associated marine shipping-related and marine transportation activities can affect the aesthetic conditions, as Project-related activities may cause a visible or audible interaction with marine users.

Marine Infrastructure

For a description of Project activities that will result in new marine infrastructure and have the potential to interfere with aesthetic conditions, refer to Project residual effects for marine navigation (Section 7.11.7.2). The construction and operation of the marine terminal will also generate ambient light. Construction lighting must allow for safe construction activities after sundown and before sunrise and in low light conditions (e.g., 24-hour lighting may be required) and therefore adequate lighting to protect workers is required. WorkSafe BC lighting requirements will be achieved. Operation lighting will require adequate lighting for the safe operation of the FLNG, including the berthing of LNGCs or NGL product carriers 24-hours a day, 7 days per week. Adequate lighting to maintain worker and marine shipping safety is integral to a safe workplace (i.e., must meet WorkSafe BC requirements) and is designed into the FLNGs and associated LNGC and NGL product carrier movements. Project infrastructure will not be visible from residential areas, such as Gingolx, the nearest Nisga'a Village to the Site, or Lax Kw'alaams, located at the mouth of the Portland Canal (Figure 7.11–30). However, the Project infrastructure will be visible to marine users navigating in the Portland Canal.

Marine Shipping and Marine Transportation

For a description of Project activities that will result in additional marine shipping and marine transportation activities along the marine shipping (transit) route and materials and supply shipping route and have the potential to interfere with aesthetic conditions, refer to Project residual effects for marine navigation (Section 7.11.7.2.1). There is an average of 472 vessel movements along the marine shipping (transit) route per year, of which an estimated 67.8% will be more than 200 m in length. A change in the aesthetic conditions with respect to visual quality is measured by the extent to which the aesthetic or scenic value of a viewscape is altered compared to pre-existing or natural conditions.

In the operation phase, noise emitted from marine shipping activities is expected to result in an increase of overall noise levels. Shipping activities that will contribute to noise effects include the operation of LNGCs and other marine vessels (such as NGL vessels), warning airhorns, and the operation of tugs. The operation phase is expected to last for 30 years (see Section 7.03 Acoustics).

7.11.7.4.2 Mitigation and Enhancement Measures

Mitigation and enhancement measures were selected based on provincial and federal regulations and policies, on management practices and guidelines, and relevant peer-reviewed literature. Mitigation was selected to address Project interactions that affect aesthetic conditions during all Project phases. Table 7.11–21 provides a summary of the mitigation and enhancement measures to avoid or reduce effects to aesthetic conditions. Additional mitigation and enhance measures to avoid or reduce effects to aesthetic conditions can be found in Section 7.03 Acoustics.

Table 7.11–21 – Mitigation and Enhancement Measures Proposed to Avoid or Reduce Effects to Aesthetic Conditions

Mitigation/Mitigation Mechanism	Rationale for Selection	Expected Success/Risks and Uncertainty	Timing	Management and/or Compensation Plans
Mitigation 7.07-6: Design and implement Project lighting in accordance with the Oil and Gas Commission's *Light Control Best Practices Guideline* (BC OGC 2021) and to limit environmental disturbance (e.g., directional or shielded lighting to direct light downward and inward). **Mitigation Mechanism:** The use of task-orientated lighting and hooded lamps limits the area and intensity of illumination surrounding near-water structures. Reduced light intensity and duration is expected to reduce changes in aesthetic conditions associated with artificial light.	The installation of hooded and directional fixtures has been reported to be successful in decreasing the intensity and area of artificial illumination in near-water areas (Phipps 2001).	**Expected Success:** There is a medium to high likelihood of success with this mitigation measure, which is generally considered an industry standard for lighting of near-water structures. **Risk and Uncertainty:** There is little uncertainty of this mitigation measure's effectiveness as artificial light is required for safe and efficient work and has the potential to cause changes in ambient lighting, even with the implementation of measures for lighting fixtures and use.	**Project Phase:** All phases **Effectiveness:** This mitigation measure is effective in the short-term as lighting regimes will be variable.	EMP

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7.11.7.4.3 Gender Based Analysis Plus Considerations for Impact Management

In consideration of GBA Plus, those of Indigenous identity may experience disproportionate effects from the Project as their sense of place and well-being is tied to their natural environment. A change in aesthetic conditions may have an impact on one's sense of place, which was identified by Indigenous Nations as a concern due to the increase of industrial development in the region and its associated increase in marine shipping traffic. Adverse Project residual effects on Indigenous persons may occur if safe access to the natural environment and/or sense of place is impeded or reduced. Mitigation measures to limit lighting and noise effects are identified in Table 7.11–23. Mitigation measures to limit sensory disturbance that may affect overall sense of place are identified in Section 7.02 Air Quality and Section 7.03 Acoustics. The Project is committed to working with Indigenous Nations to explore opportunities to further mitigate adverse effects to Indigenous Nations' interests and enhance Project benefits and will continue to work with Indigenous Nations to develop a shared understanding of how the Project may affect their Indigenous interests (see Sections 11.0 to 19.0 for further details).

7.11.7.4.4 Project Residual Effect

This section describes the Project residual effects on aesthetic conditions throughout the construction, operation, and decommissioning phases of the Project. Project residual effects are discussed as they pertain to marine infrastructure and marine shipping.

Marine Infrastructure

Project marine components, which will result in new marine infrastructure, include the FLNGs, personnel dock, jetties and platforms, MOF, and power barges. Construction and operation lighting must meet the standards, described in Section 7.11.7.4.1, required to maintain worker safety.

For a description of Project decommissioning activities that will result in the dismantling of marine infrastructure and have the potential to interfere with marine fisheries and other uses, refer to Project residual effects for marine navigation (Section 7.11.7.2.3).

Visual Quality

As the construction and operation of the marine terminal will result in new marine infrastructure, there will be an adverse effect on visual quality. However, since the marine infrastructure will not be visible from residential areas, such as the Nisga'a Village of Gingolx, the nearest community to the Site, or Lax Kw'alaams, located at the mouth of the Portland Canal, it is predicted that effects will be low in magnitude (see the results of the viewshed analysis on Figure 7.11–30). Project marine infrastructure will primarily be visible to marine users navigating in the Portland Canal. The residual effects of visual quality on aesthetic conditions from the Project's marine components will be restricted mostly to the Project footprint and be present during the construction phase and the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term). The residual effects will be continuous but reversible upon decommissioning the Project. There is low risk and uncertainty of impact predicted.

Ambient Lighting

As there is no anticipated direct line of sight between Project components and nearby residences (i.e., Gingolx), Project ambient lighting will not be directly visible. The Project will not cause light spill as there are no sensitive receptors within a direct line of site of the Project. However, the Project will likely contribute to sky glow effects, particularly during periods of low overcast, and this increase in sky glow may be noticeable to Gingolx residents due to their proximity to the Project. It will also be noticeable to marine users navigating in the Portland Canal. Soft lighting will be mounted on the outer vertical face of the FLNG facilities, where it will be visible from seaward but not interfere with mooring line deployment (Westmar Advisors 2022c). The residual effects of ambient lighting on aesthetic conditions from the Project's marine components will be adverse, as the marine infrastructure components and LNGCs that are berthed at the FLNG facility will need to be illuminated during operation for safety purposes, but the adverse residual effects will be low in magnitude as current aesthetic conditions will remain similar to current levels and the marine infrastructure will not be visible from any of the key viewpoints identified. The residual effects of ambient lighting on aesthetic conditions will be restricted mostly to the Project footprint. Project lighting will be present during the construction phase and the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term), but will be reversible upon decommissioning the Project. The residual effects will be continuous. There is low risk and uncertainty of impact predicted. The application of the appropriate mitigation measures, which are industry standards, will reduce the potential residual effects using appropriate design measures. Lighting for the Project will be designed in a manner that is consistent with the BC OGC's Light Control Best Practice Guideline and will consider measures including using directional or shielded lighting to reduce to vertical and horizontal distribution of light and using adaptive controls and variable lighting regimes (e.g., dimmers, motion sensors, timers), which will limit the Project's glare effects on nighttime marine users.

<u>Marine Shipping and Marine Transportation</u>

There will be approximately 280 to 320 LNGC movements and 16 to 24 NGL product vessel movements per year. Three suitably equipped tugboats will typically be used to safely assist berthing and unberthing LNGCs. Tugboat moorage at the Site or at a nearby location (e.g., Gingolx harbour) will be determined prior to operation and informed by the Project's engagement with regulatory authorities and local Indigenous communities.

The Project will contribute an average of an additional 148-172 large vessels that will travel through the RAA and OWAA each year, equaling to about 296-344 large vessel movements per year.

Construction and operation lighting must meet the standards, described in Section 7.11.7.4.1, required to maintain marine shipping safety.

Visual Quality

Other than the Site, the Project will not change any VSU polygons and any change in view towards them will be as a result of the temporary passage of Project marine shipping and marine transportation vessels. Large vessel movements will change the aesthetic or scenic value of the viewscape along the marine shipping (transit) route compared to pre-existing or natural conditions; however, the potential residual effect will be low in magnitude as Project-related vessels will remain underway and there are no planned anchorages anywhere along the marine shipping (transit) route. The viewpoints identified in Figure 7.11–30 will only be affected temporarily by the passage of the Project-related marine vessels. Large Project-related vessels are expected to pass the viewpoints indicated in Figure 7.11–30 about 296-344 times per year, an average of 6-7 times per week. The LNGCs and NGL product vessels along the marine shipping (transit) route will be similar in type and size to other large vessels along the marine shipping (transit) route, such as the cargo ships that are currently traveling to and from the Port of Stewart and the deep-sea bulk carriers, cargo ships, and tanker vessels that are currently travelling to and from the Port of Prince Rupert. The residual effects of visual quality on aesthetic conditions from the Project's marine shipping and marine transportation activities will be restricted mostly to the Project's marine shipping (transit) route and be present during the construction phase and the operation phase, which will be a minimum of 30 years following completion of construction and commissioning (i.e., medium-term). The residual effects will be continuous but be reversible upon decommissioning the Project. There is low risk and uncertainty of impact predicted.

Acoustics

Noise effects from shipping activities during operation will comply with federal and provincial noise guidance. The increase marine shipping activities will result in an increase in noise levels; however, the magnitude of adverse residual effects is low because the predicted noise levels are below the BC OGC noise guideline (2021) and/or Health Canada guidance thresholds. These residual effects related to marine shipping activities will occur at multiple irregular intervals during the operation phase. Residual effects for marine shipping activities will be reversible once noise-generating activities cease. Noise effects are expected to be experienced by all noise sensitive receptors (evenly distributed among the subpopulation). However, noise sensitive receptors closest to the Project activities will have more noise effects from the Project than noise sensitive receptors further away.

No adverse residual effect for acoustics is predicted because the predicted noise effects will not result in an increase in noise levels that exceed regulatory thresholds from the BC OGC noise guidelines and the Health Canada guidance (see Section 7.03 Acoustics). The equipment/material deliveries and worker transportation will be optimized to reduce construction and operation marine traffic to and from the Site, and the associated noise. This will reduce the frequency of noise occurrence from marine vessels and therefore, reduce the magnitude of an increase in noise levels.

7.11.7.4.5 Effects on Diverse Subgroups identified through Gender Based Analysis Plus

Members of Indigenous Nations have cited the uninterrupted use of, and access to, their sacred and culturally important sites, including fishing and harvesting sites, as a key component of Indigenous Nations members' physical and mental health and well-being. Project-related activities have the potential to disrupt sense of place due to the potential alteration of access to preferred marine harvesting locations, marine travel routes, and sacred places and heritage sites. Indigenous Peoples' sense of place is defined as the peaceful enjoyment of lands and waters without sensory disturbances, stress, or harassment, and their emotional and spiritual attachment to culturally important places. The Nisga'a SERC Survey indicated that 54.3% of respondents anticipated that the Project location would affect cultural and traditional activities. The Metlakatla First Nation and Gitxaała Nation expressed concerns related to community health, safety, and well-being due to sensory disturbance from marine shipping activities and changes to the acoustic environment. The Kitselas and Kitsumkalum First Nations expressed concern that Project related- development and population using the territory may pose disruptions to cultural and spiritual connections to the land and water. Kitselas First Nation noted that lights, noise, and activities associated with industrial and residential development at or near the mouth of Prince Rupert harbour and on Kaien Island, Digby Island, Ridley Island, and Lelu Island have made access and navigation in the area increasingly difficult (Kitselas First Nation 2022). In turn, changes to aesthetic conditions and sense of place can affect overall health and well-being outcomes (see Section 7.13 Community Health and Wellness and Sections 11.0-19.0 Indigenous Assessments for more information on sense of place).

7.11.7.4.6 Likelihood of Residual Effect

The likelihood of a residual effect occurring was assessed for aesthetic conditions. Likelihood refers to the probability of a residual effect occurring to marine navigation. Likelihood is determined based on an understanding of the potential effect and the likely effectiveness of available mitigation measures to reduce or avoid the residual effect on aesthetic conditions. The residual effects on aesthetic conditions are categorized as low as adverse interactions between the Project and marine navigation can largely be avoided or mitigated.

7.11.7.4.6.1 Likelihood of Residual Effect on Subpopulations/Diverse Subgroups

The residual effects on aesthetic conditions on subpopulations/diverse subgroups are categorized as low to medium, as adverse interactions between the Project and aesthetic conditions can largely be avoided or mitigated, but some adverse interactions may be difficult to avoid or mitigate and some adverse residual effects may occur.

7.11.8 Summary of Mitigation and Enhancement Measures

Table 7.11–22 provides a summary of mitigation measures for the assessment of marine use. In conjunction with these measures, the Proponents will develop and implement a Project-specific construction environmental monitoring plan that collects the mitigation and enhancement measures tied to Project-related activities and physical works associated with construction. The construction environmental monitoring plan will be incorporated into appropriate construction-related contracts.

While the mitigation measures are intended for the Proponent, Project contractors will be required to implement these measures as applicable to their scope of work.

Table 7.11–22 – Summary of Mitigation and Enhancement Measures for the Assessment of Marine Use

Mitigation Measure	Potential Effects			Subpopulation
	Change in Marine Navigation	Change in Fisheries and Other Uses	Change in Aesthetic Conditions	Indigenous persons
Mitigation 7.11-1: In consultation with Transport Canada, CCG, and BC Coast Pilots, identify and install appropriate aids to navigation within the marine Project footprint.	✓	✓	-	✓
Mitigation 7.11-2: Establish an operational buffer zone around the Project marine infrastructure.	✓	-	-	✓
Mitigation 7.11-3: Develop a Terminal Operations Manual and include information specific to the Project's marine operations and risk mitigation measures.	✓	✓	-	✓
Mitigation 7.07-6: Design and implement Project lighting in accordance with the Oil and Gas Commission's *Light Control Best Practices Guideline* (BC OGC 2021) and to limit environmental disturbance (e.g., directional or shielded lighting to direct light downward and inward).	-	-	✓	✓

7.11.9 Summary of Project Residual Effects

Table 7.11–23 summarizes project residual effects on marine use.

Table 7.11–23 – Project Residual Effects on Marine Use

Project Phase	Proposed Mitigation and Enhancement Measures	Residual Effects Characterization Criteria								
		Magnitude	Geographic Extent	Timing	Duration	Reversibility	Frequency	Affected Subpopulations	Risk (Likelihood and Consequences)	Uncertainty
Change in Marine Navigation										
Construction	7.11-1, 7.11-2, 7.11-3	L	LAA, OWAA	N/A	ST	R	R	E	L	L
Operation	7.11-1, 7.11-2, 7.11-3	L	LAA, OWAA	N/A	MT	R	C	E	L	L
Decommissioning	7.11-1, 7.11-2, 7.11-3	L	LAA	N/A	ST	R	IR	E	L	L
Residual Project effect for all phases	7.11-1, 7.11-2, 7.11-3	L	LAA, OWAA	N/A	MT	R	C	E	L	L
Change in Marine Fisheries and Other Uses										
Construction	7.11-1, 7.11-3	L to M	LAA, OWAA	A	MT	R	R	D	L to M	M
Operation	7.11-1, 7.11-3	L to M	LAA, OWAA	A	LT	R	R	D	L to M	M
Decommissioning	7.11-1, 7.11-3	L to M	LAA	A	ST	R	R	D	L to M	M
Residual Project effect for all phases	7.11-1, 7.11-3	L to M	LAA, OWAA	A	LT	R	R	D	L to M	M

Table 7.11–23 – Project Residual Effects on Marine Use

Project Phase	Proposed Mitigation and Enhancement Measures	Residual Effects Characterization Criteria								
		Magnitude	Geographic Extent	Timing	Duration	Reversibility	Frequency	Affected Subpopulations	Risk (Likelihood and Consequences)	Uncertainty
Change in Aesthetic Conditions										
Construction	7.07-6	L	LAA, OWAA	N/A	MT	R	C	D	L	M
Operation	7.07-6	L	LAA, OWAA	N/A	MT	R	C	D	L	M
Decommissioning	7.07-6	L	LAA	N/A	ST	R	C	D	L	M
Residual Project effect for all phases	7.07-6	L	LAA, OWAA	N/A	MT	R	C	D	L	M

KEY

See Table 7.11–17 for detailed definitions

Project Phase
C: Construction
O: Operation
D: Decommissioning

Magnitude:
NMC: No Measurable Change
L: Low
M: Moderate
H: High

Geographic Extent:
PA: Project Area
LAA: Local Assessment Area (including marine portion of the TLAA)
RAA: Regional Assessment Area
OWAA: Open Water Assessment Area

Timing:
N/A: Not Applicable
A: Applicable

Duration:
ST: Short-term
MT: Medium-term
LT: Long-term
N/A: Not applicable

Affected Subpopulations:
E: Evenly distributed
D: Disproportionally distributed

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Risk (Likelihood and Consequences)
L: Low
M: Moderate
H: High

Uncertainty:
L: Low
M: Moderate
H: High

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7.11.9.1 Summary of Adverse Residual Effects

The Project is expected to comply with existing marine use plans, participate in federal initiatives and requirements (e.g., the Navigational Safety Assessment), and it will result in measurable change, but the change will be low to moderate in magnitude on residual basis. It is not expected to create a change or disruption that widely reduces or restricts present marine use activities to a point where they cannot continue at current activity levels.

The magnitude of the adverse residual effects of the Project on marine use is low to moderate because the proposed mitigation measures will allow for current marine uses to continue at current levels. The adverse residual effects of the Project will be medium-term in duration as they will not extend beyond the life of the Project and will be reversible upon the decommissioning of the Project at the end of the facility life. Upon decommissioning of the Project, the area will be restored as required by NLG and/or per the applicable agreements with the Nisga'a Nation and as prescribed in operating permits.

7.11.9.2 Summary of Positive Residual Effects

The addition of ATON near the Site will have a positive effect on marine navigation. The installation of ATON will not only mark dangers and obstructions related to the Project but assist marine users in determining their position and course, warn marine users of other dangers or obstructions, and advise marine users of the location of the best or preferred route. ATON along the marine shipping (transit) route can be approved and installed by the CCG to support general shipping. Any Project-specific requirements (i.e., on approaches to the marine terminal) will be designed and installed by the Project. Marine terminal specific ATONs need to be recommended by the BC Coast Pilots through their review of the routing and marine terminal configuration. All installations would be reviewed by the CCG to ensure compliance with the International Association of Lighthouse Authorities.

7.11.10 Transmission Line Assessment

The assessment of the transmission line examines effects of the Project's transmission line component on marine use, including:

- Change in marine navigation
- Change in marine fisheries and other uses
- Change in aesthetic conditions

A third-party will own, design, constrict, and operate the transmission line; this includes selection of the route. A high voltage (287kV) electrical cable will be installed to distribute power to smaller substations, the FLNGs, and the plant buildings at the marine terminal location. While the transmission line route is not currently known, for the purposes of this assessment the TLAA encompasses a broad area measuring 36,400 ha and represents the area within which the transmission line is expected to be installed (Figure 7.11–2). Preliminary transmission line scenarios, including aerial and submarine options, with segments of variable lengths have been put forward as potential routes for the assessment; however, final route selection will be the responsibility of the third-party owner. Installation methods associated

with submarine route scenarios include the potential for areas of transmission line burial as well as areas of surface-lay on the seabed. The decommissioning plan is not currently known so for the purposes of this assessment, two scenarios have been considered: removal or abandonment in place.

7.11.10.1 Analytical Assessment Techniques

The assessment of the transmission line and the potential effects associated with the installation and operation of the transmission line is assessed qualitatively as limited information is available at the time of writing. A review of a similar project (i.e., the Sea Breeze Juan de Fuca Cable) was used to inform the decision of relevant effects to consider and the potential for effects on marine use.

Figure 7.11–2 presents the TLAA. It should be noted that the marine portion of the TLAA is fully encompassed within the marine use LAA, which is assessed in Section 7.11.7. Any portion of the transmission that crosses the ocean (i.e., Observatory Inlet, Portland Canal, Portland Inlet, etc.) is assumed to be constructed either subsea or aerially. All potential scenarios presented in this assessment are assumed to be subject to change.

7.11.10.2 Project Pathways

The assessment of the transmission line on the change in marine use considered the portion of the navigable waterway affected by the transmission line during the construction, operation (including infrastructure maintenance), and decommissioning of the marine components of the transmission line. The potential effects due to the marine components of the preliminary transmission line scenarios for the third-party powerline and its associated marine activities has the potential to affect marine navigation through a reduction in area available for marine users to navigate and to interact with marine fisheries (i.e., Indigenous, commercial, and recreational fisheries) and other uses, including marine-based tourism and recreation activities. The construction, operation, and decommissioning of the transmission line may also result in an effect to aesthetic conditions (i.e., visual quality and ambient lighting conditions). The acoustic conditions affected by the transmission line during the construction, operation, and decommissioning of the transmission line are assessed in Section 7.03 Acoustics.

7.11.10.3 Mitigation Measures

A third-party will ultimately design, implement, and operate the transmission line. As such, the Proponents are not able to commit to mitigation measures specific to the transmission line. The mitigation measures presented in Table 7.11–22 are mitigation measures the owner may consider using to avoid or reduce the potential adverse effects associated with the transmission line.

7.11.10.4 Project Residual Effects

The construction, operation, and decommissioning of the transmission line are expected to require additional marine vessels to transport workers and equipment. A dedicated cable-lay vessel is expected to be required for the installation of the transmission line through the submarine area if a subsea cable scenario is taken. Equipment used to bury the cable at nearshore locations is also expected to be required and may consist of one or more dedicated vessels with the necessary equipment to complete the design.

