PACIFIC NORTHWEST LNG

Summary of the Environmental Impact Statement and Environmental Assessment Certificate Application

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TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

1.1 Overview

Pacific NorthWest LNG Limited Partnership (PNW LNG) is proposing to undertake a project to construct and operate a liquefied natural gas (LNG) facility on Lelu Island. The Pacific NorthWest LNG Project (the Project) will be located primarily on federal lands and waters under the jurisdiction of the Prince Rupert Port Authority (PRPA) (Figure 1 and Figure 2). The Project would be located within the District of Port Edward, British Columbia (BC).

The Project would convert processed natural gas into LNG for export to the Pacific Rim markets in Asia. The natural gas would be transported to the Project via a new pipeline from northeast BC. The pipeline is a separate project proposed by a third party (TransCanada Pipelines Ltd.) and assessed independently as the Prince Rupert Gas Transmission project pipeline under the applicable regulatory regime.

At full build-out, the facility will receive approximately 3.2 billion standard cubic feet per day of pipeline grade natural gas, and produce up to 19.2 million tonnes per annum of LNG.

LNG is natural gas that has been cooled to approximately -162ºC, where it becomes a liquid and can be stored at atmospheric pressure. In this liquid form it can be transported in specially designed cargo ships (i.e., LNG carriers). Once delivered to markets, the LNG would be returned to a gaseous state and sent through pipelines for residential, commercial, and industrial uses. The use of LNG in Asian countries reduces, at least in some markets, reliance on other forms of non-renewable energy (e.g., burning coal and nuclear power).

It is anticipated that the Project will include the construction and operation of a natural gas liquefaction facility capable of producing 19.2 million tonnes per annum of liquid natural gas and a marine terminal capable of berthing and loading LNG carriers. Two phases of construction are expected for the Project with the first phase having a design capacity of two trains producing 12.8 million tonnes per annum of LNG; the second phase will include an additional 6.4 million tonnes per annum of capacity to be developed after the first two trains are operational. Construction is expected to take approximately four years and the first phase of the proposed Project is expected to be operational by early-2019.

The key components of the proposed Project shown in Figure 3 include: a natural gas reception system; gas pretreatment; three 6.4 million tonnes per annum natural gas liquefaction trains; three full containment 180,000 m^3 LNG storage tanks; a marine terminal and berths with a trestle, trestle control room, two LNG carrier berths; shipping LNG (between the terminal and Triple Island pilotage station); a materials off-loading facility; an access road; pioneer dock; bridge; and pipeline and utility connections (e.g., water and sewer). Gas turbines will be used to produce up to 1,100 MW of electrical and mechanical power.

PNW LNG is committed to a high standard of environmental management for the planned activities to ensure all regulatory and corporate requirements are fulfilled.

1.2 The Proponent

Pacific NorthWest LNG Limited Partnership (PNW LNG) is principally owned by PETROLIAM NASIONAL BERHAD (PETRONAS). At the time of submission of the EIS/Application Japan Petroleum Exploration Company (JAPEX) and PetroleumBRUNEI are minority shareholders in Pacific NorthWest LNG and its associated natural gas supply. PNW LNG's engineering, procurement, construction and commissioning (EPCC) contractor will construct and commission the facility and PNW LNG will own and operate it.

PETRONAS is a top ranked integrated oil and gas business which is wholly owned by the Government of Malaysia. It is a fully integrated gas business from exploration and production to processing and liquefaction, pipeline operations, shipping and regasification. PETRONAS operates one of the world's largest LNG facilities in Bintulu, Sarawak, which consists of three plants with a combined capacity of 24 million tonnes per annum.

Communications regarding the PNW LNG Project should be sent to:

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1.3 Environmental Assessment Process

The EIS/Application has been prepared to fulfill the requirements applicable to a designated project under the *Canadian Environmental Assessment Act* (CEAA 2012) and the requirements with respect to a reviewable project under the BC *Environmental Assessment Act* (BCEAA). In particular, the EIS/Application has been prepared to comply with EIS Guidelines prepared for the Project by the Canadian Environmental Assessment Agency (CEA Agency) and the Application Information Requirements as approved and issued by the BC Environmental Assessment Office (BC EAO). The CEA Agency and the BC EAO have agreed to work together to conduct a coordinated environmental assessment for the proposed Project.

The CEA Agency is the lead agency for the environmental assessment, noted in the section 11 Order issued by the BC EAO on September 17, 2013, as the LNG facility will be primarily located on federal land and waters.