The third-party contractor will likely apply the mitigation measures described below, also identified in Table 7.11–22.

The third-party contractor, in consultation with Transport Canada, CCG, and BC Coast Pilots, may be required by a regulator to identify and install appropriate aids to navigation along the submarine route, if applicable. It will also likely establish and implement effective communications with marine users regarding marine activities such as its schedule and activities for cable-laying operations, including the installation of submarine cables.

During construction, transmission line activities such as marine transportation and the installation of new submarine and/or aerial cables would temporarily disrupt marine users and navigation. The cable would be left in place during the operation and decommissioning phases and would not have an effect on marine users and navigation. During the operation phase, maintenance and repairs to submarine cables are not expected to cause any additional interference with marine users and navigation. In a review of the Sea Breeze Juan de Fuca Cable National Energy Board (now the Canadian Energy Regulator) Environmental Screening, commercial fishers expressed concern that their gear could become caught on the subsea cable. However, it was noted that if the cable remain buried there would be minimal potential for interaction between fishing activities and the subsea cable. It is anticipated that once the subsea cable is buried, it will remain buried to the extent possible. Decommissioning activities such as the removal of subsea and/or aerial cables are expected to cause temporary disruptions to marine users and navigation. Alternatively, the cable may be abandoned in place.

The construction, operation, and decommissioning of the transmission line are expected to involve the use overhead powerlines, which are assumed to be installed at a height that would not interfere with marine navigation but may be visible to marine users utilizing nearby waterways. The potential effect on marine users could be reduced through infrastructure design measures. The transmission line is also likely to be similar in appearance to those already present on the Skeena River.

While the specific details of the transmission line for the Project are not currently known, the potential effects associated with this type of project are well understood. The EA conducted for the Sea Breeze Juan de Fuca Cable considered similar types of activities and pathways of effects and found that the adverse residual effects could be adequately managed. Based on current understanding of the potential scenarios and the effectiveness of anticipated mitigation measures, the effect on marine navigation, fisheries and other uses, and aesthetic conditions is not expected to exceed the effect of other Project activities. Current marine uses are expected to continue at current levels, with minimal disruption.

7.11.11 Assessment of Cumulative Effects on Marine Use

The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The Project has residual adverse effects on marine use
- The residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities

Project residual effects described in Section 7.11.9 that are likely to interact cumulatively with residual effects from past, present, or reasonably foreseeable projects are identified in this section and the resulting cumulative effects are assessed. This is followed by an analysis of the Project contribution to residual cumulative effects.

7.11.11.1 Project Residual Effects Likely to Interact Cumulatively

The Project residual effects identified in Section 7.11.9 with potential to act cumulatively with those past, present and reasonably foreseeable future projects and activities (see Table 6.7-1 in Section 6.7.1 for more information regarding the projects and activities included in the Project and Physical Activities Inclusion List) are listed in Table 7.11–22. Where residual effects from the project have the potential to act cumulatively with residual effects from other projects and physical activities, a cumulative effects assessment is carried out. Effects identified in Table 7.11–24 as not likely to interact cumulatively with residual effects of other projects and physical activities (no check mark) are not discussed further. The assessment of the cumulative effects that are likely to result from the project in combination with other projects and physical activities are discussed in subsequent sections.

Table 7.11–24 – Interactions with the Potential to Contribute to Cumulative Effects

Other Projects and Physical Activities with Potential for Cumulative Effects		Potential Cumulative Effects			
		Marine Navigation	Marine Fisheries and Other Uses	Aesthetic Conditions	Number of Large Vessels* Predicted per Year
Past and Present Physical Activities and Resource Use					
Port of Prince Rupert (PRPA)	Fairview Container Terminal (includes Stage 1A southern expansion) (DP World/PRPA)	✓	✓	✓	208
	Northland Cruise Terminal	✓	✓	✓	60
	Prince Rupert Ferry Terminal	✓	✓	✓	320
	Prince Rupert Grain Terminal (Prince Rupert Grain Terminal Ltd.)	✓	✓	✓	96
	Prince Rupert LGP Export Terminal (Pembina Pipeline Corp.)	✓	✓	✓	48
	Prince Rupert Marine Fuels Project (Wolverine Terminals ULC)	-	✓	✓	-
	Trigon Pacific Terminals	✓	✓	✓	176
	Ridley Island Propane Export Terminal (AltaGas Ltd.)	✓	✓	✓	30
	Westview Wood Pellet Terminal (Pinnacle Renewable Energy Inc.)	✓	✓	✓	20

Other Projects and Physical Activities with Potential for Cumulative Effects		Potential Cumulative Effects			
		Marine Navigation	Marine Fisheries and Other Uses	Aesthetic Conditions	Number of Large Vessels* Predicted per Year
LNG Canada Export Terminal		✓	✓	✓	350
Prince Rupert Airport		-	-	-	-
Northwest Regional Airport Terrace-Kitimat (YXT)		-	-	-	-
Swamp Point – Sand and Gravel		✓	✓	✓	-
Stewart Bulk Terminal		✓	✓	✓	-
Stewart World Port		✓	✓	✓	10
Port of Hyder, AK		✓	✓	✓	-
Kitsault Mine		-	-	-	-
Tru Grit Abrasives[1]		-	-	-	-
All West Trading		✓	✓	✓	-
Various Forestry Activities		-	-	-	-
Various fishing and aquaculture activities		-	✓	✓	-
Marine shipping activities		-	✓	✓	-
Coastal GasLink		-	-	-	-
Future Physical Activities					
Third-party powerline		✓	✓	✓	-
Port of Prince Rupert	Fairview Container Terminal Expansion – Phase 2B, Stage 18 Northern expansion (DP World/PRPA)	✓	✓	✓	508
	Ridley Island Export Logistics Platform Project (PRPA)	✓	✓	✓	700
	Trigon Pacific Terminals Limited (formerly Ridley Terminals Berth Expansion Project)	✓	✓	✓	-
	Vopak Pacific Canada Storage and Export Facility (Vopak Development Canada Inc.)	✓	✓	✓	171
Port Edward Small Scale LNG (Port Edward LNG)		-	✓	✓	0
Prince Rupert Gas Transmission Project (TransCanada Corp.)		✓	✓	-	-

Other Projects and Physical Activities with Potential for Cumulative Effects	Potential Cumulative Effects			
	Marine Navigation	Marine Fisheries and Other Uses	Aesthetic Conditions	Number of Large Vessels* Predicted per Year
Westcoast Connector Gas Transmission Project (Enbridge Inc.)	✓	✓	-	-
Cedar LNG	✓	✓	✓	50
Skeena LNG	✓	✓	✓	2
Totem LNG	✓	✓	✓	1
BC Hydro transmission line upgrades	-	-	-	-

NOTES:

* Large vessels are defined as vessels that are 350 gross tonnes or more and were estimated based on the best available information at the time of writing.

✓ = Those "other projects and physical activities" whose effects are likely to interact cumulatively with the Project's residual effects.

– = Interactions between the residual effects of other projects and the residual effects of the Project are not expected.

SOURCES: PRPA 2022c; PRPA n.d.; BCFC 2022; PRPA 2022d; BC EAO 2018; PRPA 2022e; PRPA 2022f; AltaGas 2016; PRPA 2022g; Ascot Gold n.d.; LNG Canada 2014b; Stewart 2022b, pers. comm.; Pettit 2022, pers. comm.; BC OGC n.d.; IAAC 2008; PRPA 2020d; BC EAO 2020; Vopak 2021a, Port Edward LNG n.d.; TC Energy n.d.; BC OGC 2020; Cedar 2021f

For the cumulative effects assessment, projects and physical activities with marine infrastructure or marine works located in the Portland Canal have been considered in the change in marine navigation. Projects and physical activities with marine shipping activity (i.e., large vessels that have been identified in Table 7.11–24) that intersects the Project's expected marine shipping (transit) route have been considered in the change in marine navigation, change in marine fisheries and other uses, and change in aesthetic conditions.

Present and future industrial development, including LNG projects such as Cedar LNG, LNG Canada, and Port Edward LNG, will likely increase the overall marine traffic in the region. However, they will only act cumulatively with the Project if there is spatial and temporal overlap. The Port Edward LNG project is anticipated to be in service in 2024. The LNG Canada Export Terminal is expected to begin operation in 2025. Cedar LNG, if approved, will not begin its construction until 2027. Based on available information, the operation of the Project will overlap temporally with these LNG projects. As of March 2023, the LNG Canada, Port Edward, and Cedar LNG projects have received their regulatory approvals. The LNG Canada project has been under construction since 2019 and is expected to become operating in the mid-2020s. The Skeena LNG and Totem LNG projects, two small-scale LNG projects located in Terrace and Prince Rupert, have been proposed. The proposed locations for Skeena LNG and Totem LNG are in Terrace and

Prince Rupert, respectively. The two LNG projects have been for sale since 2021. No other information on their statuses was available at the time of writing. It is expected that should they be built, there will be additional shipping activity coming from Prince Rupert associated with the Skeena LNG and Totem LNG projects, although it will be minimal. Existing marine shipping traffic has been considered in the assessment of residual effects (e.g., cruise ship and ferry traffic). The future projects and physical activities listed in Table 7.11–24 are not expected to transit to the Portland Canal but may intersect the Project's expected marine shipping (transit) route near the Triple Island Pilot Boarding Station or its expected materials and supply shipping route near Prince Rupert.

Only projects or physical activities that are anticipated to increase the number of large vessel (i.e., 350 gross tonnes or more) along the marine shipping (transit) route are expected to interact cumulatively with marine use. Small vessels such as the ones used in marine fishing or aquaculture activities are not expected to add to residual cumulative effects on marine use. Large vessel traffic was considered in the cumulative effects assessment of the change in marine navigation, change in marine fisheries and other uses, and change in aesthetic conditions.

Some of the future physical activities listed in Table 7.11–24 may not proceed. For example, the Prince Rupert Gas Transmission, West Coast Connector Gas Transmission, and third-party powerline projects are currently on hold and their schedules for construction and operation are unknown.

7.11.11.2 Change in Marine Navigation

This section describes the effect pathways, mitigation and enhancement measures, residual cumulative effects, and likelihood of residual cumulative effects as they pertain to change in marine navigation.

7.11.11.2.1Cumulative Effect Pathways

The cumulative effects assessment of change in marine navigation considered the effects of current and future projects with marine infrastructure located in the Portland Canal and whose marine shipping routes intersect the marine shipping (transit) route and materials and supply shipping route for the Project. An increase in marine infrastructure located in the Portland Canal may interfere with marine navigation if the amount of marine infrastructure is increased to a level that marine users find it difficult or not possible to navigate the navigable channel. An increase in marine shipping traffic may interfere with marine navigation if the volume of marine shipping traffic is increased to a level that marine use activities are difficult to access or complete or can no longer be accessed or completed.

Present and future physical activities that meet at least one of the following conditions are considered in the cumulative effects assessment on marine navigation:

- Have, or will have, marine infrastructure/marine works in the Portland Canal
- Have, or will have, vessels that intersect or transit the expected marine shipping (transit) route and materials and supply shipping route
- Have, or will have, vessels that transit past the Triple Island Pilot Boarding Station

If none of the conditions are met, the assessment of cumulative effects concludes with a statement that further assessment of cumulative effects is not warranted because the Project does not interact cumulatively with other projects or physical activities. If at least one of the conditions is met, further assessment is carried out to determine whether additional mitigation is required and how conclusions may be affected.

7.11.11.2.2Mitigation and Enhancement Measures for Cumulative Effects

There is minimal to no overlap between the Project and other projects and physical activities with in-water works near the Site and while there is overlap in terms of marine shipping activities, primarily close to the Triple Island Pilot Boarding Station, mitigation and enhancement measures will be implemented to reduce the potential effects to marine navigation (Table 7.11–24). Mitigation and enhancement measures for cumulative effects will be the same as the mitigation and enhancement measures used for residual Project effects (see Table 7.11–22). It is assumed that the projects and physical activities listed in Table 7.11–24 will follow applicable Canadian and international legislation and regulations and implement similar mitigative actions as conditions of Environment Assessment Certificates and permits as those that are Project-related. For example, the Cedar LNG and LNG Canada projects, which are similar LNG projects, have implemented similar mitigative actions (Cedar 2021f, LNG Canada 2014b).

7.11.11.2.3Residual Cumulative Effects

The Project is in a remote area with little other presence of industrial or residential development with in-water project components and is therefore not expected to interact cumulatively with other projects. A review of the Canadian Hydrographic Services charts for the marine terminal location found that there is no existing submarine cables, pipelines, or development nearby (Westmar Advisors 2022c). The Prince Rupert Gas Transmission Project, Westcoast Connector gas Transmission Project, and third-party powerline will result in some marine construction activities in the Portland Canal; however, they will not result in marine infrastructure that will interact cumulatively with the Project's marine infrastructure on marine navigation because the pipeline and cable will be laid directly on the seabed and will not affect the navigation of marine users. Alternatively, the transmission line cable could be placed aerially. However, the construction of the pipeline may affect marine navigation temporarily if access is blocked or reduced with pipe-lay, or other construction activities, including dredging, trenching, seabed preparation, and lowering activities, are occurring. No other projects are anticipated to have in-water marine infrastructure in the same section of the Portland Canal as the Project. The adverse residual effects of the Project's marine infrastructure on marine navigation have been discussed in Section 7.11.7.1.

Based on information in Table 7.11–24, the cumulative effects will include 2,922 vessels per year passing the Triple Island Pilot Boarding Station, through to the OWAA, on both inbound and outbound vessel movements. This total includes the maximum of 160 LNGCs and 12 NGL product vessels visiting the Project. Of these, 2,522 will intersect or transit the expected marine shipping (transit) route and materials and supply shipping route, mostly to and from the Port of Prince Rupert (i.e., 2,340 vessels), and 400 will transit to and from the south (i.e., from Kitimat) to the Triple Island Pilot Boarding Station.

Within the number of large vessels intersecting or transiting the expected marine shipping (transit) route, 380 are cruise ships and ferries. There is an average of two ferry trips per week to Haida Gwaii (91 per year) (see BC Ferries) and an average of four ferry trips per week that have north-south routes (229 per year) (see AMHS and BC Ferries). Based on these data, the aggregated daily number of large vessel movements that are used in the cumulative effect assessment for marine use includes:

- 48 vessels per week that intersect or transit the expected marine shipping (transit) route
- 8 vessels per week that intersect or transit the open water marine shipping route, past Triple Island Pilot Boarding Station

This estimate of present and future large marine vessel traffic assumes that all present and future projects and physical activities identified in Table 7.11–24 will be built and proceed to operation. If all present and future projects and physical activities listed in Table 7.11–24 proceed to construction and operation, approximately 2,922 vessels could intersect or transit the expected marine shipping (transit) route or transit past the Triple Island Pilot Boarding Station annually. The Project will contribute up to 160 LNGCs and 12 NGL vessels, or approximately 6%, to the total present and future large marine vessel traffic predicted for the region if all present and future projects and physical activities are built and proceed to operation.

While the overall increase in marine traffic, if all past, present, and future projects and physical activities continue into their construction and operation phases, exceeds current existing levels of marine traffic, marine traffic is anticipated to increase gradually as projects become operating. Agencies such as the PRPA are anticipating and planning for an increase in marine traffic levels. For example, the PRPA completed a navigational risk assessment study to identify navigational risks in the region and to predict future marine traffic levels. The PRPA's navigational risk assessment study estimates that there will be 1,207 commercial vessels (excluding passenger vessels) calling to the Port of Prince Rupert by 2030 (PRPA 2020b). The model used current port activities as a benchmark and analyzed future scenarios, including potential growth and diversification in terms of vessel numbers, vessel types, and vessel sizes from the Port of Prince Rupert and other north coast developments (PRPA 2020b). The Portland Inlet and Portland Canal have the capacity to accommodate Project-related marine shipping and marine transportation activities while retaining capacity for growth (Westmar Advisors 2022a). Current and future marine traffic volumes are considered feasible as other areas, such as Prince Rupert and Kitimat, are already experiencing higher levels of marine traffic in areas of more constrained marine vessel routing (Westmar Advisors 2022a).

7.11.11.2.4Likelihood of Cumulative Residual Effect

The Project is in a remote area with little other presence of industrial or residential development with in-water project components, and it is expected to interact cumulatively with the other projects that are listed in Table 7.11–24, but at low magnitudes, resulting in a low likelihood of an adverse cumulative residual effect on marine navigation.

With the assumption that all present and future projects and physical activities that are listed in Table 7.11–24 will proceed to their respective construction and operation phases, Project-related large marine vessel traffic will represent 6% of the increase. In consideration of the mitigation and

enhancement measures listed in Table 7.11–22, there is a medium likelihood, but low Project contribution, of cumulative residual effects on marine navigation from present and future projects and physical activities, as adverse cumulative residual effects can be largely mitigated. It is also assumed that the projects and physical activities listed in Table 7.11–24 will follow applicable Canadian and international legislation and regulations and implement similar mitigative actions as conditions of Environment Assessment Certificates and permits as the Project.

7.11.11.3 Change in Marine Fisheries and Other Uses

This section describes the effect pathways, mitigation and enhancement measures, residual cumulative effects, and likelihood of residual cumulative effects as they pertain to change in marine fisheries and other uses.

7.11.11.3.1Cumulative Effect Pathways

The cumulative effects assessment of change in marine fisheries and other uses considered the effects of current and future projects with marine infrastructure located in Portland Canal, and whose marine activities or marine shipping routes intersect the proposed marine shipping (transit) route and materials and supply shipping route for the Project. An increase in marine shipping traffic may interfere with fishing activities (i.e., Indigenous, commercial, and recreational), shoreline harvesting, marine-based tourism, and recreational activities if the volume of marine shipping traffic is increased to a level that marine use activities are difficult to access or complete or can no longer be accessed or completed.

The National Framework for Assessing the Cumulative Effects of Marine Shipping (2022) outlines four impacts that marine shipping (both vessels underway and at rest) have on Indigenous marine uses. The following impacts were presented: open water harvesting, shoreline harvesting, safe access to travel routes, and shoreline cultural features (Transport Canada 2022b). Transport Canada 2022b also presented a list of stressors, effects, and connections. For vessels underway, wake was identified as a potential effect (wake and other potential effects identified, such as vessel strikes, are discussed Section 7.09 Marine Resources). Wake may result in changes in sedimentation, erosion, and interference and may affect bivalve habitats, cultural/burial sites, estuaries, shoreline habitats, and Indigenous marine uses (e.g., Tribal journeys, canoeing, harvesting). For vessels at rest, obstruction was identified as a potential effect. Obstruction may result in reduced visual quality and enjoyment and/or interference and may affect individuals' enjoyment on the water and Indigenous marine uses (e.g., Tribal journeys, canoeing, harvesting).

The general presence of vessels and increased number of vessels on the water may result in reduced access interference, community concerns, and safety on the water, which may affect communities' mental and physical health; consumption and quality of marine resources, fishing, hunting, and cultural sites; trade and traditional journey routes; the transmission of cultural, knowledge, and family ties; and tourism (Transport Canada 2022b). The Gitga'at First Nation have noted that the increased marine traffic to and from the Prince Rupert Harbour and surrounding area raises safety issues for Gitga'at First Nation members when travelling in vessels to fishing areas (e.g., areas for trolling for halibut, setting and pulling traps for crabs and prawns, and shoreline harvesting for clams, cockles, seaweed) (Inglis Consulting 2022).

7.11.11.3.2 Mitigation and Enhancement Measures for Cumulative Effects

There is minimal to no overlap between the Project and other projects and physical activities with in-water works near the Site and while there is overlap in terms of marine shipping activities, primarily close to the Triple Island Pilot Boarding Station, mitigation and enhancement measures will be implemented to reduce the potential effects to marine navigation (Table 7.11–24). Mitigation and enhancement measures for cumulative effects will be the same as the mitigation and enhancement measures used for Project residual effects (see Table 7.11–22). It is assumed that the projects and physical activities listed in Table 7.11–24 will follow applicable Canadian and international legislation and regulations and implement similar mitigative actions as conditions of Environment Assessment Certificates and permits as those that are Project-related.

7.11.11.3.3 Residual Cumulative Effects

The Project is in a remote area with little other presence of industrial or residential development with in-water project components, and as such it is not expected to interact cumulatively with other projects with the exception of the Prince Rupert Gas Transmission and the Westcoast Connector Gas Transmission Projects. The Prince Rupert Gas Transmission and the Westcoast Connector Gas Transmission Projects will result in some marine construction activities and in-water project components in the Portland Canal. The residual cumulative effects to marine fisheries and other uses from these projects are predicted to be minimal as most of the infrastructure will be laid directly on the seabed. The construction of the pipelines, including the pipeline placement activity and noise emissions, were identified as having the potential to interact with marine fisheries and other uses. During operation, minimal potential effects on marine fisheries and other uses were predicted, with the exception of the Project's presence (i.e., the presence of the buried pipeline in the marine environment). No overlapping commercial groundfish trawling activity in the area was identified (Figure 7.11–20). No other projects are anticipated to have in-water marine infrastructure in the same section of the Portland Canal as the Project. The adverse residual effects of the Project's marine infrastructure have on marine fisheries and other uses have been discussed in Section 7.11.7.3.

Refer to Project residual cumulative effects for marine navigation (Section 7.11.11.2), for discussion on the volume of marine shipping traffic along the marine shipping (transit) route and materials and supply shipping route per year from present and future projects and physical activities. This estimate of present and future large marine vessel traffic assumes that all present and future projects and physical activities identified in Table 7.11–24 will be built and proceed to operation. If all present and future projects and physical activities listed in Table 7.11–24 proceed to construction and operation, approximately 2,922 vessels could intersect or transit the expected marine shipping route or transit past the Triple Island Pilot Boarding Station, through to the OWAA, annually. The Project will contribute up to 160 LNGCs and 12 NGLs, or approximately 6%, to the total present and future large marine vessel traffic predicted for the region if all present and future projects and physical activities are built and proceed to operation.

Research conducted on the economic contribution of ocean-based activities on Pacific coast of BC showed that ocean sectors contributed about $4.9 billion to the province's Gross Domestic Product (**GDP**) in 2015, generating total industry revenues of about $12 billion and about 106,120 full-time equivalent jobs (Teh et al. 2022). The study assessed the following ocean sectors: wild fisheries, recreational fisheries, seafood processing, marine recreation and tourism (i.e., whale watching, kayaking, and ocean-side activities), cruise lines, and marine transportation (consisting of marine shipping, freight and passenger transport, and support services) (Teh et al. 2022). These ocean sectors were then defined as living or nonliving, where living means the sector is dependent on an ecologically functioning ocean ecosystem and nonliving requires only a water medium to operate and does not require underlying biodiversity or ecological health (Teh et al. 2022). The study did not account for subsistence fisheries, based on the rationale that their primary purpose is to fulfill food and sociocultural requirements (Teh et al. 2022). The study was also limited in that it did not account for the sociocultural, aesthetic, and spiritual values that are associated with the marine environment (Teh et al. 2022). Revenues, GDP contributions, wages, and the number of jobs for the nonliving ocean sector steadily increased from 2000 to 2015, whereas for the living sector, over the same period, revenues, GDP contribution, wages, and the number of jobs either slightly increased or remained the same (Teh et al. 2022). Previous EAs completed in the region have drawn the conclusion that there is no positive correlation between the presence of marine shipping activities and commercial fisheries catch data (Cedar 2021f; LNG Canada 2014b). As the Project is located in a remote area with little to no other presence of industrial or residential development with in-water project components, The Project's cumulative effects will be limited and as evidenced by the researched conducted by Teh et al. and other EAs completed in the region, the cumulative effects of the Project's marine shipping-related activities will have a limited effect on marine fisheries and other uses.

A study on the cumulative effects of vessels in the Burrard Inlet in Vancouver, BC acknowledged the distinction between wind-generated waves and vessel wake waves (KWL 2021). The study found that vessels with no AIS data (i.e., smaller vessels that do not require AIS data) generated the largest wave power exceedance probabilities, followed by tugs and AIS-equipped passenger and pleasure craft (KWL 2021). Cargo, fishing, tanker, and sailing vessels recorded the smallest wave power exceedance probabilities; however, this is due to the fact wake events from smaller vessels such as tugs, passenger, and pleasure craft are more frequent than other vessel types (KWL 2021). The Project will contribute up to 172 large vessels (i.e., up to 160 LNGCs and 12 NGL product vessels) per year. As previously discussed, the height of wake waves generated by Project-related vessels will be well within the range of natural wave conditions, and in some cases will be less severe than waves created naturally by weather. Wake wave heights at the shore from LNGCs and escort tugs increase as the speed of the vessels increase and decrease as the distance of the vessel from the shoreline increases. Project-related vessels will be operated by a vessel Master and at least one experienced BC Coast Pilot. Project-related vessels are not anticipated to exceed 14 knots and are expected to transit along the centre of the channel, or as advised by the vessel Master, BC Coast Pilots, CCG, and PPA, further decreasing Project-related vessels' wake effects and as such, cumulative effects of Project-related vessels in regard to wake effects are expected to be limited.

7.11.11.3.4Likelihood of Cumulative Residual Effect

With the assumption that all present and future projects and physical activities that are listed in Table 7.11–24 proceed to their respective construction and operation phases, Project-related large marine vessel traffic will represent 6% of the increase. In consideration of the mitigation and enhancement measures listed in Table 7.11–22, there is a medium likelihood, but low Project contribution, of cumulative residual effects on marine fisheries and other uses from present and future projects and physical activities as adverse cumulative residual effects can be largely mitigated. It is also assumed that the projects and physical activities listed in Table 7.11–24 will follow applicable Canadian and international legislation and regulations and implement similar mitigative actions as conditions of Environment Assessment Certificates and permits as those that are Project-related.

7.11.11.4 Change in Aesthetic Conditions

This section describes the effect pathways, mitigation and enhancement measures, residual cumulative effects, and likelihood of residual cumulative effects as they pertain to change in aesthetic conditions.

7.11.11.4.1Cumulative Effect Pathways

The cumulative effects assessment of change in aesthetic conditions considered the effects of current and future projects with marine infrastructure located in Portland Canal and whose marine shipping routes intersect the proposed marine shipping routes for the Project. An increase in marine shipping traffic may interfere with aesthetic conditions along the marine shipping (transit) route and materials and supply shipping route if the volume of marine shipping traffic is increased to a level that the aesthetic conditions (i.e., visual quality, acoustic environment, and ambient lighting) are reduced.

7.11.11.4.2Mitigation and Enhancement Measures for Cumulative Effects

There is minimal to no overlap between the Project and other projects and physical activities with in-water works near the Site and while there is overlap in terms of marine shipping activities, primarily close to the Triple Island Pilot Boarding Station, mitigation and enhancement measures will be implemented to reduce the potential effects to marine navigation (Table 7.11–24). Mitigation and enhancement measures for cumulative effects will be the same as the mitigation and enhancement measures used for Project residual effects (see Table 7.11–22). It is assumed that the projects and physical activities listed in Table 7.11–24 will follow applicable Canadian and international legislation and regulations and implement similar mitigative actions as conditions of Environment Assessment Certificates and permits as those that are Project-related.

7.11.11.4.3Residual Cumulative Effects

The Project is in a remote area with little other presence of industrial or residential development with in-water project components, and as such it is not expected to interact cumulatively with other projects. The Prince Rupert Gas Transmission Project, the Westcoast Connector Gas Transmission Project, and third-party pipeline will result in some marine infrastructure in the Portland Canal that may interact cumulatively with the Project on aesthetic conditions. This is due to the visual presence of vessels, ambient lighting, and noise emissions that will be generated during the construction phase. During operation, no potential effects on aesthetic conditions were predicted. No other projects are anticipated to have in-water marine infrastructure in the same section of the Portland Canal as the Project. As there are no other industrial development located near the Site, the Project is not expected to interact cumulatively to reduce the aesthetic conditions of the marine environment (i.e., visual quality, acoustics, and ambient lighting). The adverse residual effects of the Project's marine infrastructure have on aesthetic conditions have been discussed in Section 7.11.7.4.

Refer to Project residual cumulative effects for marine navigation (Section 7.11.11.2), for discussion on the number of marine shipping traffic along the marine shipping (transit) route and materials and supply shipping route per year from present and future projects and physical activities. This estimate of present and future large marine vessel traffic assumes that all present and future projects and physical activities identified in Table 7.11–24 will be built and proceed to operation. If all present and future projects and physical activities listed in Table 7.11–24 proceed to construction and operation, approximately 2,922 vessels could intersect or transit the expected marine shipping route or transit past the Triple Island Pilot Boarding Station, through to the OWAA, annually. The Project will contribute up to 160 LNGCs and 12 NGLs, or approximately 6% to the total present and future large marine vessel traffic predicted for the region if all present and future projects and physical activities are built and proceed to operation. This could result in some overlapping effects to visual quality due to the increased presence of large shipping vessels along the marine shipping (transit) route and materials and supply shipping route.

7.11.11.4.4Likelihood of Cumulative Residual Effect

With the assumption that all present and future projects and physical activities that are listed in Table 7.11–24 proceed to their respective construction and operation phases, Project-related vessel traffic will represent 6% of the total increase in vessel traffic. In consideration of the mitigation and enhancement measures listed in Table 7.11–22, there is a medium likelihood, but low Project contribution, of cumulative residual effects on aesthetic conditions from present and future projects and physical activities. The Project's contribution to adverse cumulative residual effects will be moderate. While there is some overlap with other projects and physical activities, the adverse cumulative residual effects can be reduce using the proposed mitigation and enhancement measures. It is assumed that the projects and physical activities listed in Table 7.11–24 will follow applicable Canadian and international legislation and regulations and implement similar mitigative actions as conditions of Environment Assessment Certificates and permits as those that are Project-related.

7.11.11.5 Summary of Cumulative Effects

Table 7.11–25 summarizes cumulative effects on marine use.

Table 7.11–25 – Summary of Residual Cumulative Effects on Marine Use

Project Phase	Proposed Mitigation Measures	Cumulative Effects Rating Criteria								
		Magnitude	Geographic Extent	Timing	Duration	Reversibility	Frequency	Affected Subpopulations	Risk (Likelihood and Consequences)	Uncertainty
Change in Marine Navigation										
Construction	7.11-1, 7.11-2, 7.11-3	L	RAA	NA	MT	R	MR	E	M	M
Operation	7.11-1, 7.11-2, 7.11-3	L	RAA	NA	MT	R	MR	E	M	M
Decommissioning	7.11-1, 7.11-2, 7.11-3	L	RAA	NA	ST	R	MR	E	M	M
Residual Project effect for all phases	7.11-1, 7.11-2, 7.11-3	L	RAA	NA	MT	R	MR	E	M	M
Change in Marine Fisheries and Other Uses										
Construction	7.11-1, 7.11-3	L	RAA, OWAA	A	MT	R	MR	D	M	M
Operation	7.11-1, 7.11-3	L	RAA, OWAA	A	MT	R	MR	D	M	M
Decommissioning	7.11-1, 7.11-3	L	RAA, OWAA	A	ST	R	MR	D	M	M
Residual Project effect for all phases	7.11-1, 7.11-3	L	RAA, OWAA	A	MT	R	MR	D	M	M
Change in Aesthetic Conditions										
Construction	7.07-6	L	RAA, OWAA	NA	MT	R	MR	D	M	M
Operation	7.07-6	L	RAA, OWAA	NA	MT	R	MR	D	M	M
Decommissioning	7.07-6	L	RAA, OWAA	NA	ST	R	MR	D	M	M
Residual Project effect for all phases	7.07-6	L	RAA, OWAA	NA	MT	R	MR	D	M	M

Table 7.11–25 – Summary of Residual Cumulative Effects on Marine Use

Project Phase	Proposed Mitigation Measures	Cumulative Effects Rating Criteria								
		Magnitude	Geographic Extent	Timing	Duration	Reversibility	Frequency	Affected Subpopulations	Risk (Likelihood and Consequences)	Uncertainty

KEY

See Table 7.11–17 for detailed definitions

N/A: Not applicable

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project development area
LAA: Local assessment area
RAA: Regional assessment area
OWAA: Open water assessment area
TLAA: Transmission line assessment area

Timing:
N/A: Not Applicable
A: Applicable

Frequency:
S: Single event
MI: Multiple irregular events
MR: Multiple regular events
C: Continuous

Duration:
ST: Short-term
MT: Medium-term
LT: Long-term
P: Permanent

Reversibility:
R: Reversible
I: Irreversible

Affected Subpopulations:
E: Evenly distributed
D: Disproportionally distributed

Risk (Likelihood and Consequences)
L: Low
M: Moderate
H: High

Uncertainty
L: Low
M: Moderate
H: High

The Project will contribute 148-172 additional large vessels annually to the current and reasonably foreseeable-future marine traffic. The adverse residual cumulative effects of the Project on marine use are predicted to be reasonably similar with the presence of the Project and without the presence of the Project, as Project-related vessel traffic will represent only 6% of the total large marine vessel traffic from present and future projects and physical activities.

7.11.11.6 Prediction Confidence

Overall, there is a medium degree of confidence in the assessment of Project residual and cumulative effects on marine use. The prediction confidence in the conclusions for Project residual and cumulative effects on marine use is based on:

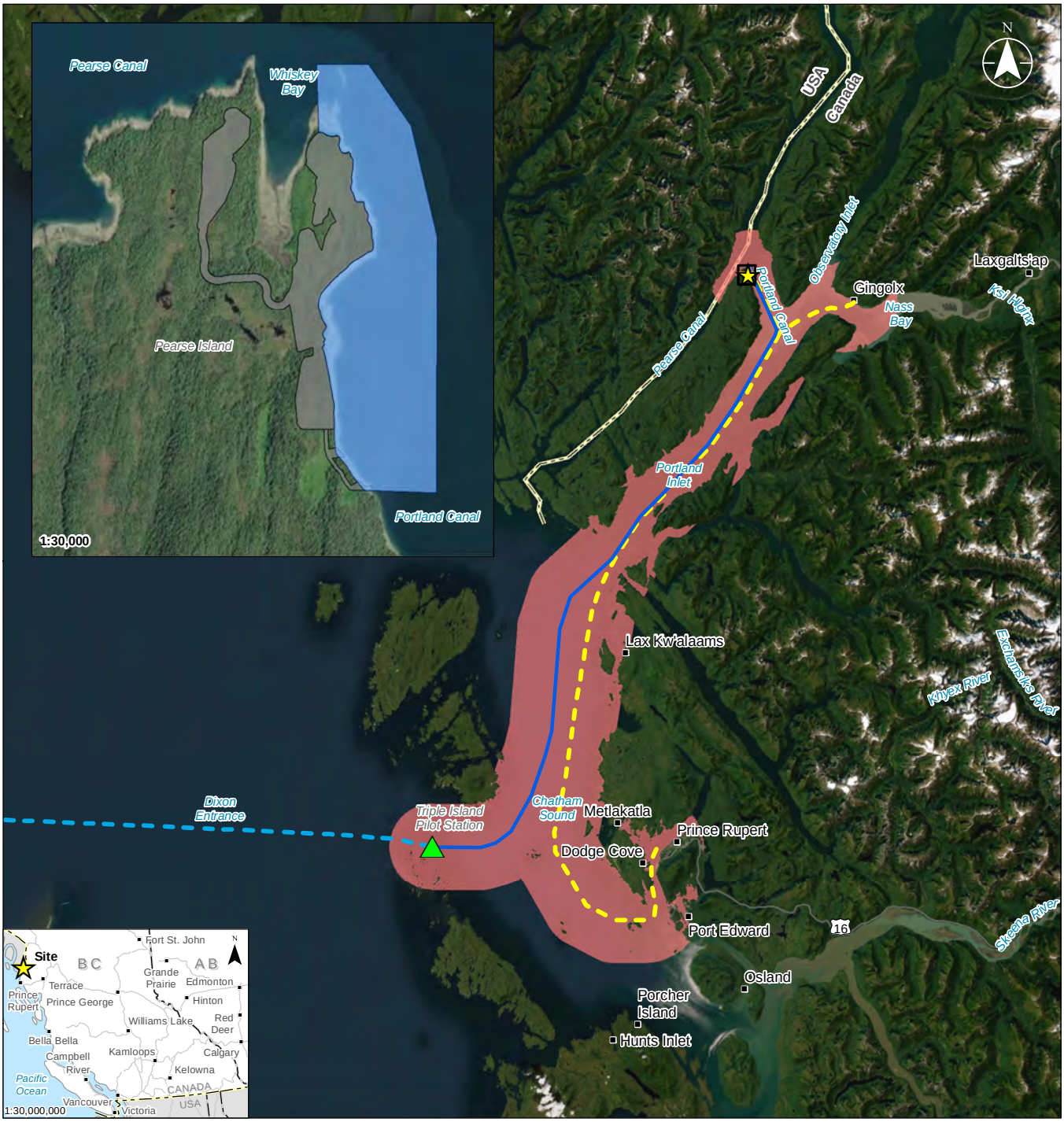
- The availability of quality existing conditions information on marine navigation, vessel traffic, marine fisheries (Indigenous, commercial, and recreational), marine-based tourism and recreation, and aesthetic conditions
- An understanding of the Project effect mechanisms
- An understanding of the effectiveness of proposed mitigation measures and a high level of certainty relative to the effectiveness of proposed mitigation measures
- Professional judgment from prior experience and understanding of proposed mitigation measures
- Limitation of available AIS data for small vessels (e.g., motorized, and non-motorized small vessels that are not required to operate AIS Class A systems)
- Limitations of available spatial data on marine fisheries and shoreline harvesting locations, particularly for Indigenous fisheries
- Limitations and uncertainty surrounding the timing and opening of some marine fisheries
- Uncertainty surrounding future projects and physical activities; reasonably near-future projects and physical activities included in the cumulative effects assessment are subject to change or cancellation

7.11.12 Follow-up Strategy

With the implementation of standard mitigation measures and best management practices, the potential adverse residual and cumulative effects of Project activities on marine use are expected to be low to moderate. The level of confidence in this prediction is medium to high for effects on marine navigation and marine fisheries and other uses because of limitations in the level of AIS data available for small vessels and limitations in the level of spatial detail available to describe some marine fisheries.

No follow-up monitoring programs are proposed for marine use. However, the Project is committed to the development of a Terminal Operations Manual. This plan will describe best management practices and mitigation measures to maintain navigational safety and protect marine users during operation of the Project. The plan will describe, as a minimum, marine communication and traffic systems, safety, security and environmental policies, tug requirements, and navigation (including marine route, pilotage and interactions with marine mammals). During the construction phase, Transport Canada will require the second phase of the NSA be completed, prior to the start of operation. The second phase of the NSA will be the subject of certificate conditions. It will also require the development of the previously mentioned Terminal Operations Manual.

7.11.13 Figures



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Project Footprint
- Marine Use Local Assessment Area
- Project Footprint
- Highway
- International Boundary

0 5 10 15 20 25 km
1:825,000 (at original document size of 8.5x11)

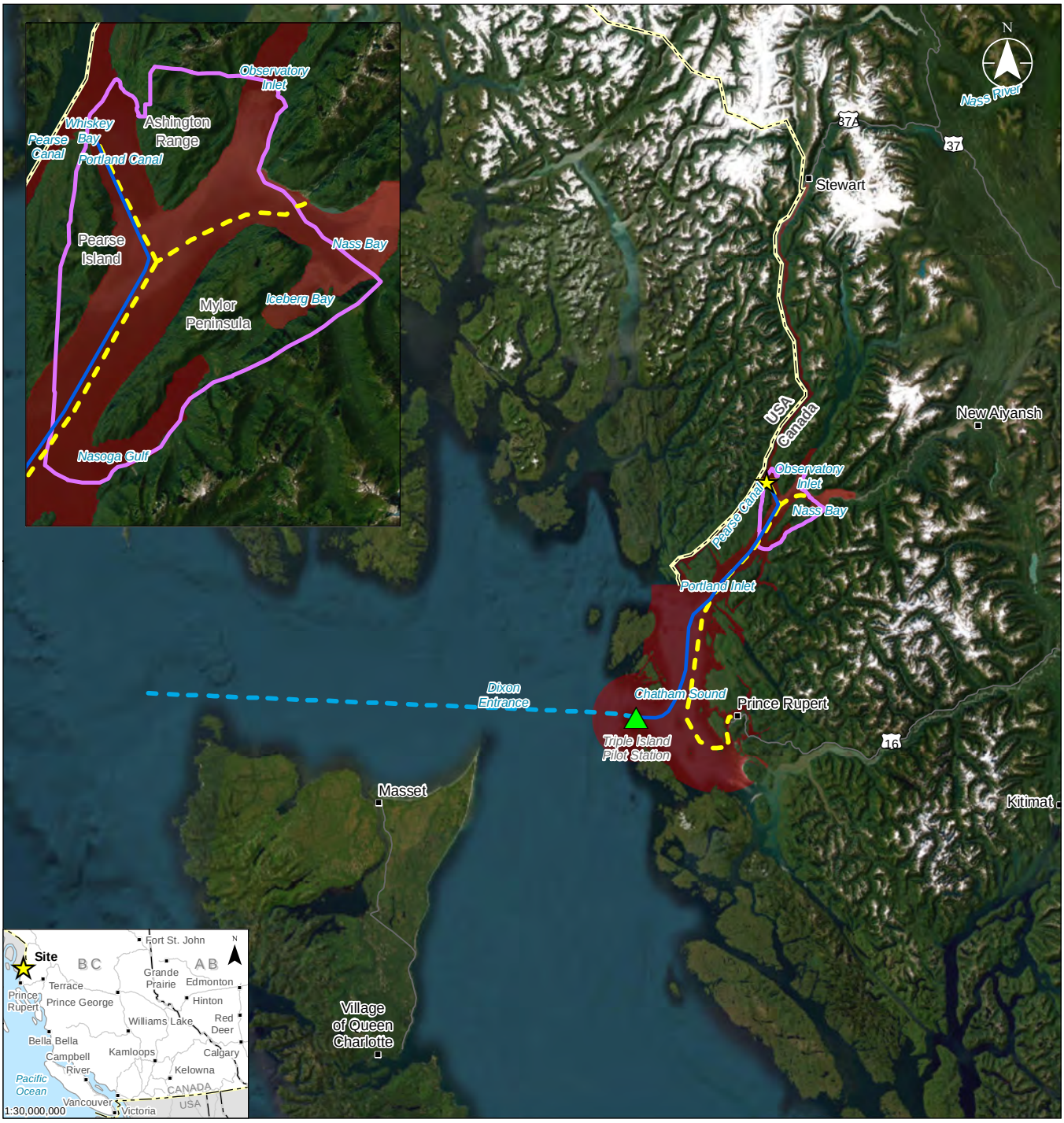
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220722
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-1

Title
Marine Use Local Assessment Area



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- Site
- Triple Island Pilot Station
- Expected Marine Transit Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Regional Assessment Area
- Transmission Line Assessment Area
- Highway
- International Boundary

0 10 20 30 40 50 km
1:2,000,000 (at original document size of 8.5x11)

Stantec

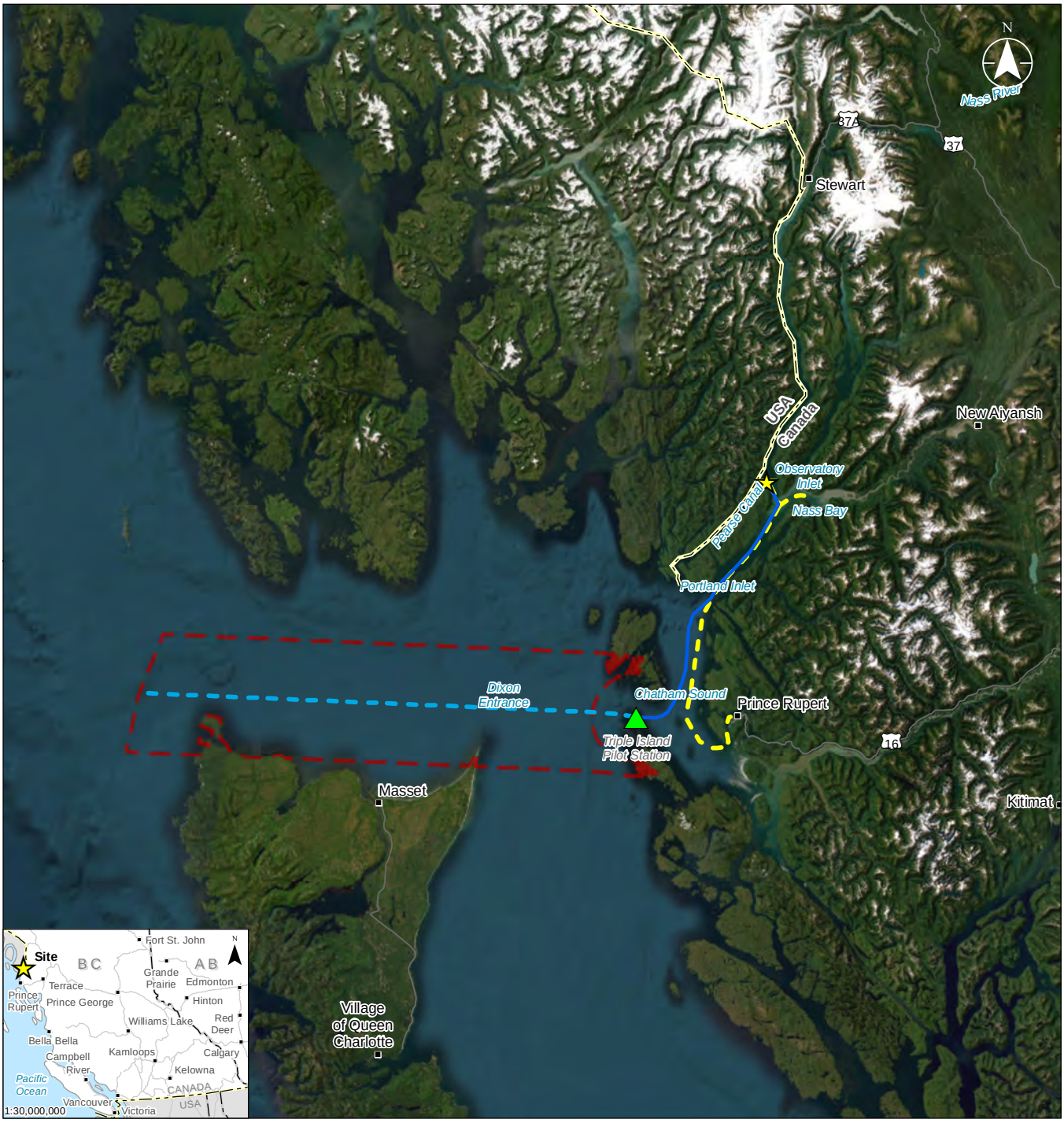
Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220722
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220722

Client/Project/Report

Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-2

Title
Marine Use Regional Assessment Area and Transmission Line Assessment Area



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Open Water Assessment Area
- Highway
- International Boundary

0 15 30 45 60 75 km

1:2,000,000 (at original document size of 8.5x11)

Stantec

Project Location:
Pearse Island, BC

Project Number: 123221820
Prepared by SMOSS on 20220722
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220722

Client/Project/Report

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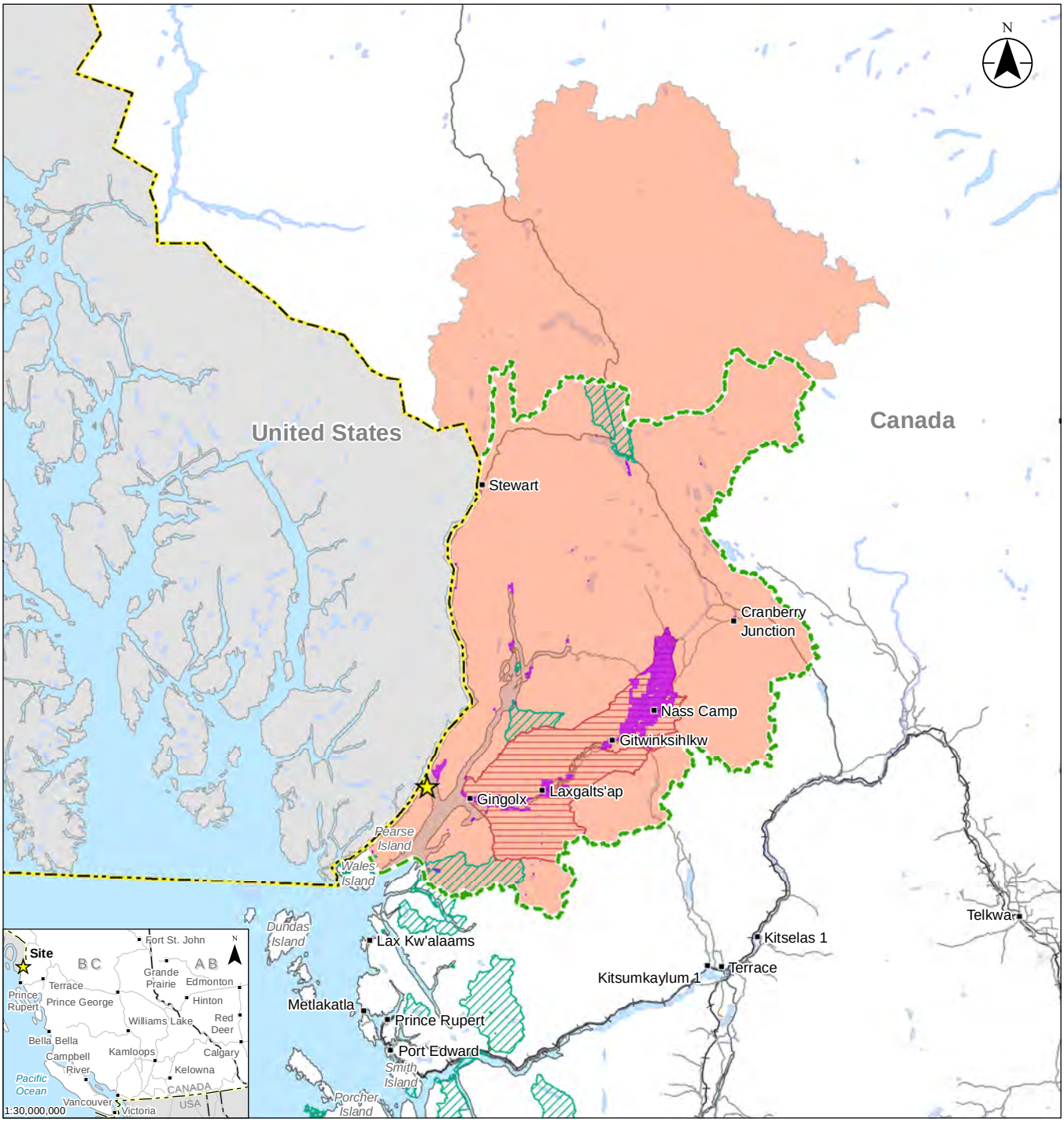
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.

7.11-3

Title

Marine Use Open Water Assessment Area



KSI LISIMS LNG

Site
Conservancy Area
Nass Area
Nisga'a Lands
Nass Wildlife Area
Nisga'a Nation Category A & B Land
City, Town, Village, or District Municipality
International Boundary
Highway
Road
Railway
Waterbody

0 15 30 45 60 km
1:2,000,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada, Maxar, Rockies LNG

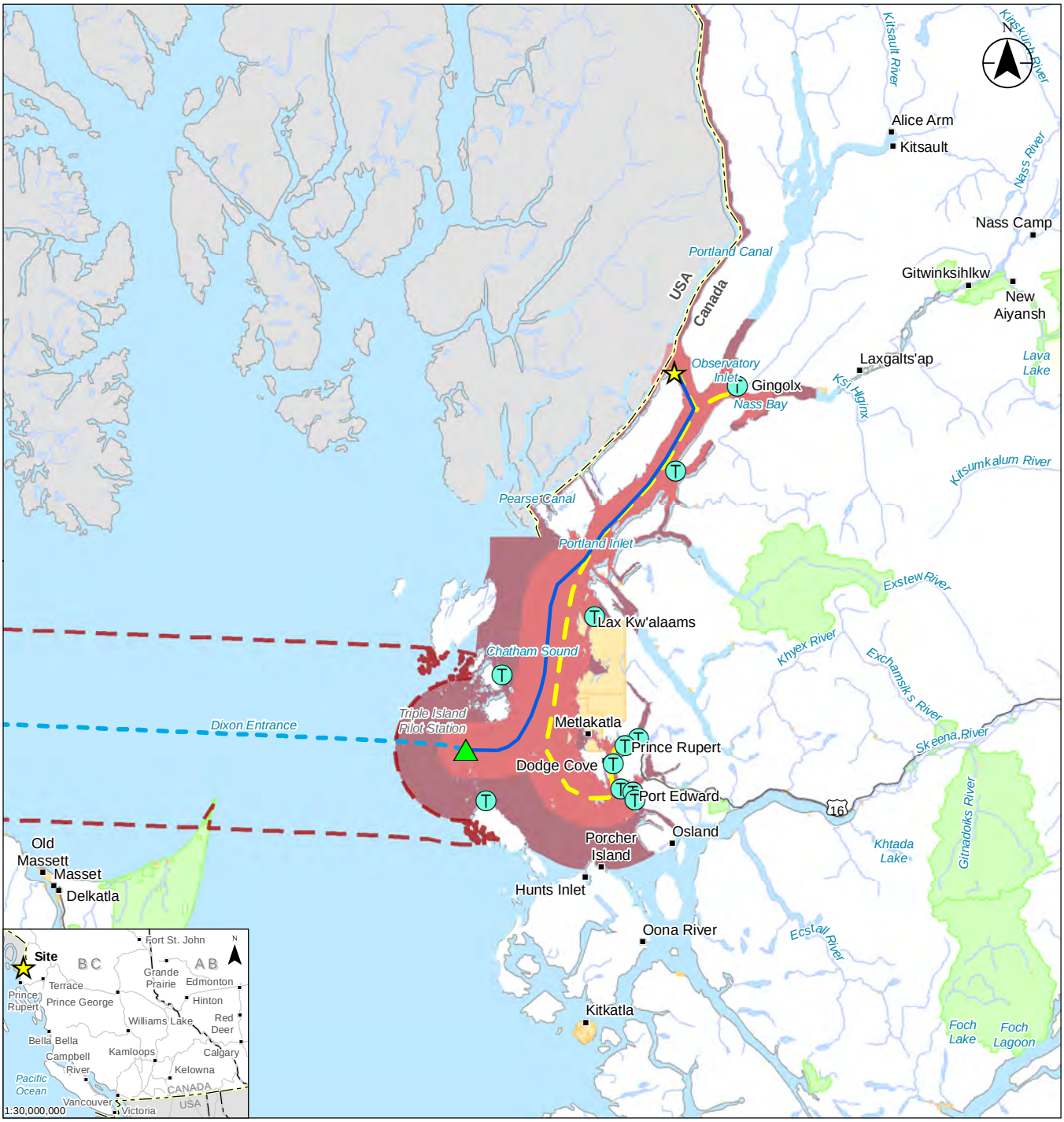
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20221129
Requested by MMACDONALD on 20221128

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-4

Title
Nass Area Overview



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Tide Station
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Boundary
- Watercourse
- First Nations Reserve
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

Stantec

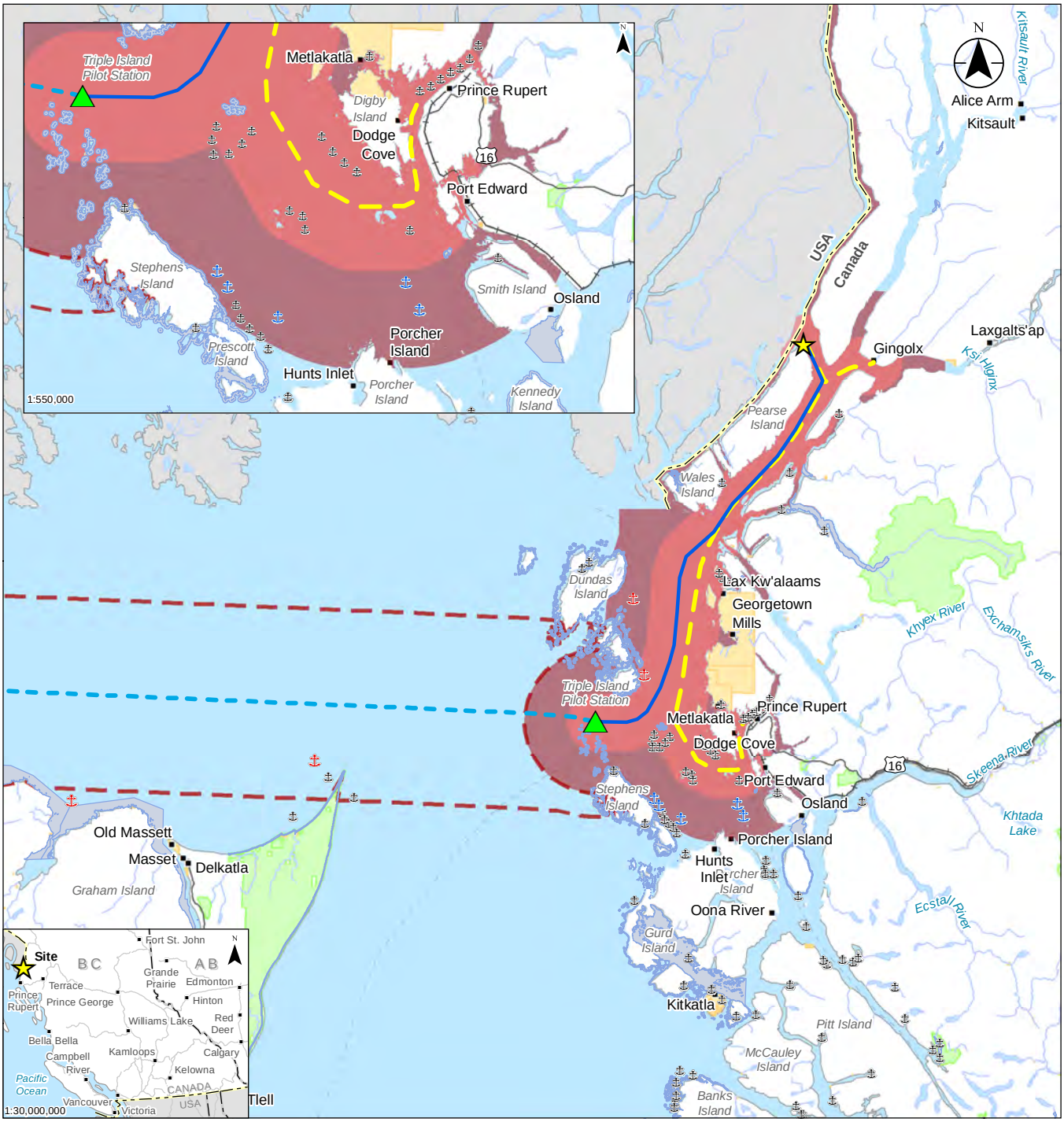
Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220722
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report

Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-5

Title
Tide Stations



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Anchorage
- Anchorage Approved for LNG Carriers
- Emergency Anchorage
- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Border
- Watercourse
- First Nations Reserve
- Provincial Park, Ecological Reserve, or Protected Area
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220728
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220728

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-6

Title
Anchorages

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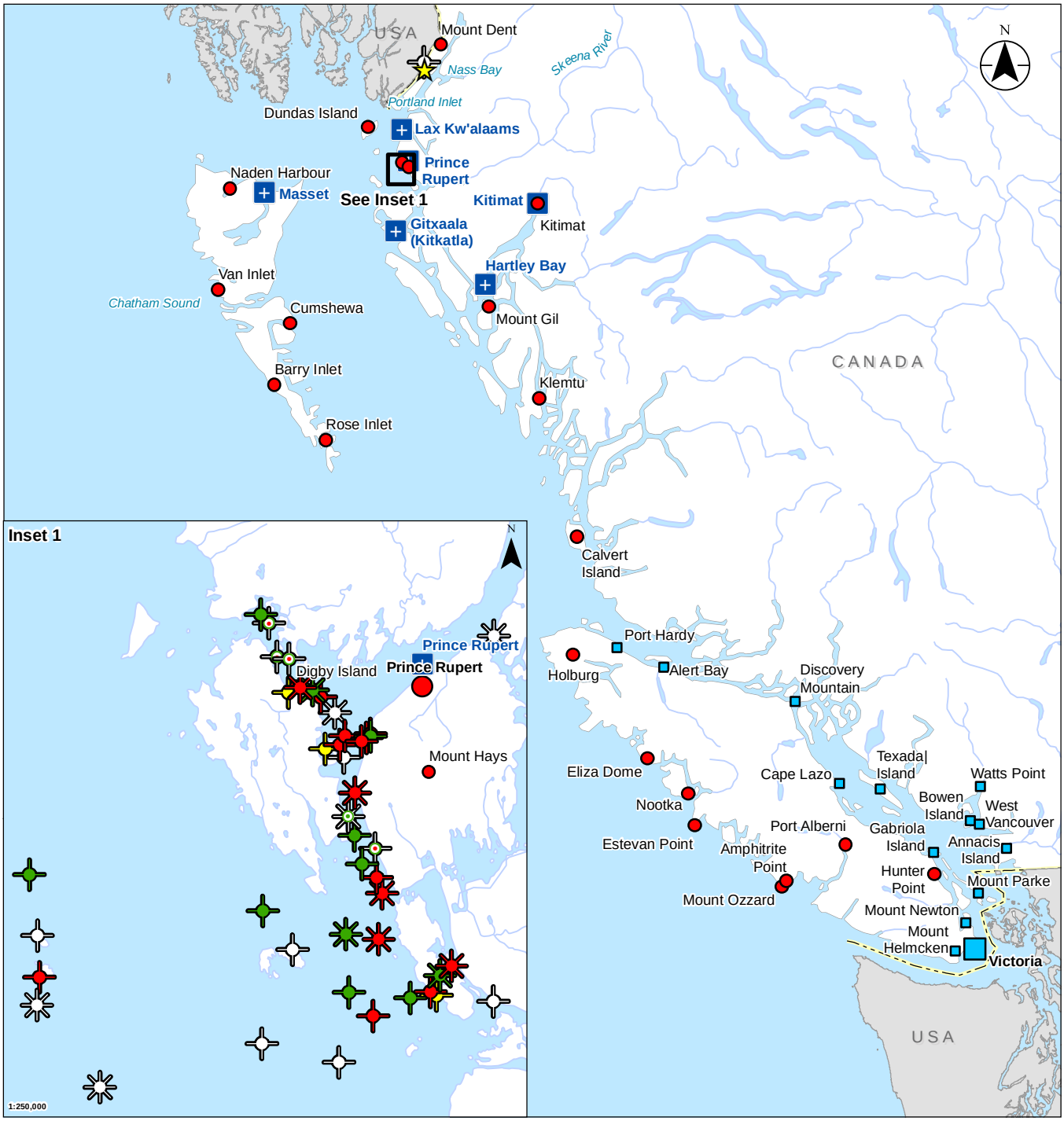

KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Aid to Navigation*
- Flashing
- Quick Flashing

Marine Communications and Traffic Services (MCTS) Centre
- Victoria

Remote Controlled Site
- Remotely Controlled by Prince Rupert MCTS
- Remotely Controlled by Victoria MCTS

- Royal Canadian Marine Search and Rescue (RCMSAR) Rescue Station
- Site
- International Boundary
- Watercourse
- Waterbody

* Symbol colour corresponds to light colour

0 50 100 150 200 km
1:5,000,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220725
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220725

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-7

Title
Aids to Navigation

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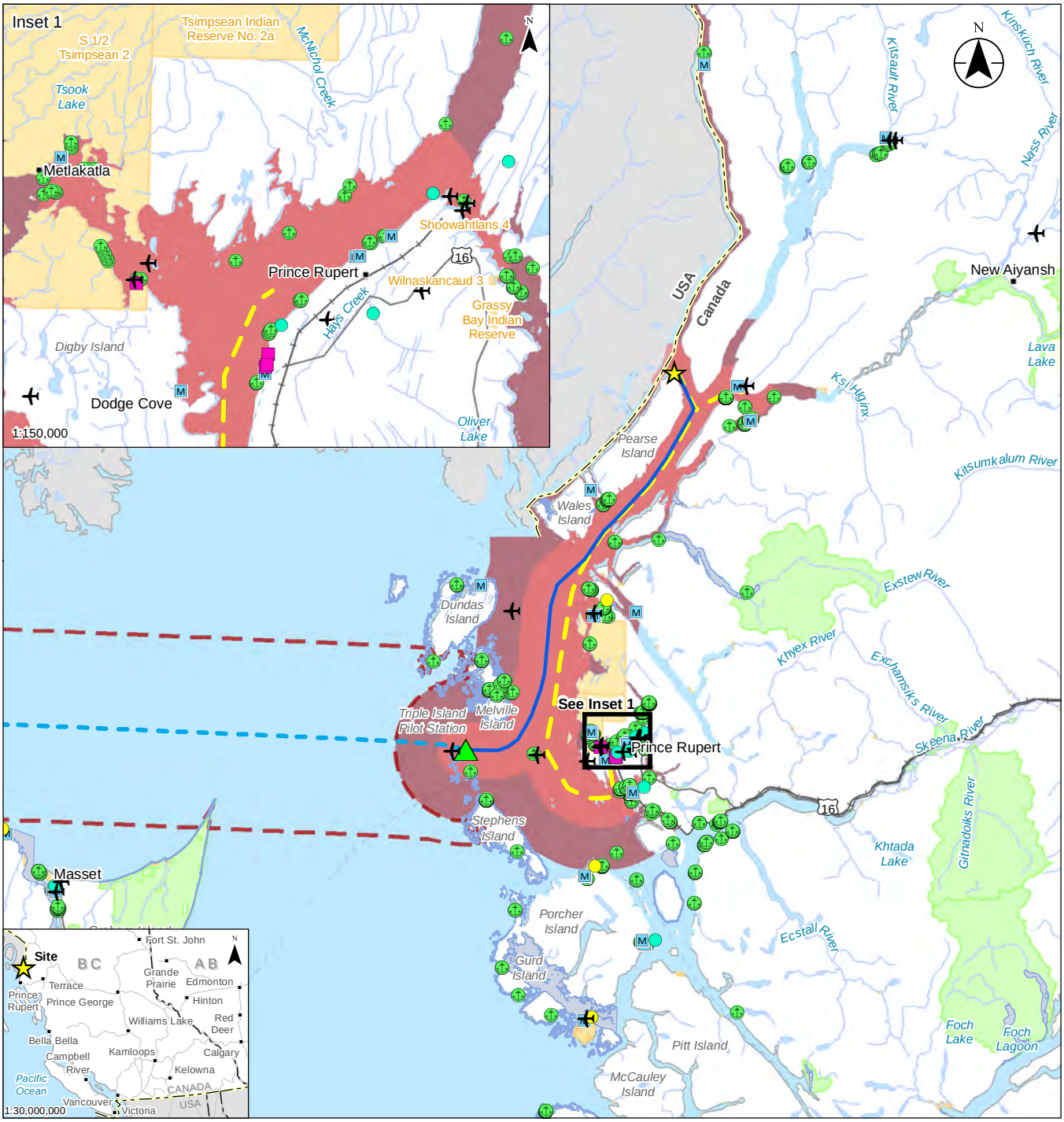


KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Airport, Aerodrome, Heliport
- Coastal BC Mooring
- Ferry Terminal

Harbour
- Core Fishing Harbour
- Non-core Fishing Harbour
- Recreational Marina
- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Border
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

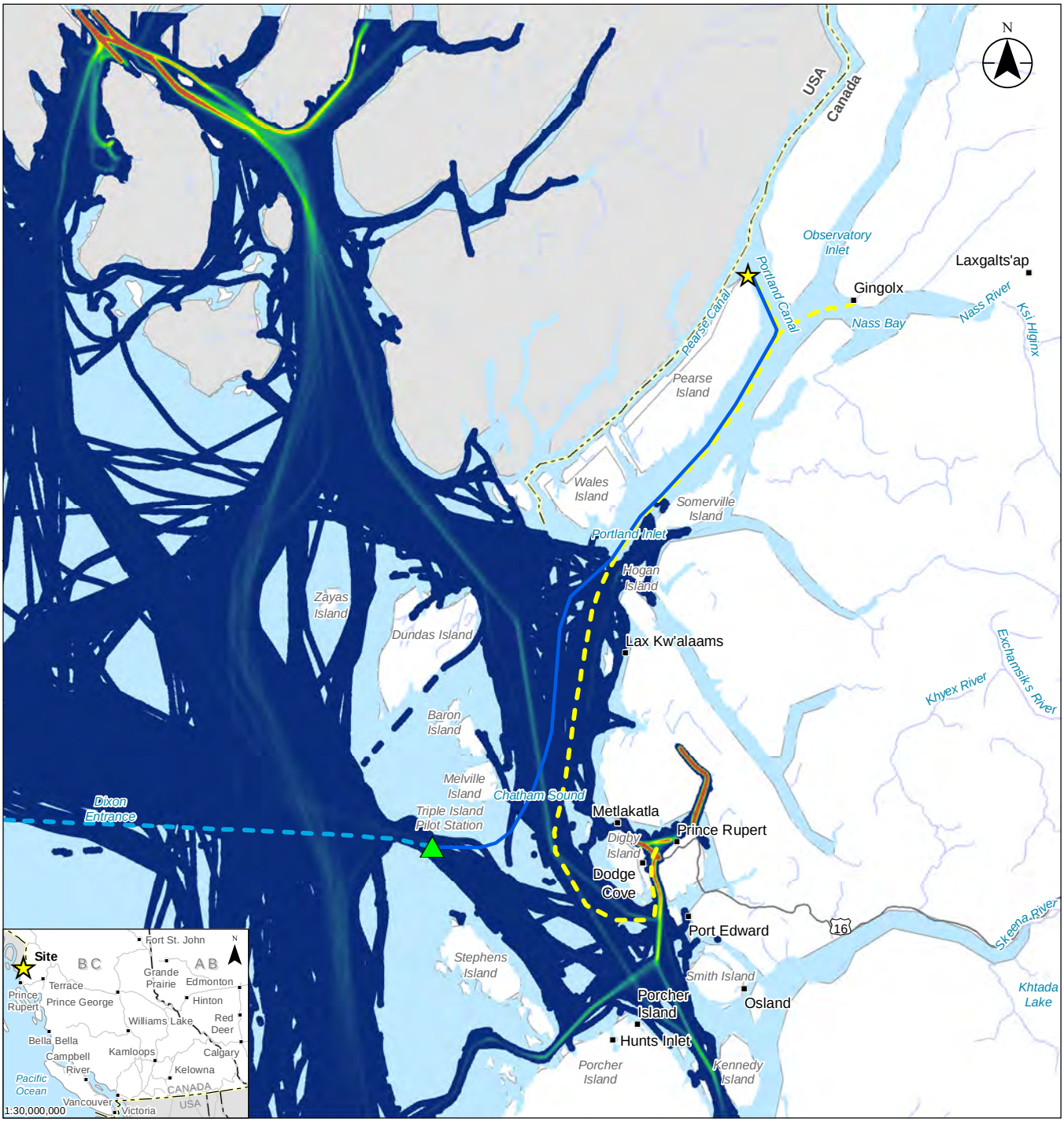
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SPARKER on 20220728
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220728

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-8

Title
Marine Infrastructure



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov.

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Highway
- International Boundary
- Watercourse
- Waterbody

Vessel Density per m²
High: 13.0
Low: 0.05

0 5 10 15 20 25 km
1:825,000 (at original document size of 8.5x11)

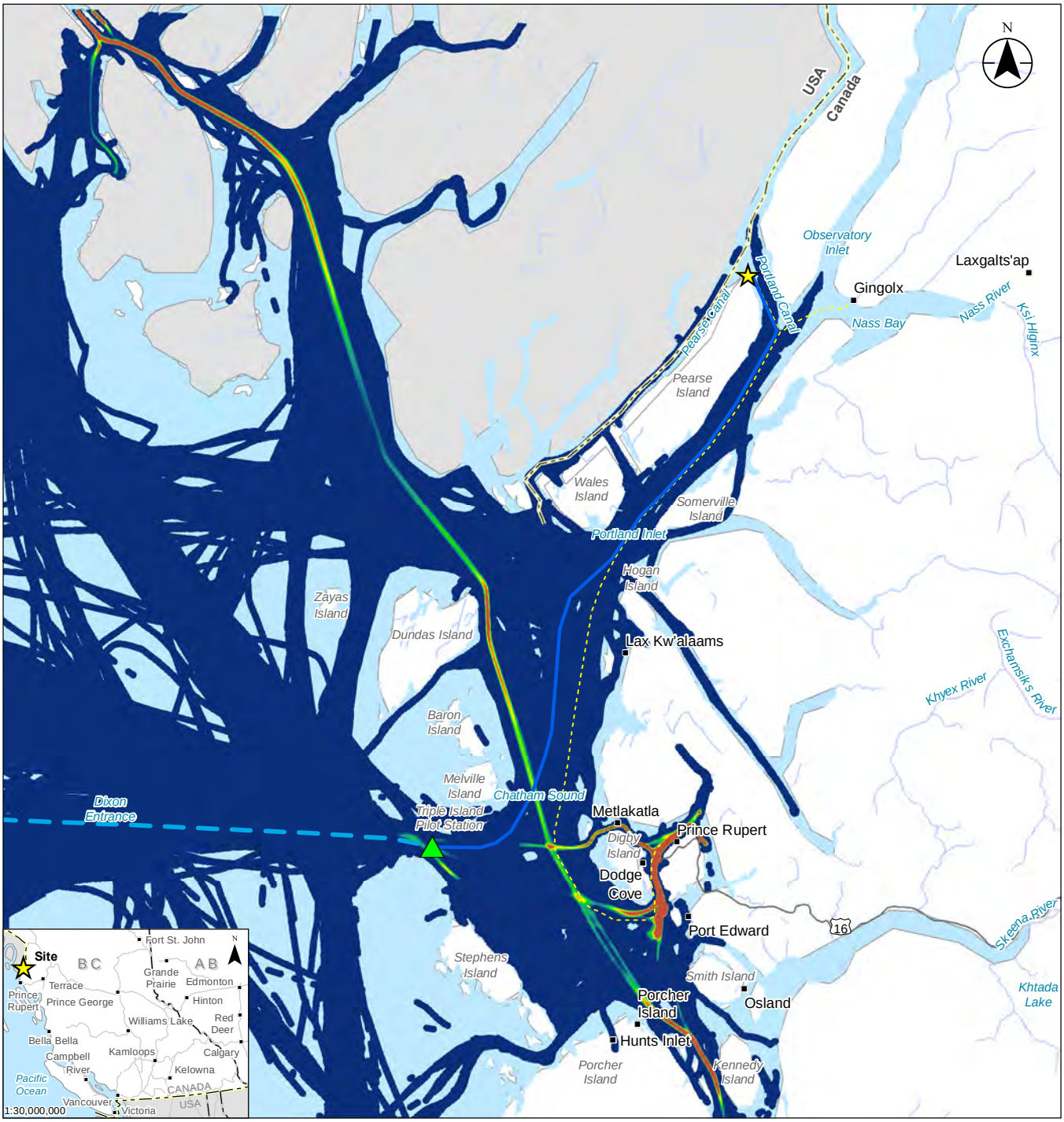
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220721
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-9

Title
Passenger - Other Vessel Traffic Density (2016 - 2020)



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov.

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Highway
- International Boundary
- Watercourse
- Waterbody

Vessel Density per m²
High: 94.7
Low : 0.4

0 5 10 15 20 25 km
1:825,000 (at original document size of 8.5x11)

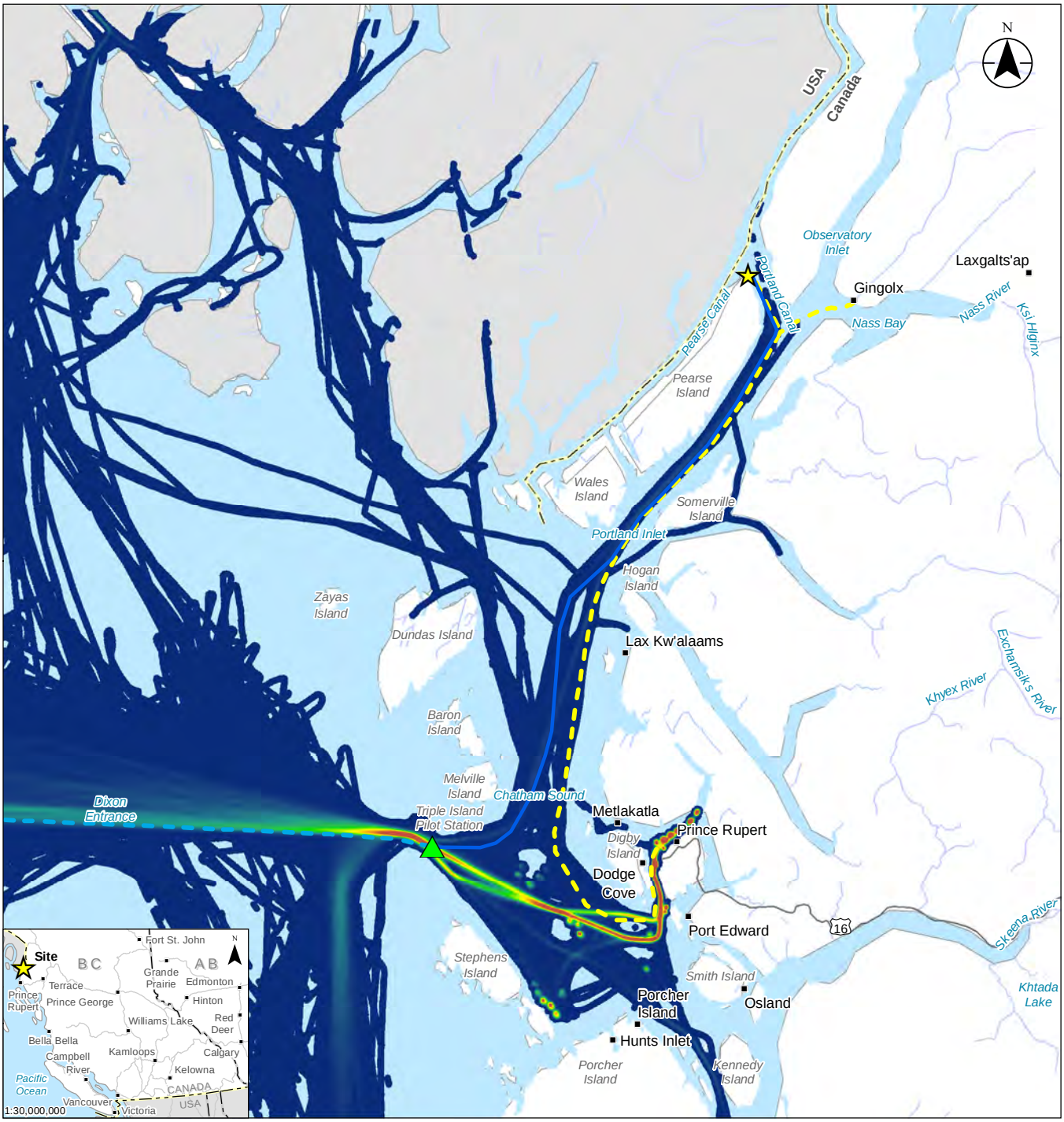
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220721
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-10

Title
Commercial – Tugs and Barges Vessel Traffic Density (2016 - 2020)



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov.

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Highway
- International Boundary
- Watercourse
- Waterbody

Vessel Density per m²
High: 8.1
Low: 0.03

0 5 10 15 20 25 km
1:825,000 (at original document size of 8.5x11)

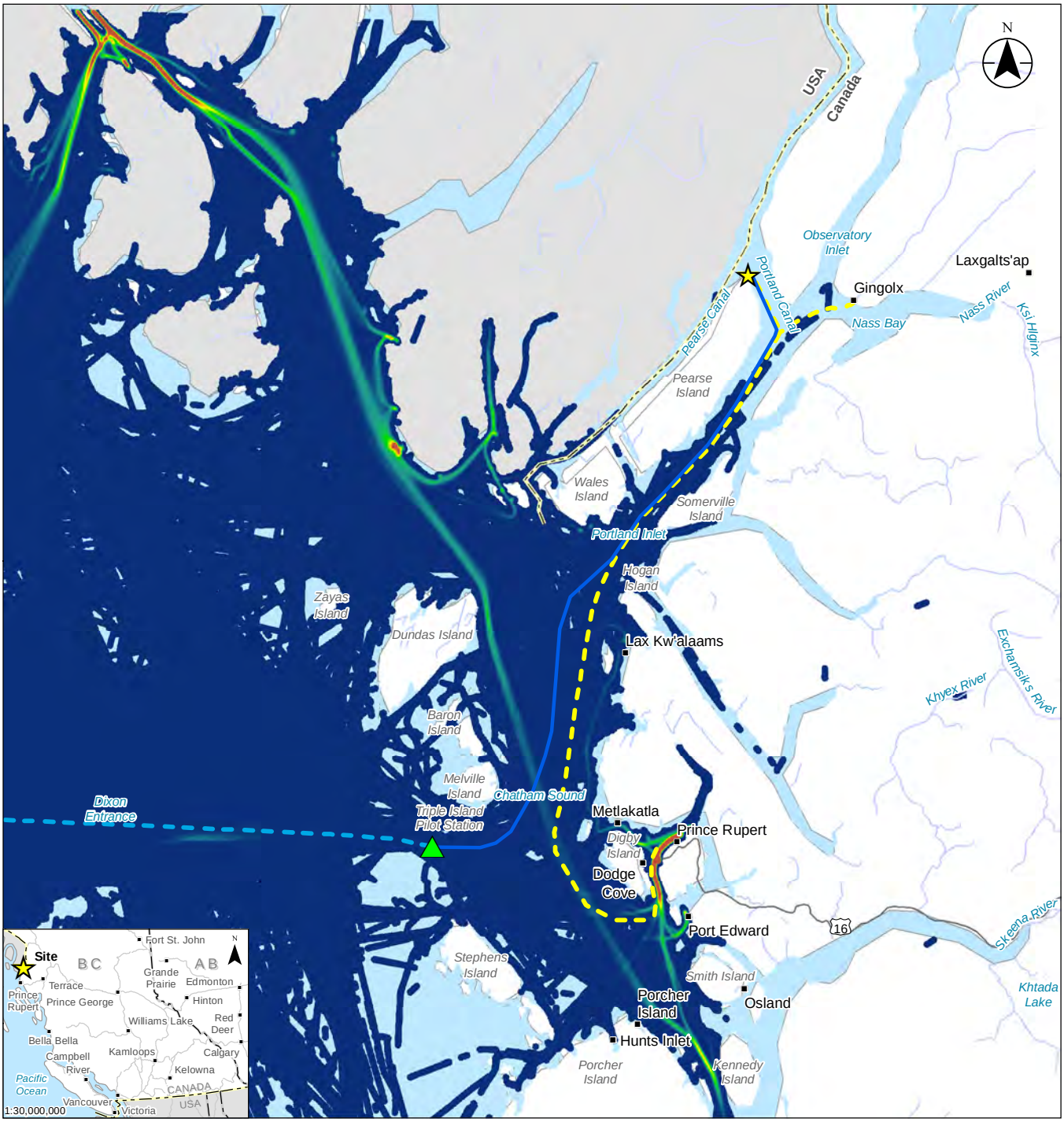
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220721
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-11

Title
Commercial Deep Sea and Cargo Vessel Traffic Density (2016 - 2020)



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov.

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Highway
- International Boundary
- Watercourse
- Waterbody

Vessel Density per m²
High: 14.5
Low: 0.05

0 5 10 15 20 25 km
1:825,000 (at original document size of 8.5x11)

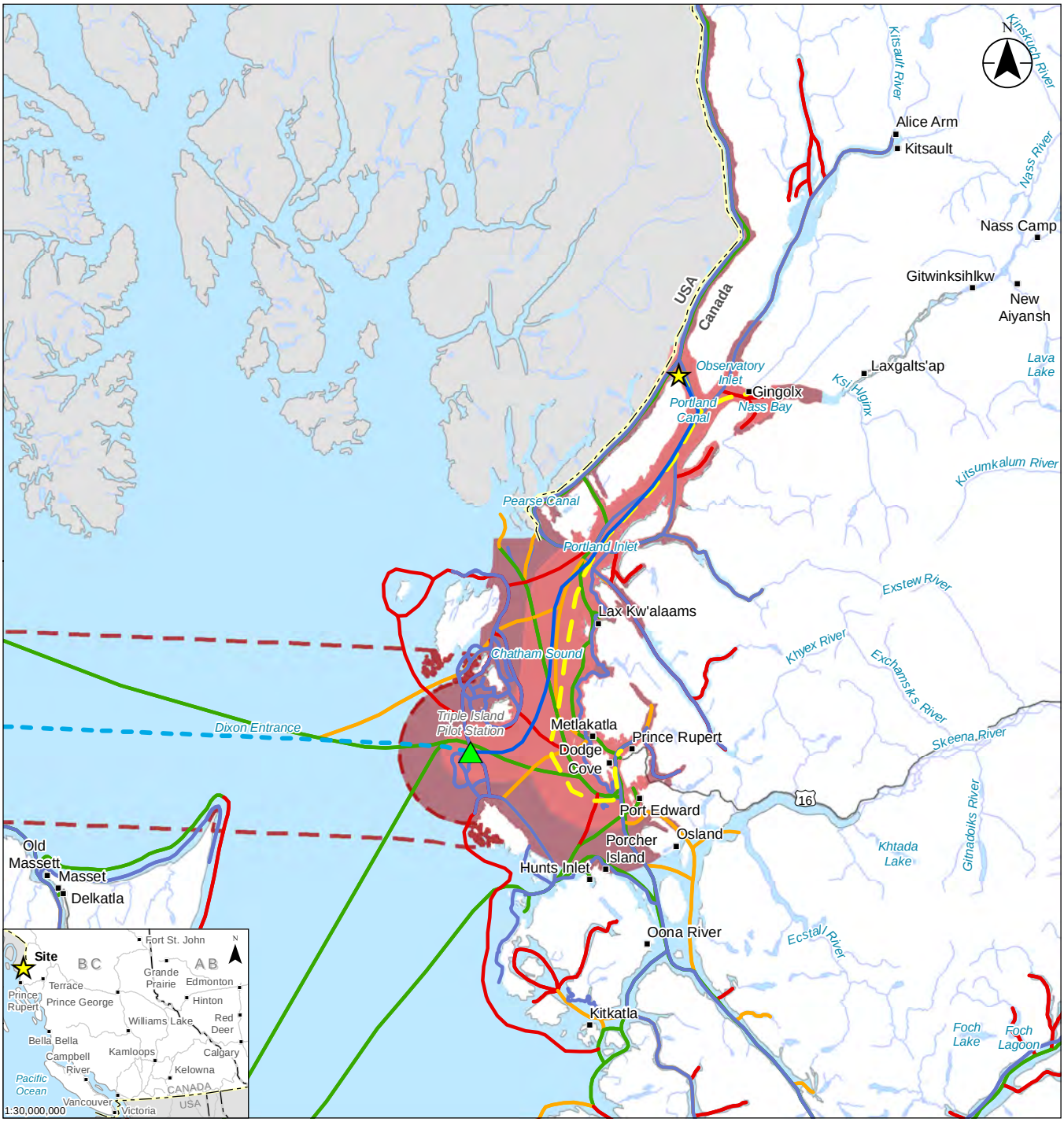
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220721
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-12

Title
Commercial Fishing Vessel Traffic Density (2016 - 2020)



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route

Recreational Boating Route (Relative Intensity of Use)
- Low
- Moderate
- High

Recreational Kayak Route (Relative Intensity of Use)
- Unassigned
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Boundary
- Watercourse
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

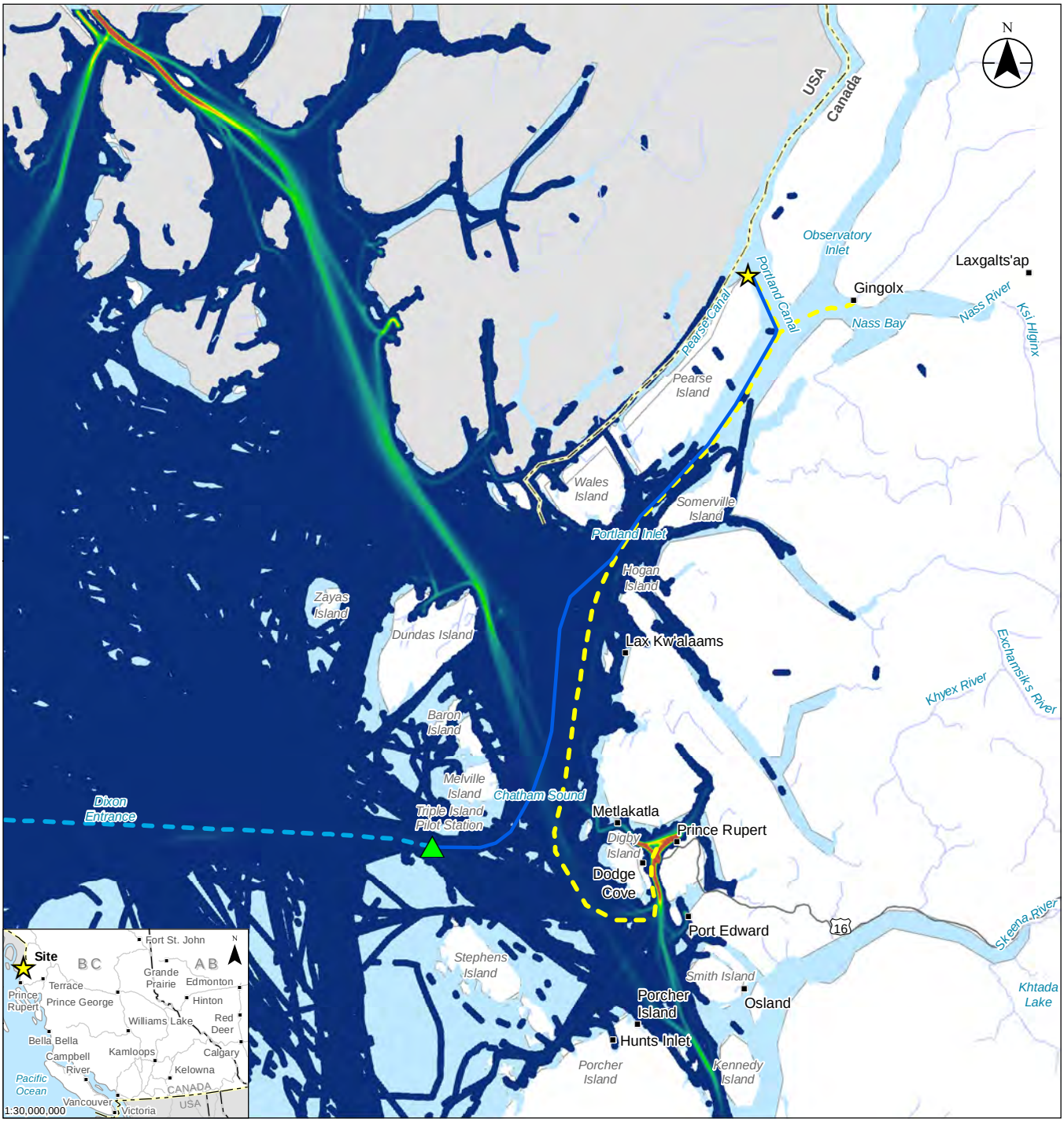
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220722
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-13

Title
Recreational Boating Routes and Sea Kayaking Routes



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Bureau of Ocean Energy Management (BOEM) and National Oceanic and Atmospheric Administration (NOAA). MarineCadastre.gov.

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Highway
- International Boundary
- Watercourse
- Waterbody

Vessel Density per m²
High: 6.2
Low: 0.02

0 5 10 15 20 25 km
1:825,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220721
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220722

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-14

Title
Pleasure Craft Vessel Traffic Density (2016 - 2020)

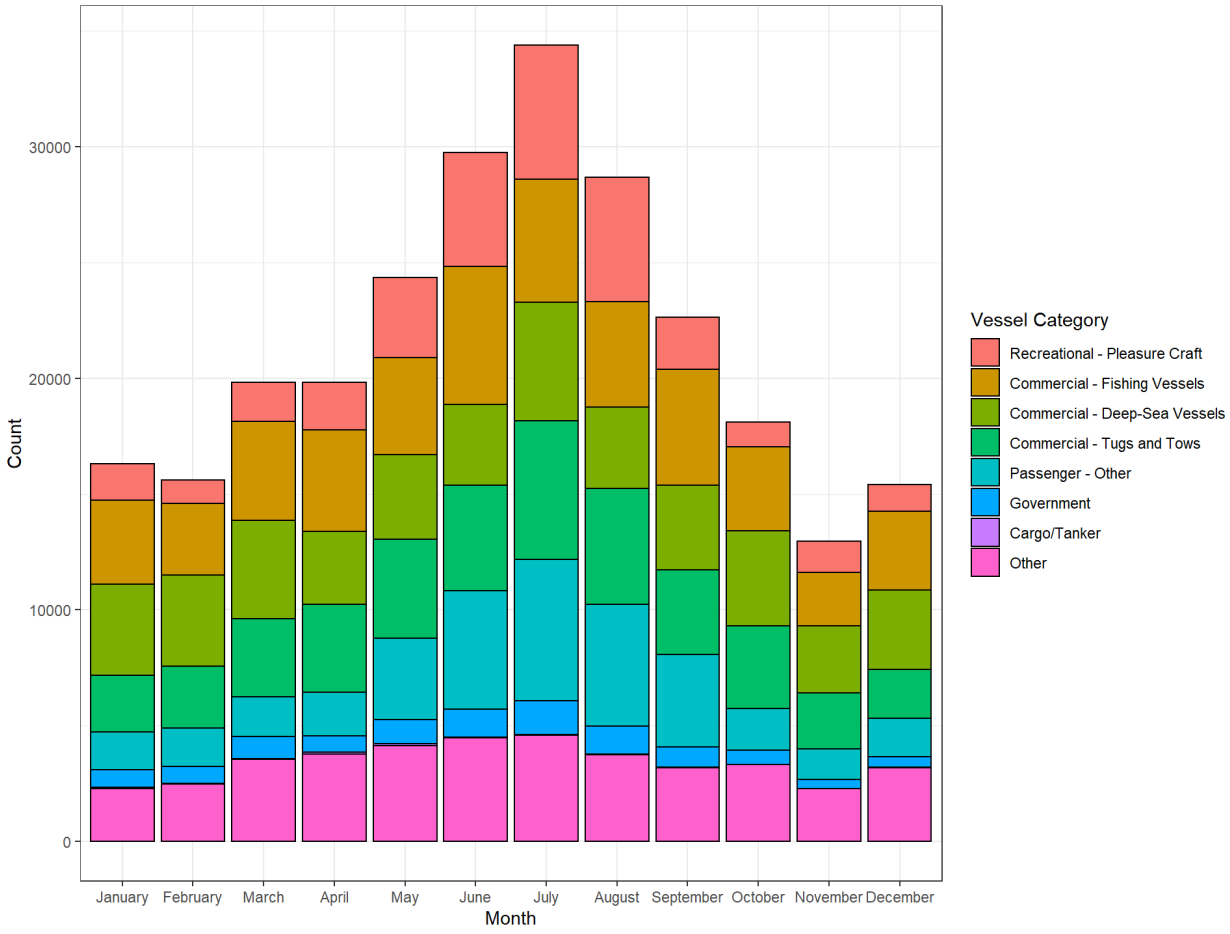


Figure 7.11–15 – Kernel Density – Pleasure Craft

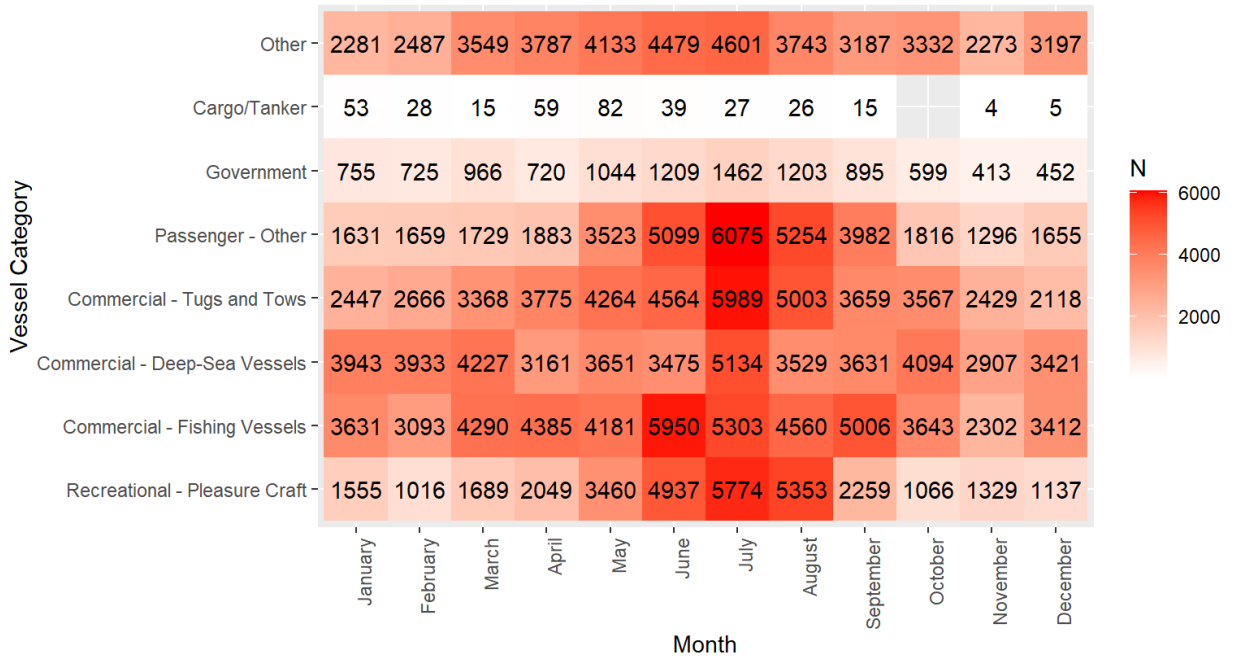


Figure 7.11–16 – Summary Vessel Movements through the RAA by Vessel Type and Month, 2016 to 2020

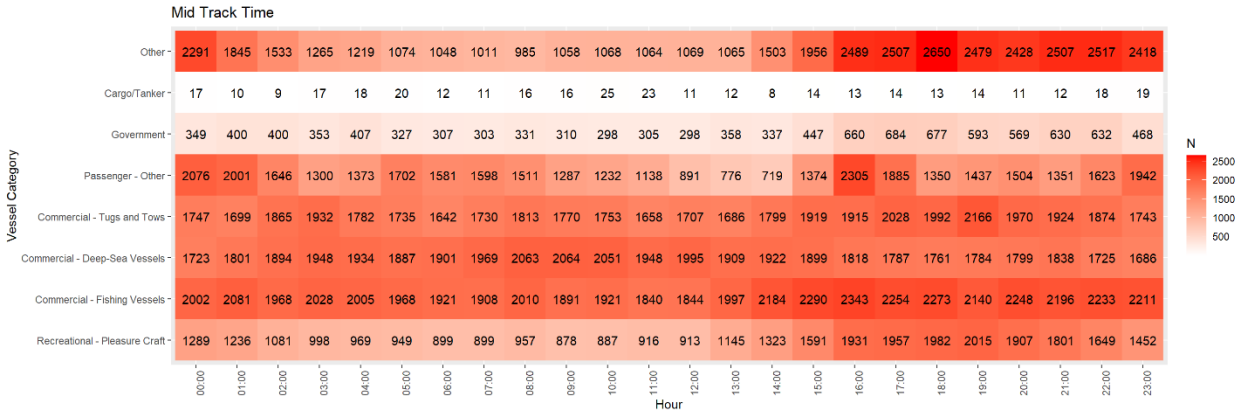
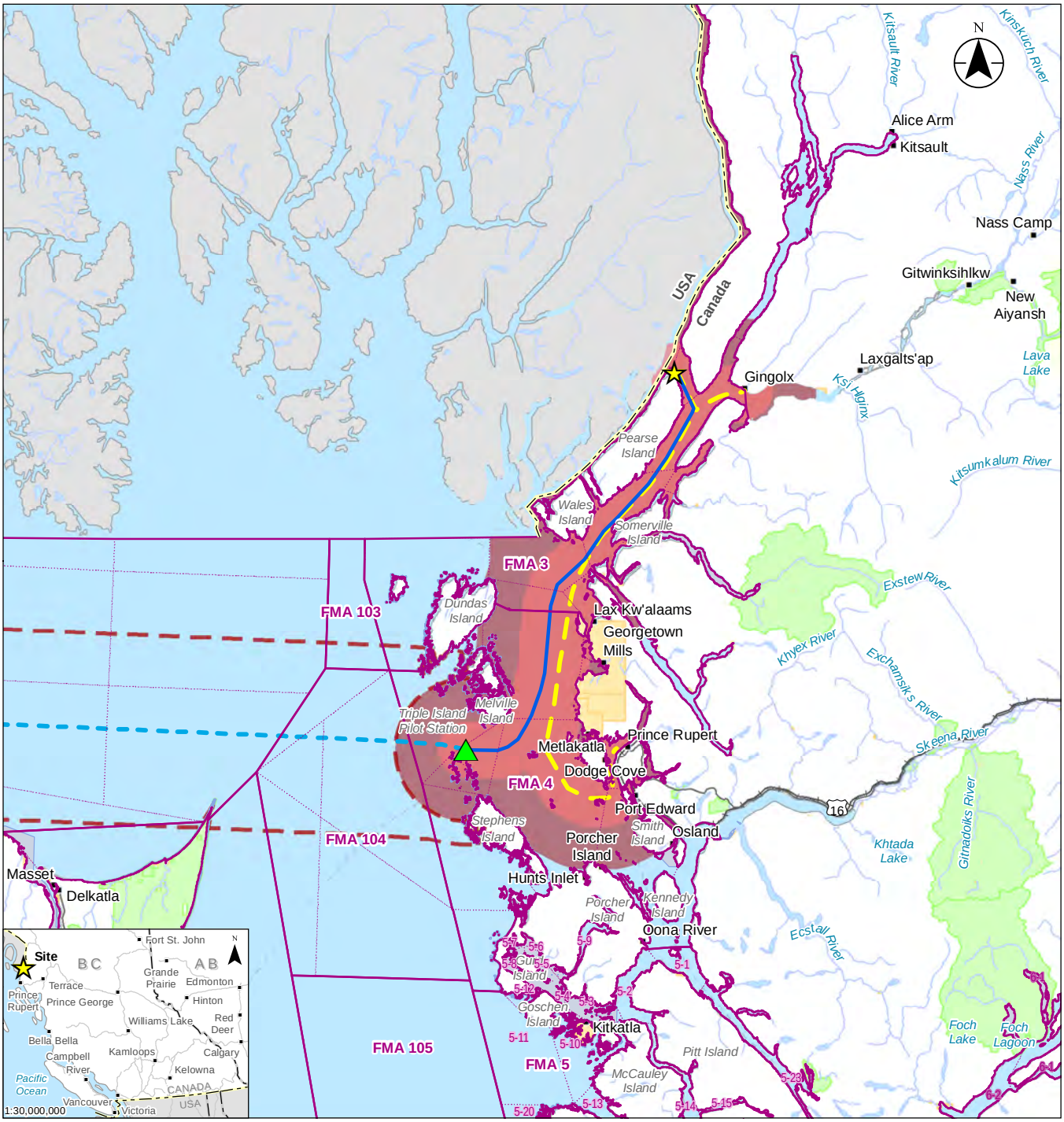


Figure 7.11–17 – Heat Map of Vessel Movements through the RAA by Vessel Type and Month, 2016 to 2020



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- DFO Fisheries Management Area
- DFO Management Sub-Area
- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Border
- Watercourse
- First Nations Reserve
- Provincial Park, Ecological Reserve, or Protected Area
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Waterbody

0 10 20 30 40 50 km

1:1,250,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC

Project Number: 123221820
Prepared by SPARKER on 20220728
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220728

Client/Project/Report

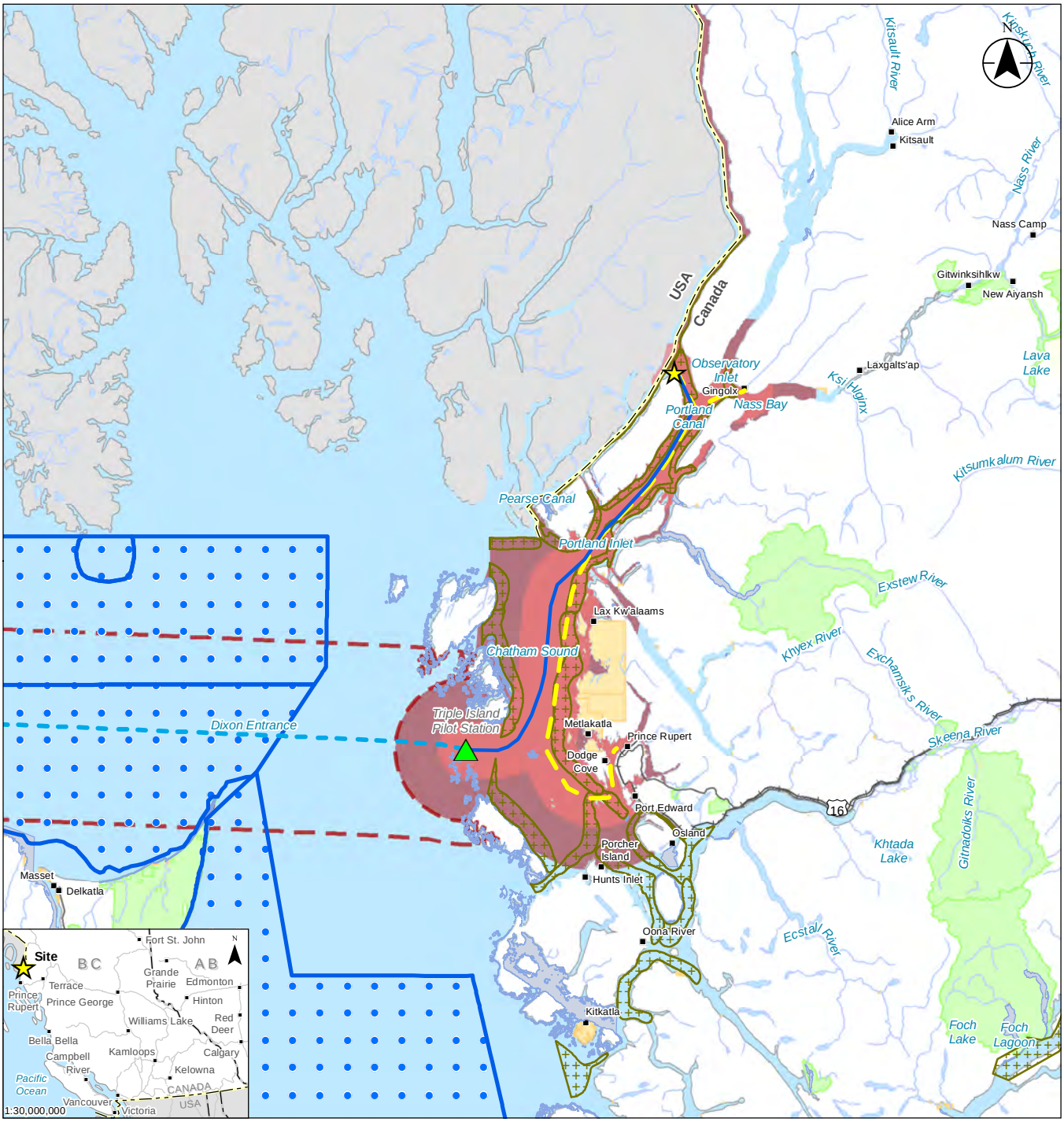
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.

7.11-18

Title

Pacific Fisheries Management Areas



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Commercial Salmon Fishing Grounds (Troll)
- Commercial Salmon Fishing Grounds (Net, Gillnet, Seine)
- Highway
- International Boundary
- Railway
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

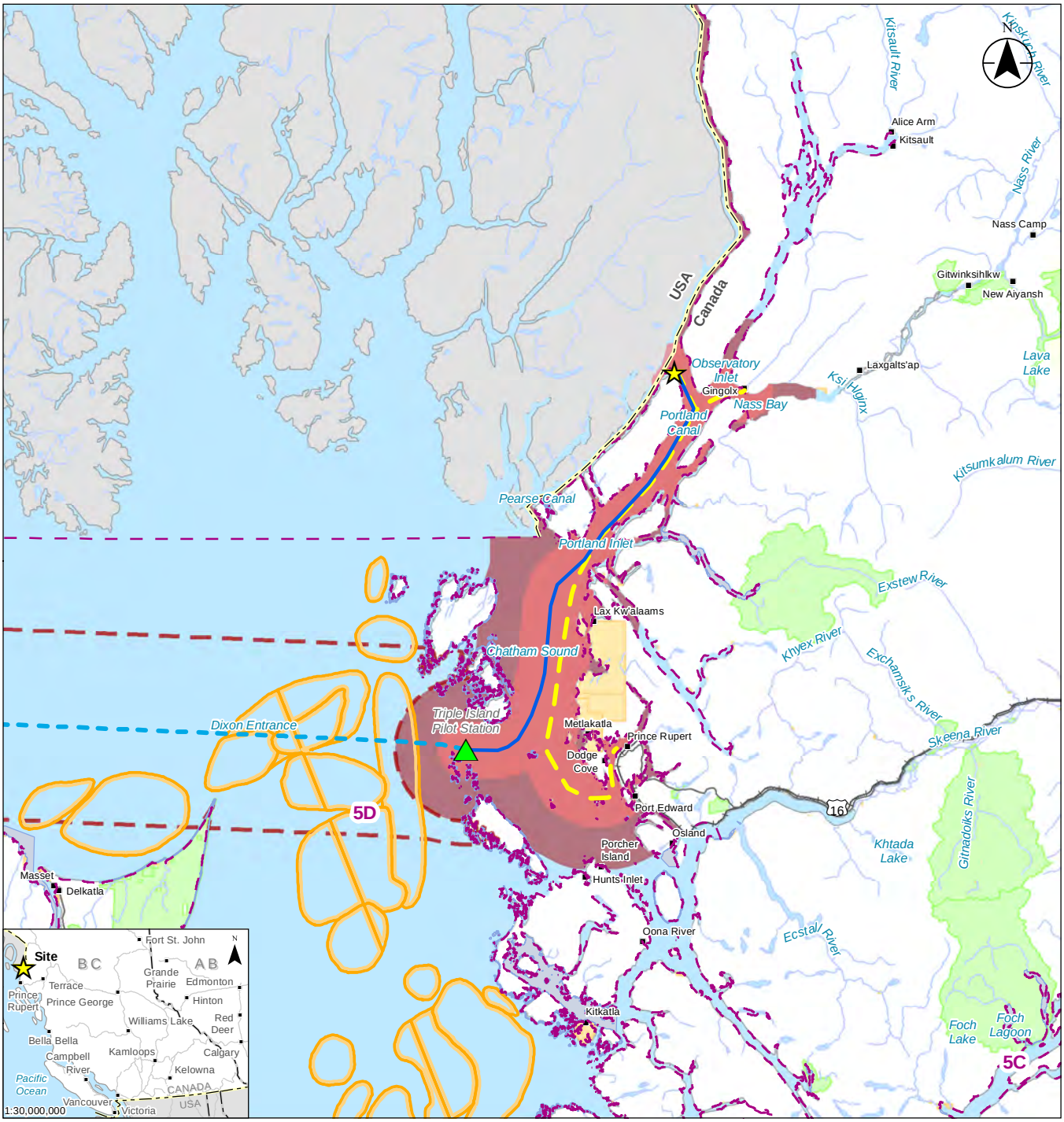
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220729

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-19

Title
Commercial Fishing Ground: Salmon



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Triple Island Pilot Station
- Site
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Commercial Groundfish Fishing Ground (Trawl)
- Groundfish Management Area
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Boundary
- Railway
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

Stantec

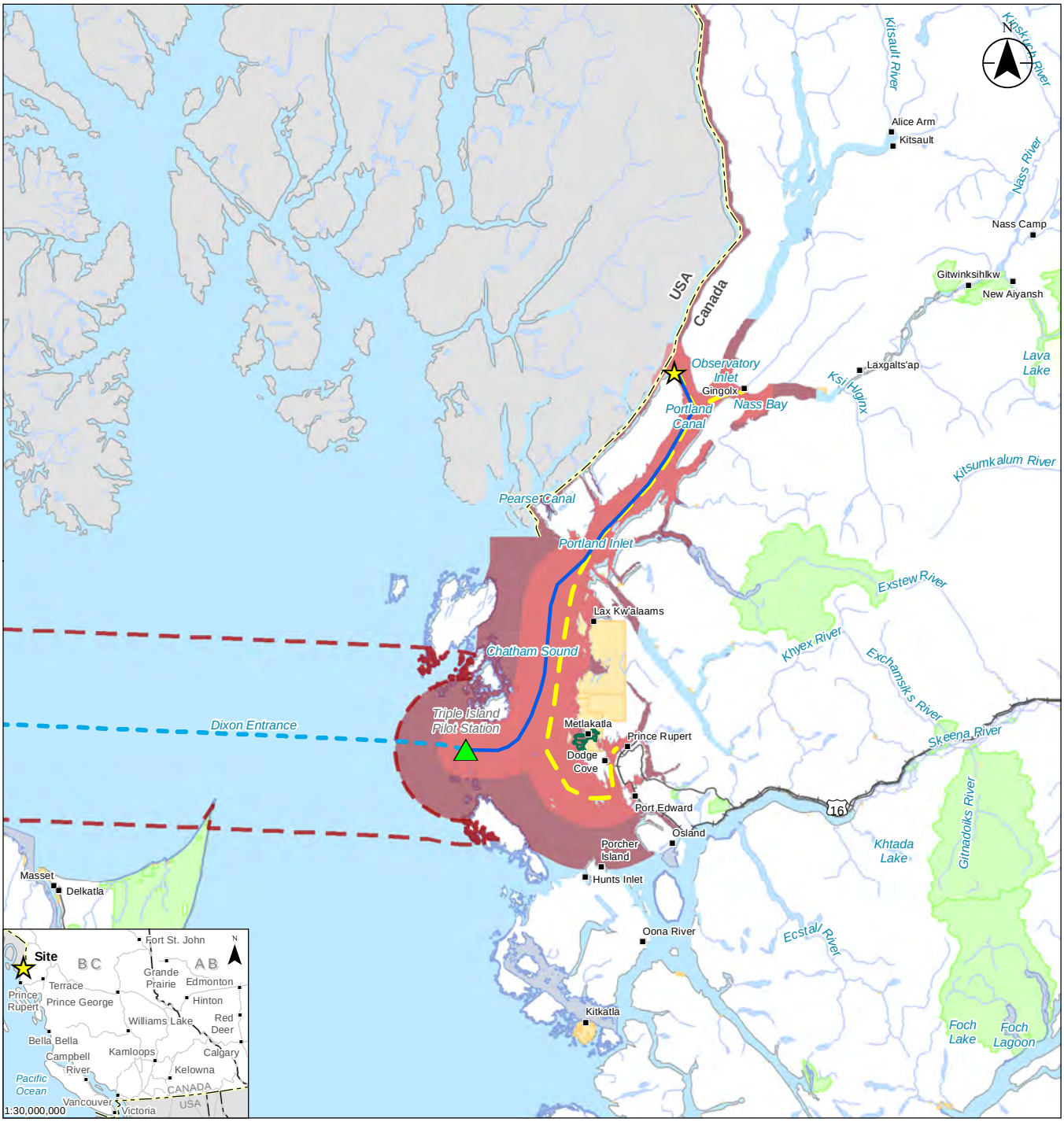
Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220729

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-20

Title
Commercial Fishing Ground: Groundfish

S:\123\20\projects\123221820\figures\report\EA\Marine_Use\fig7_11-20_123221820_260_cfg_groundfish.mxd Revised: 2023-09-08 By: tquilichini



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Commercial Herring Fishing Ground
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Boundary
- Railway
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

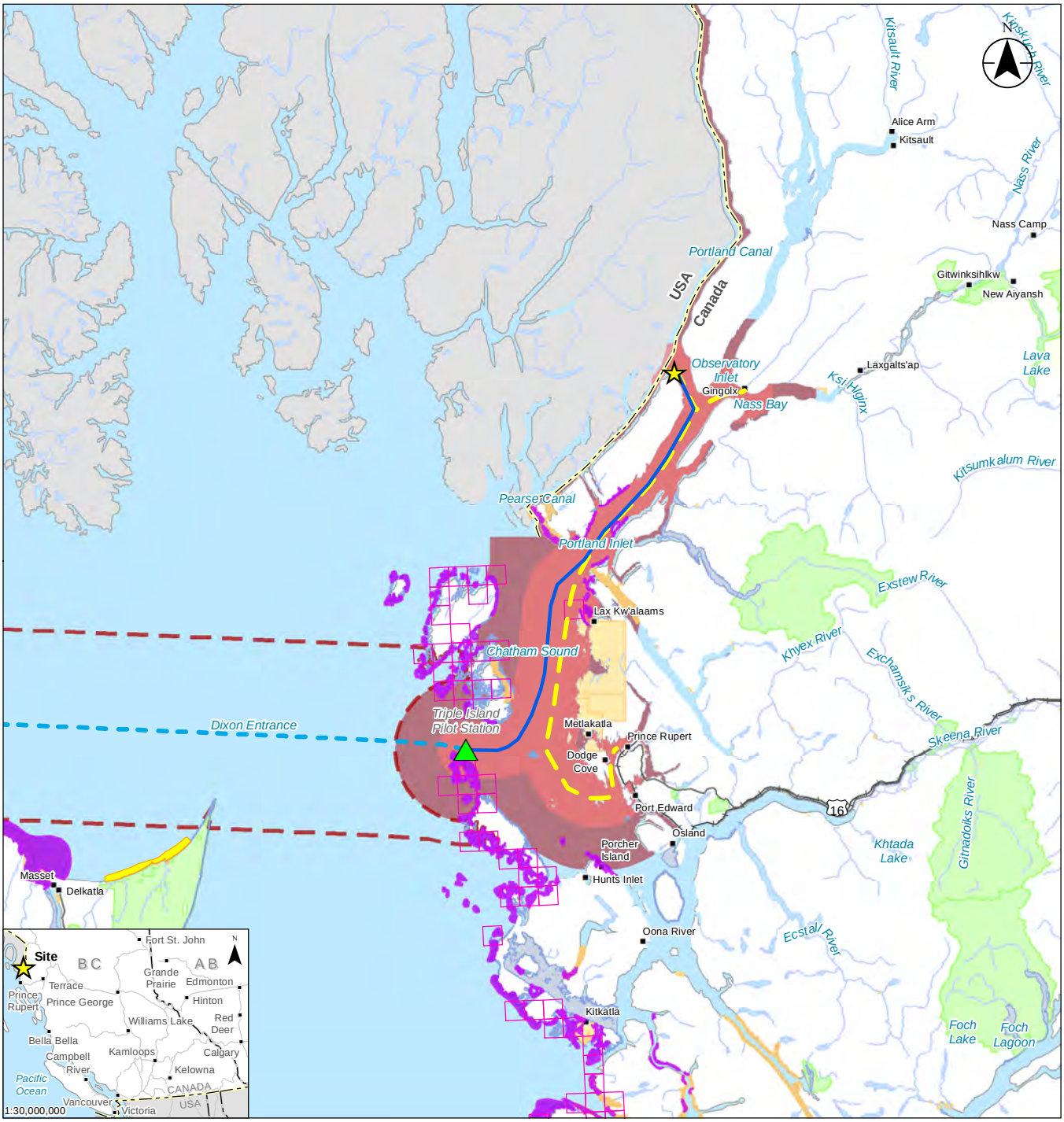
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220729

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-21

Title
Commercial Fishing Ground: Herring



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Clam Bed Area
- Commercial Fishery - Geoduck
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Commercial Fishery - Red Sea Urchin
- Commercial Fishery - Sea Cucumber
- Highway
- International Boundary
- Railway
- Watercourse
- Waterbody
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area

0 10 20 30 40 50 km

1:1,250,000 (at original document size of 8.5x11)

Stantec

Project Location:
Pearse Island, BC

Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220729

Client/Project/Report

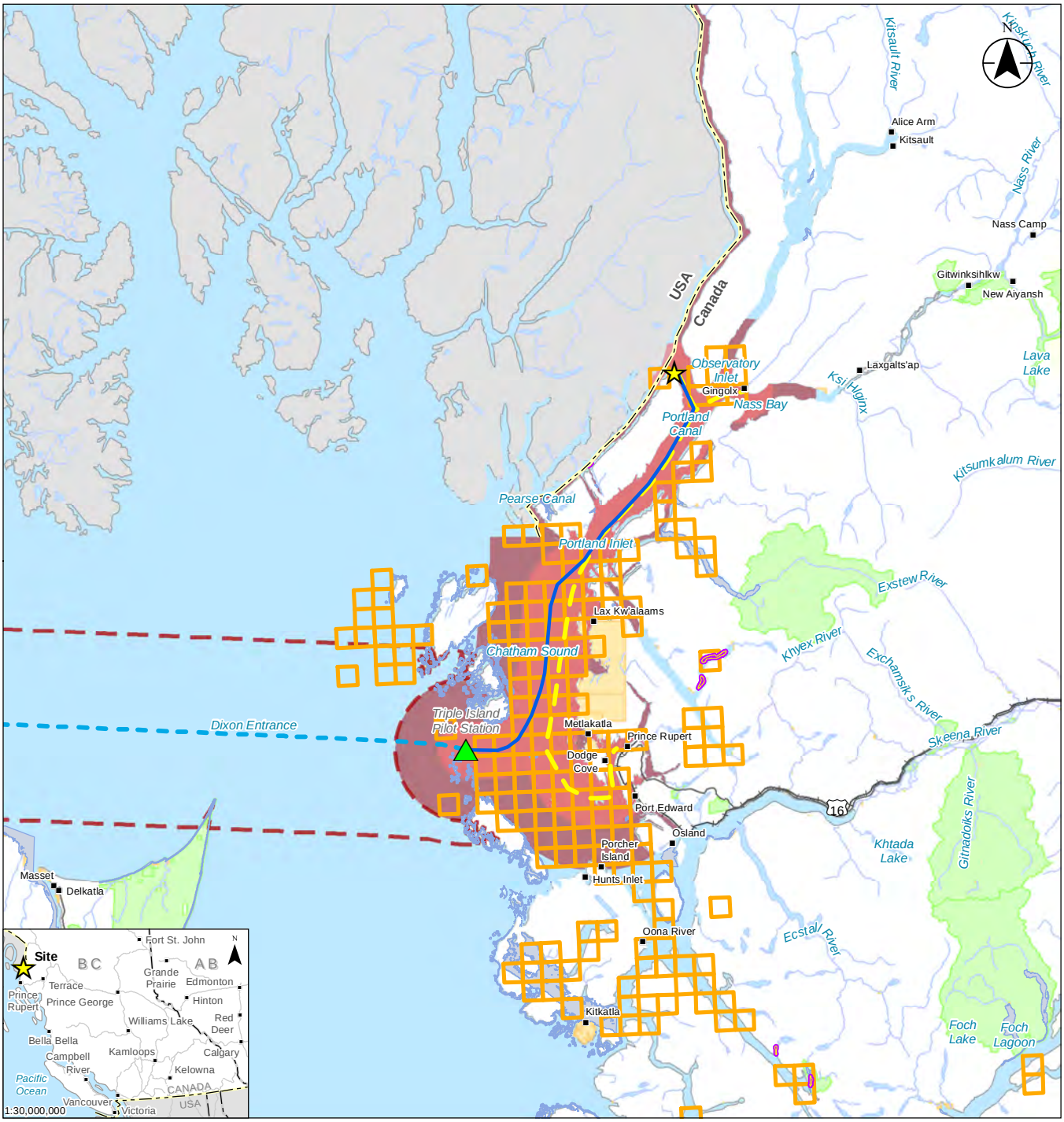
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.

7.11-22

Title

Commercial Fishing Ground: Dive-Based Features



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Commercial Prawn and Shrimp Fishery (Trap)
- Commercial Shrimp Fishery (Trawl)
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Boundary
- Railway
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km

1:1,250,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC

Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220729

Client/Project/Report

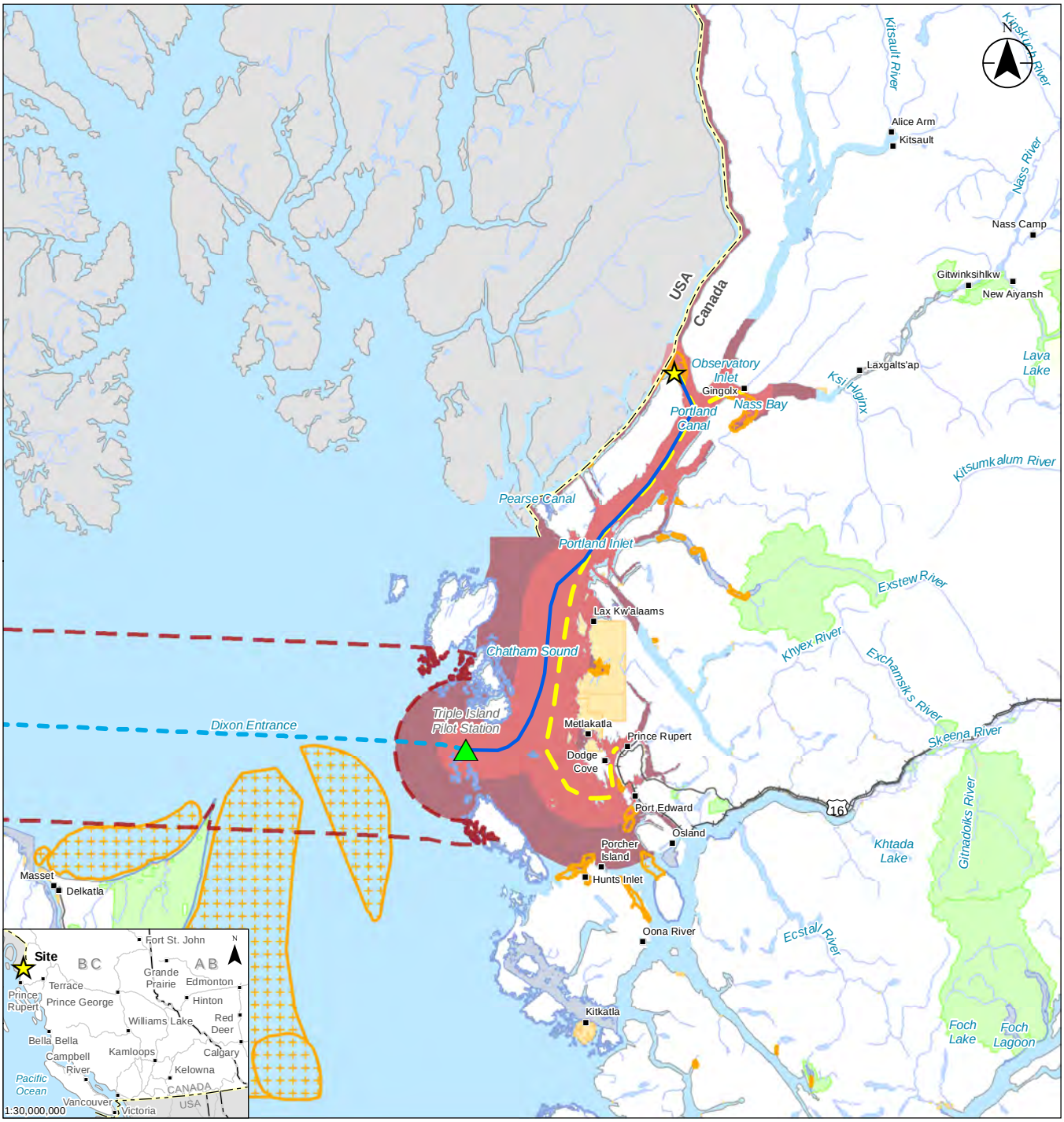
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.

7.11-23

Title

Commercial Fishing Ground: Prawn and Shrimp



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Commercial Crab Fishery
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Highway
- International Boundary
- Railway
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km
1:1,250,000 (at original document size of 8.5x11)

Stantec

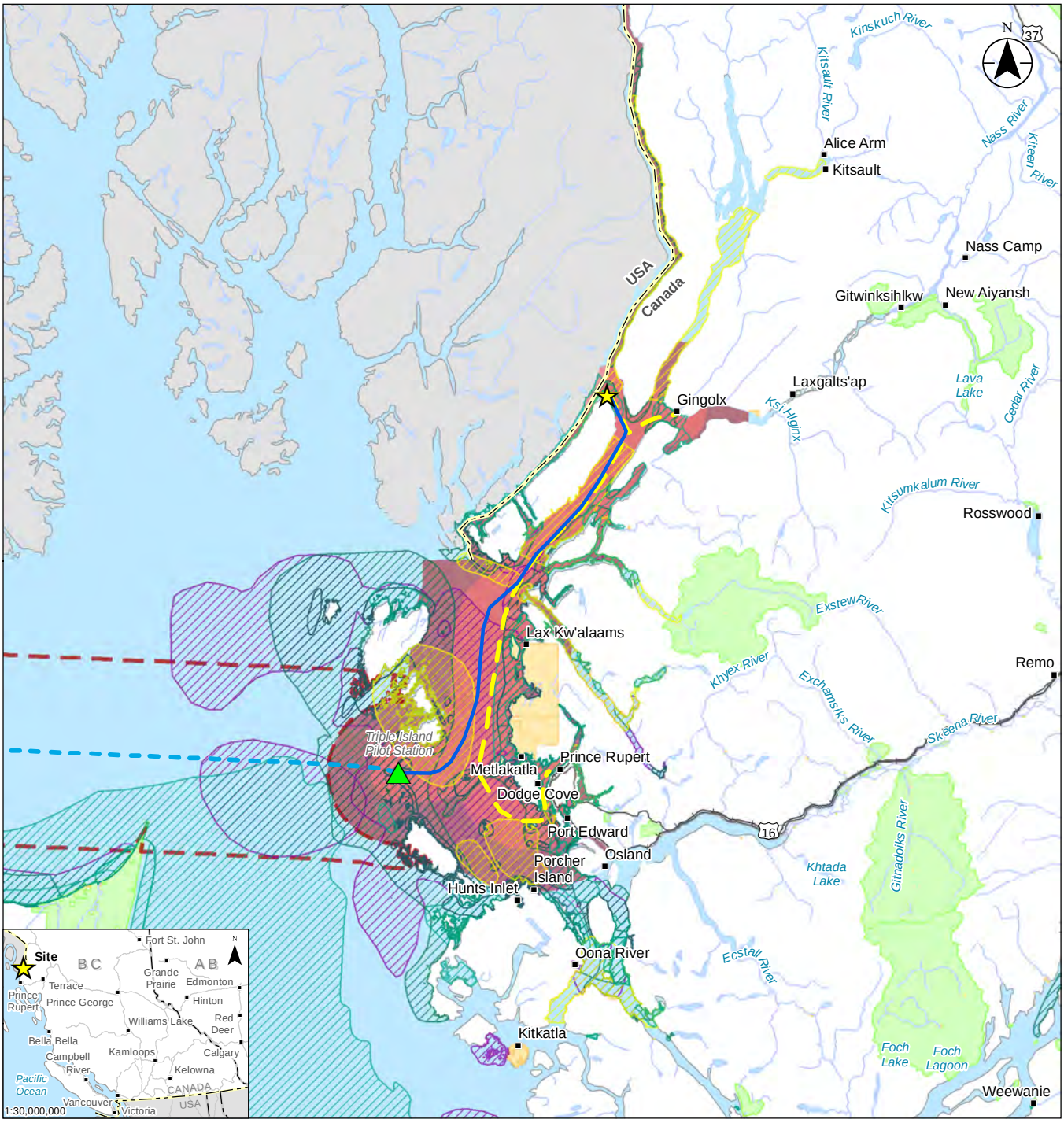
Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220728

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-24

Title
Commercial Fishing Ground: Crab

S:\1232\projects\123221820\figures\report\EA\Marine_Use\fig7_11-24_123221820_263_cfg_crab.mxd Revised: 2023-09-21 By: tquilichini



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area

Recreational Fishing Ground
- Crab
- Prawn and Shrimp
- Salmon
- Groundfish
- International Boundary
- Highway
- Road
- Local Street
- Railway
- Watercourse
- First Nations Reserve
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 5 10 15 20 25 km
1:1,250,000 (at original document size of 8.5x11)

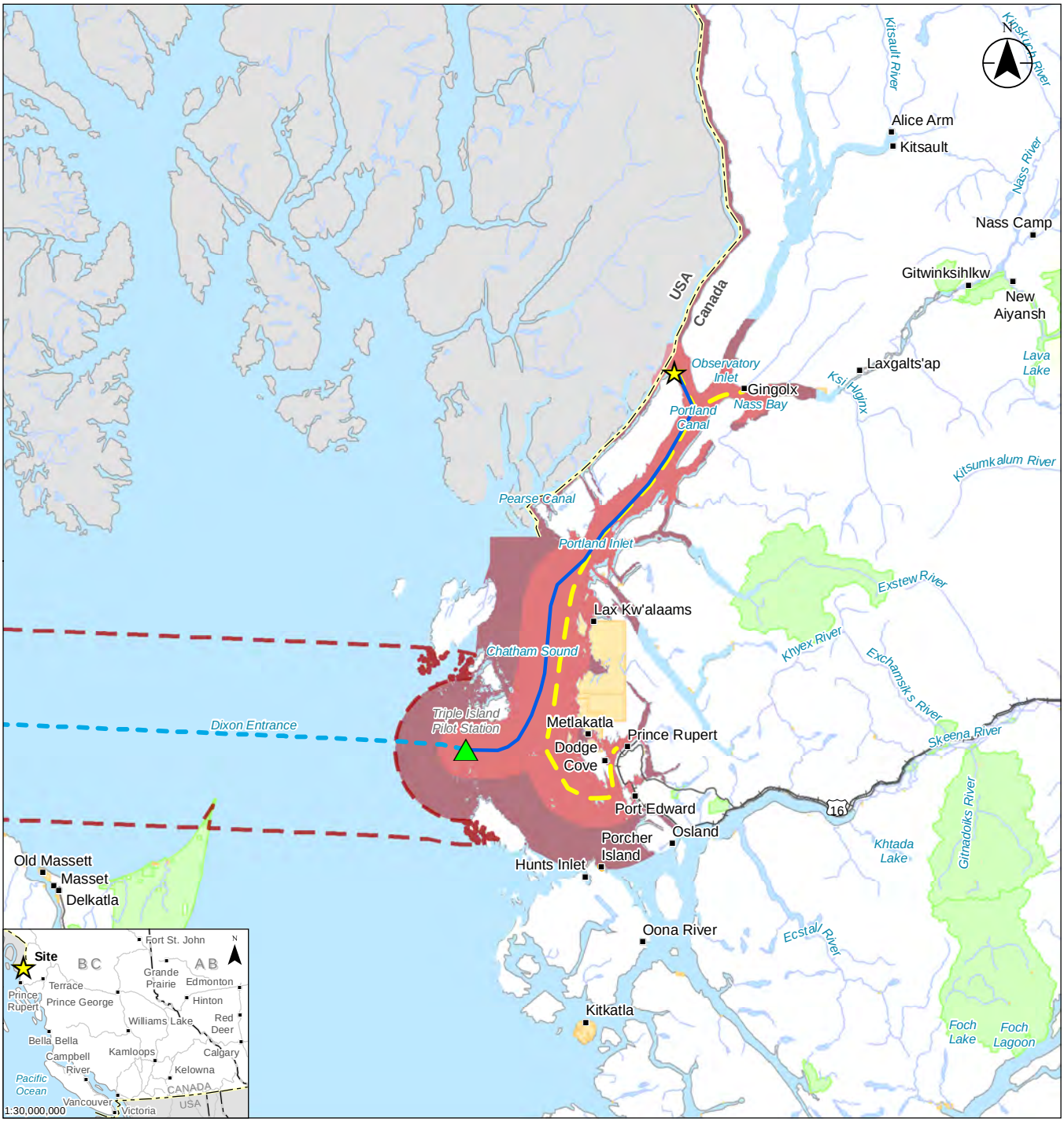
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220921
Requested by MMACDONALD on 20220804
Reviewed by NFORRESTER on 20220921

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-25

Title
Recreational Fishing Gronds



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Shellfish Aquaculture
- Highway
- International Boundary
- Railway
- Watercourse
- First Nations Reserve
- Provincial Park, Ecological Reserve, or Protected Area
- Waterbody

0 10 20 30 40 50 km

1:1,250,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC

Project Number: 123221820
Prepared by SMOSS on 20220729
Requested by MMACDONALD on 20220712
Checked by TQUILICHINI on 20220729

Client/Project/Report

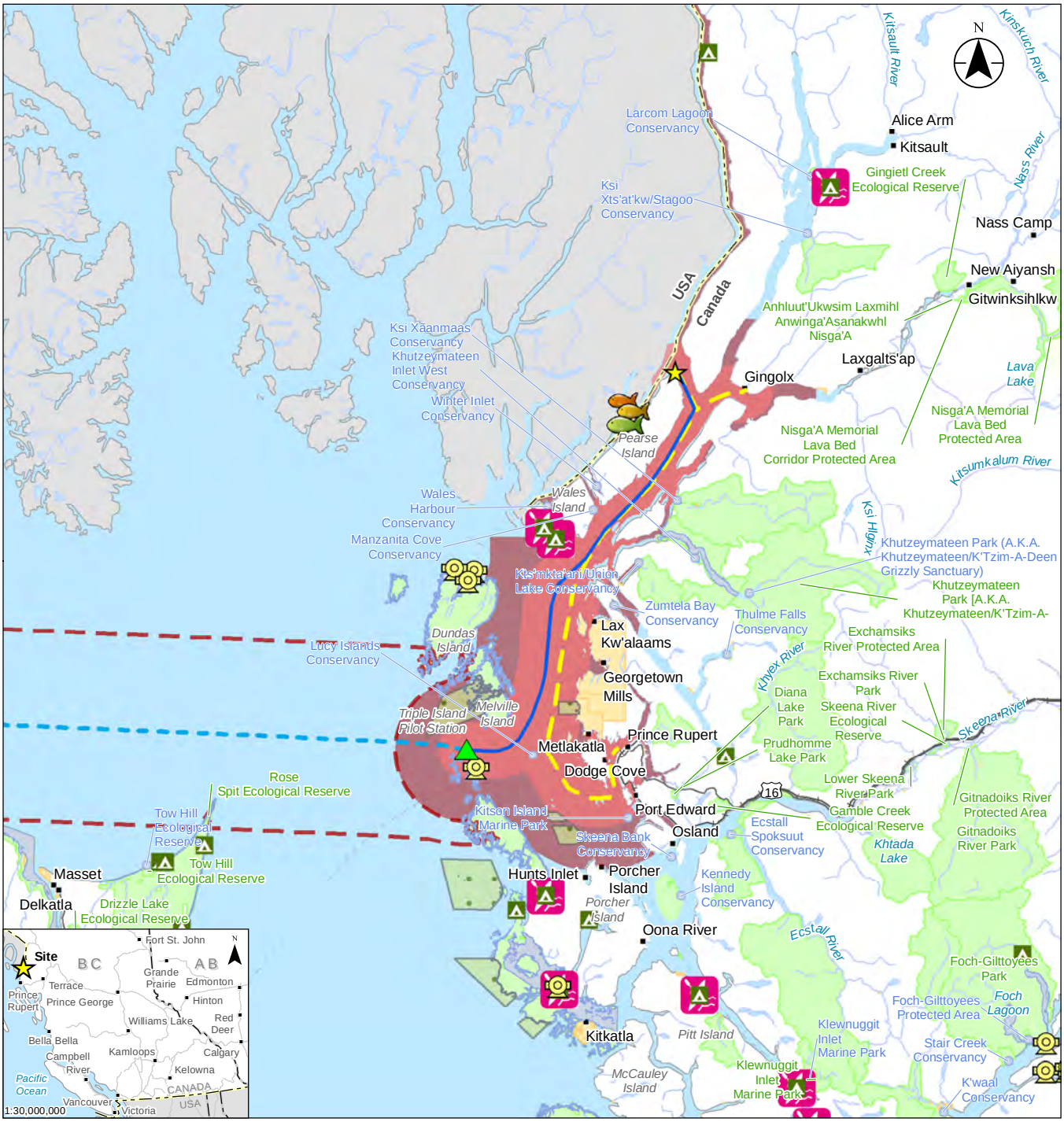
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.

7.11-26

Title

Shellfish Aquaculture Facilities



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Camping Site
- Hidden Inlet Fishing Resort
- Recreational Kayak Site
- Scuba Dive Site
- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional AssessmentArea
- Marine Use Open Water Assessment Area
- Rockfish Conservation Area
- Highway
- International Border
- Watercourse
- First Nations Reserve
- Marine Park, Ecological Reserve, Protected Area or Conservancy Area
- Provincial Park, Ecological Reserve, Protected Area or Conservancy Area
- Waterbody

0 10 20 30 40 50 km

1:1,250,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC

Project Number: 123221820
Prepared by TQUILICHINI on 20220825
Requested by MMACDONALD on 20220712
Checked by SMOSS on 20220825

Client/Project/Report

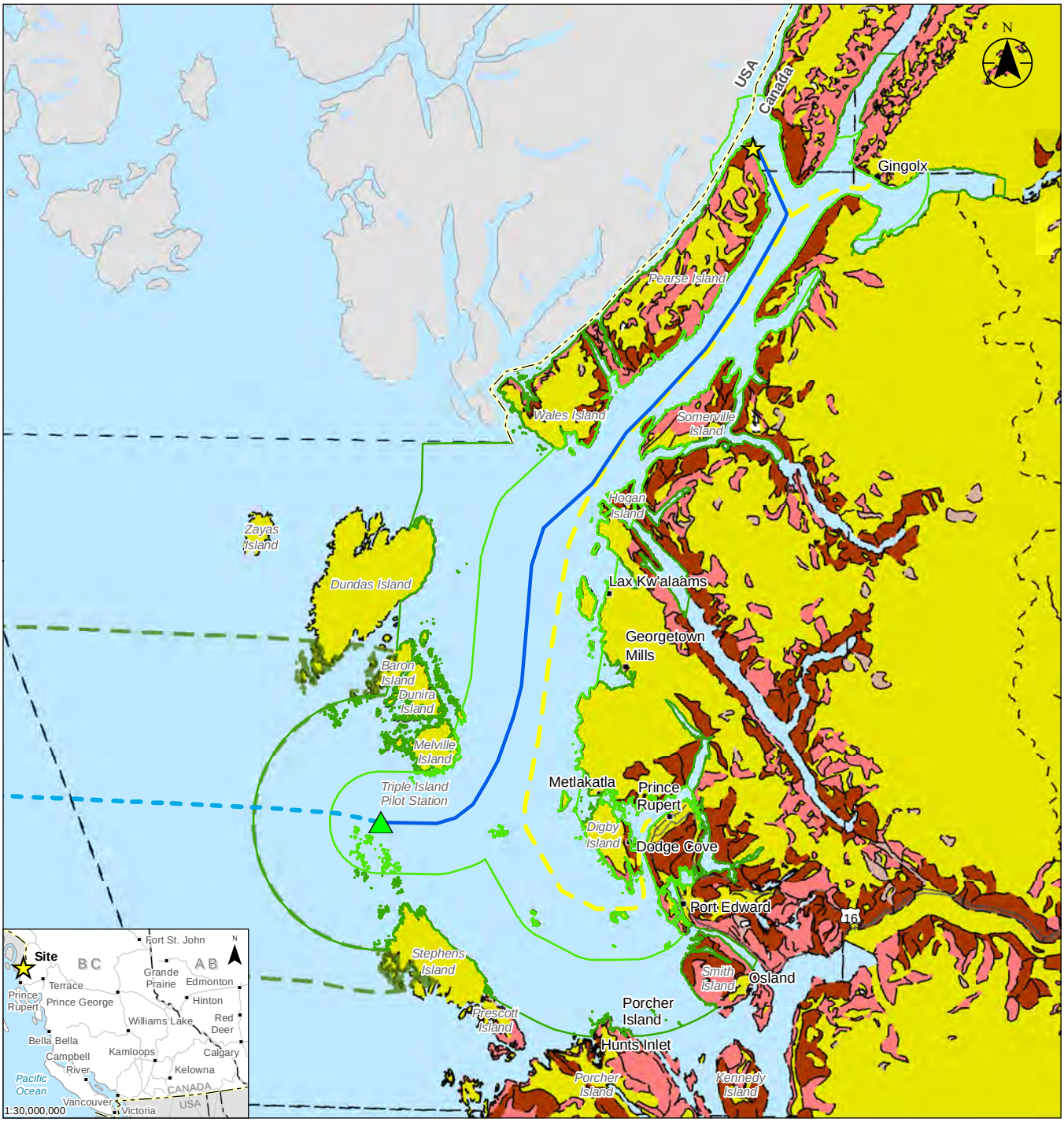
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.

7.11-27

Title

Marine Accessible Parks and Important Areas



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Visual Landscape Inventory

Visual Sensitivity to Human-made Alteration
- High
- Moderate
- Low
- Not Rated
- Highway
- International Border
- Waterbody

0 5 10 15 20 25 km
1:700,000 (at original document size of 8.5x11)

Stantec

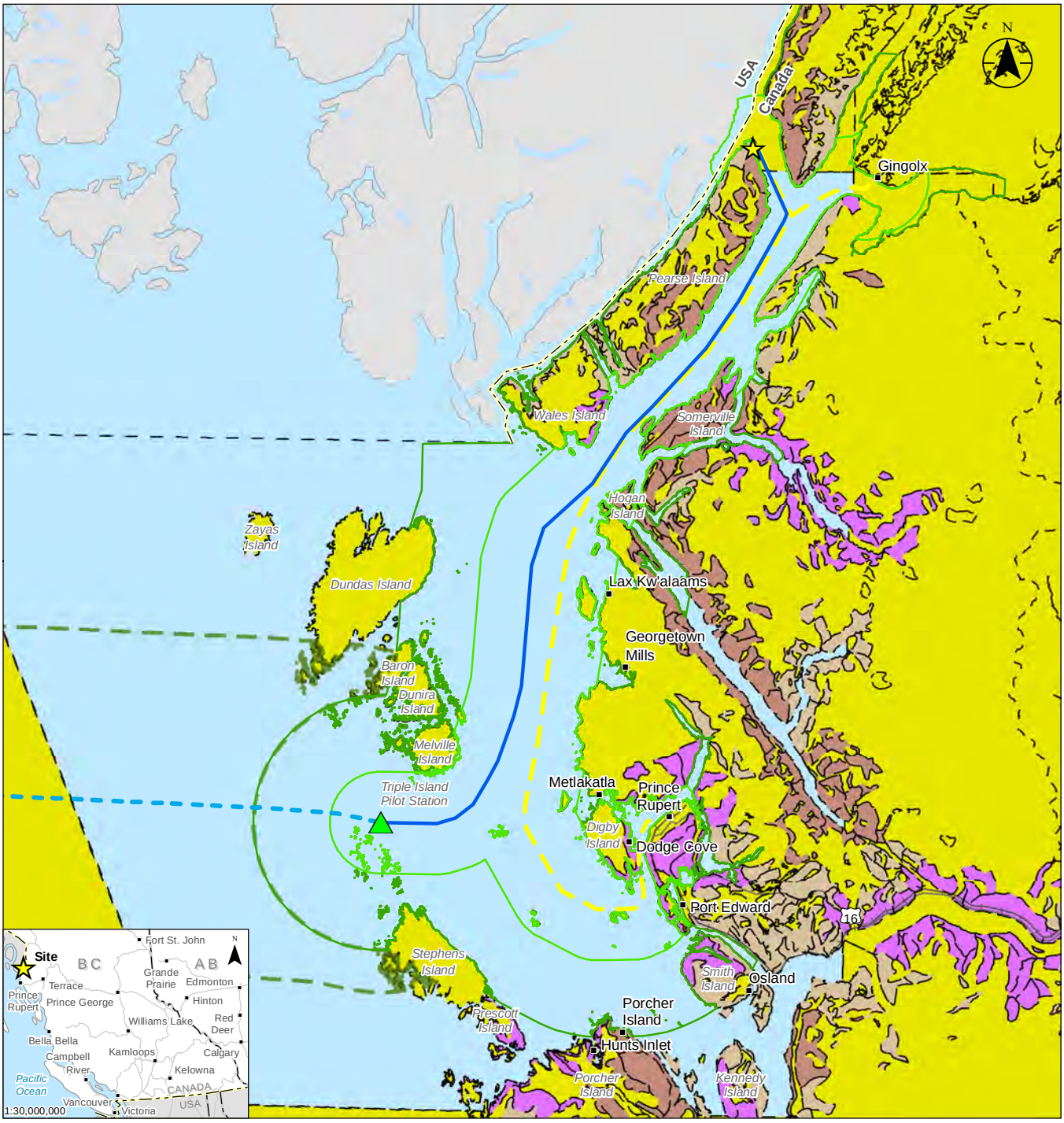
Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220825
Requested by MMACDONALD on 20220804
Checked by SMOSS on 20220825

Client/Project/Report

Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-28

Title
Visual Sensitivity Units



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station
- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Visual Landscape Inventory

Established Visual Quality Objective
- Retention
- Partial Retention
- Modification
- Not Rated
- Highway
- International Border
- Waterbody

0 5 10 15 20 25 km
1:700,000 (at original document size of 8.5x11)

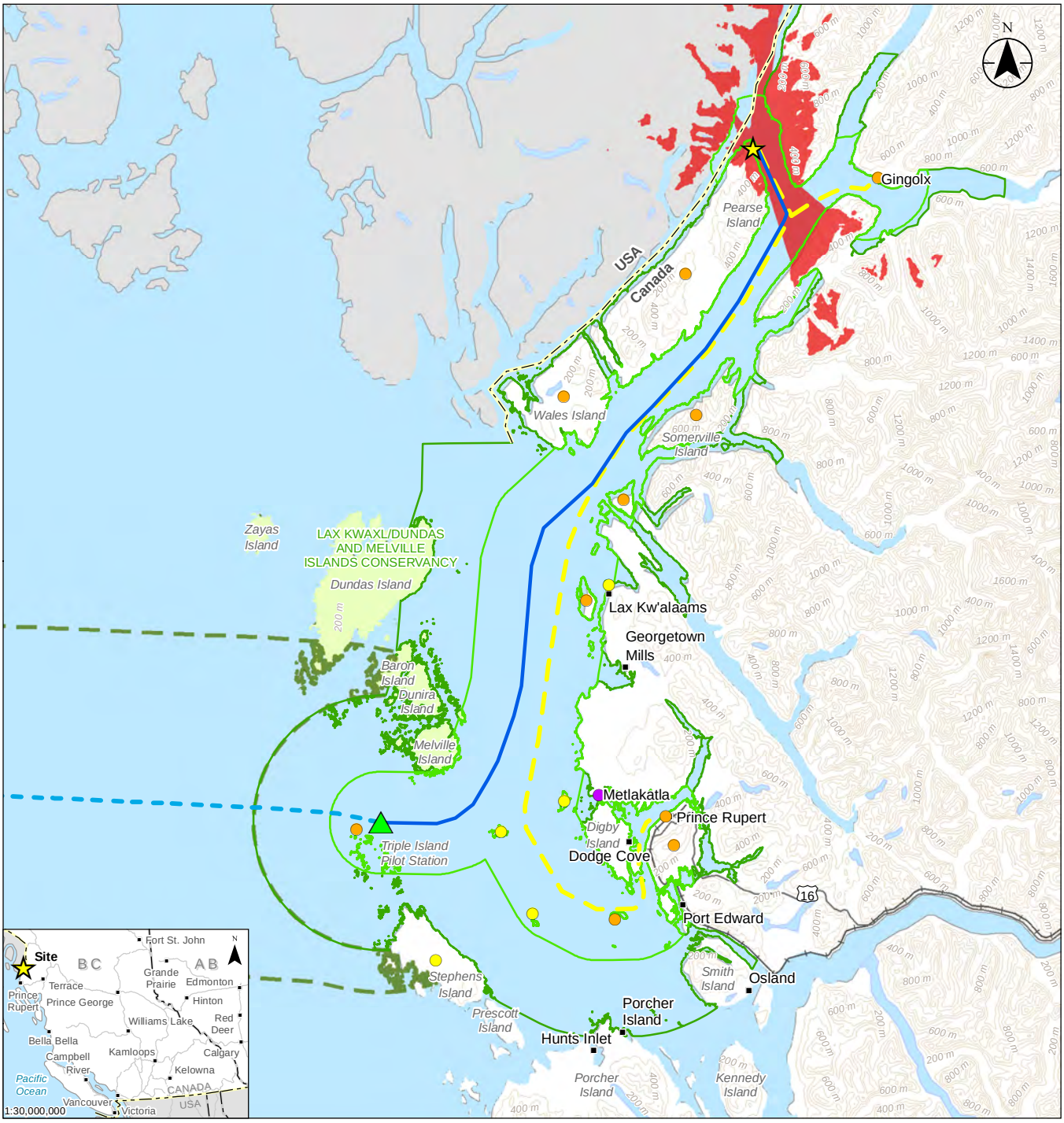
Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220825
Requested by MMACDONALD on 20220804
Checked by SMOSS on 20220825

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-29

Title
Visual Quality Objectives



KSI LISIMS LNG

Notes
1. Coordinate System: NAD 1983 UTM Zone 9N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Site
- Triple Island Pilot Station

Viewpoint Type
- Background
- Foreground
- Mid-ground

- Marine Shipping Route
- Open Water Marine Shipping Route
- Materials and Supply Shipping Route
- Marine Use Local Assessment Area
- Marine Use Regional Assessment Area
- Marine Use Open Water Assessment Area
- Area of Potential Visibility from Project Site
- Highway
- International Border
- Topographic Contour
- Conservancy Area
- Waterbody

0 5 10 15 20 25 km
1:700,000 (at original document size of 8.5x11)

Stantec

Project Location: Pearse Island, BC
Project Number: 123221820
Prepared by TQUILICHINI on 20220921
Requested by MMACDONALD on 20220804
Reviewed by NFORRESTER on 20220921

Client/Project/Report
Ksi Lisims LNG
Natural Gas Liquefaction and Marine Terminal
Environmental Assessment - Impact Assessment

Figure No.
7.11-30

Title
Visual Quality Viewpoints