1.3.1 Federal Environmental Assessment Process

The Project requires an environmental assessment under CEAA 2012. The Project triggers the CEAA requirements under subsections 2(a) and 14 (d) of the Physical Activities included in the

Regulations Designating Physical Activities (SOR/2012-147) and amended in the *Regulations Amending the Regulations Designating Physical Activities* (2013). Power generation for the Project will exceed the 200 MW threshold requirements for fossil fuel fired electrical and/or mechanical power generation options as stated in subsection 2(a). The Project's construction of a natural gas liquefaction facility with, at full build-out, a processing capacity of 52,603 t/d and a combined LNG storage capacity of approximately 248,000 t (depending on density) for all three tanks will also exceed the threshold requirements under subsection 14 (d).

The Project will require review under CEAA section 5 as identified in the federal information requirements in the final EIS Guidelines issued by the CEA Agency on October 30, 2013.

1.3.2 Provincial EA Process

The Project is being reviewed under Part 4 of the *Reviewable Projects Regulation* under BCEAA as the Project includes a new energy storage facility with the capacity to store an energy resource in a quantity above the threshold of 3 petajoules (PJ) of energy.

The BC EAO issued an Order under section 10 of BCEAA for the Project on July 16, 2013 indicating the Project requires an environmental assessment. The BC EAO issued an Order under section 11 of BCEAA on September 17, 2013 which describes the scope of the Project and the scope of the assessment under BCEAA.

The EIS/Application prepared by the Proponent will be used to satisfy both processes, including joint federal and provincial public comment periods.

2 PROJECT DESCRIPTION

2.1 Purpose of the Project

The purpose of the Project is to convert processed natural gas from Progress Energy Canada Ltd. reserves into LNG for export to the Pacific Rim markets in Asia. The use of LNG in Asian countries reduces reliance on other non-renewable energy sources such as coal and nuclear fuels, in some markets.

Supply contracts for LNG are typically negotiated on a long term basis. Current demand from Pacific Rim markets—particularly Japan—have created a window of opportunity for supply contracts that can only be met by new facilities; the schedule proposed for this Project is designed specifically to take advantage of this window of opportunity.

2.2 Project Location

The proposed Project will be located on Lelu Island in northwest British Columbia, Canada. Lelu Island and surrounding waters are federal lands and waters within the boundaries of the PRPA, 15 km southwest of the City of Prince Rupert, and within the District of Port Edward, approximately 2 km from the town centre (Figure 1 and Figure 2). Lelu Island is identified in the PRPA 2020 Land Use Management Plan for future major industrial uses. Lelu Island is also located within the asserted traditional territories of a number of Tsimshian Aboriginal groups including Metlakatla First Nation; Lax Kw'alaams Nation; Gitxaala Nation; Kitselas First Nation; and Kitsumkalum First Nation.

Lelu Island and its surrounding waters are located within the boundaries of the Port of Prince Rupert under the jurisdiction of the PRPA, established under the *Canada Marine Act* and its regulations. The coordinates of the center of the proposed Project are:

- Degrees – Minutes – Seconds—Latitude 54°11'58.02"N/Longitude 130°17'19.81"W
- Decimal Degrees—Latitude 54.199451/Longitude – 130.288836°
- Universal Transverse Mercator—415924 E/6006480 N (Zone 9).

Lelu Island is a small, gently sloping, undeveloped island, occupied by large expanses of wetlands, near the mouth of the Skeena River and its estuary in an area subject to large tidal fluctuations (-3.68 to 3.62 m above mean sea-level) and very wet climate (average of 2,469 mm of rainfall). The project development area would have a total size of approximately 263 hectares with approximately 160 hectares on Lelu Island, covering 83% of the island. The remaining 103 hectares would include marine infrastructure.

2.3 Project Components

The Project will be developed in two distinct phases, with the key components as listed in Table 1. The description of project components is based upon on-going engineering design; the final design may differ slightly in configuration and equipment sizing.

Table 1: Overview of Project Components and Activities

Project Components and Activities	Description
Construction	
Site Preparation (land-based)	▪ Tree removal, vegetation clearing, peat removal, grading, and general site preparation within terrestrial project development area (including the facility on Lelu Island, the bridge, and road access to the mainland)
Onshore Construction	▪ Construction, operation, and decommissioning of a temporary camp that would accommodate 3,500 to 4,500 people at peak construction for the purposes of constructing the facility and all related infrastructure, services, and facilities ▪ Excavating and pouring foundations, constructing of buildings, installation of drainage systems, and installation of utilities ▪ Construction of: • LNG facility (and related infrastructure) up to the point of connection with the natural gas transmission line • Site fencing • Pipeline connectors for waste • Gas treatment infrastructure (acid gas removal unit, dehydration unit, and mercury removal unit) • Three 6.4 MTPA liquefaction trains • Three 180,000 m^3 LNG storage tanks • Administration, control, and maintenance buildings • Water supply pipe from the Port Edward water system and a water distribution system • Wastewater treatment systems (for sewage and oily other effluent) and a pipe connecting the mainland and the Port Edward wastewater sewage treatment facility • Firewater system ▪ Air emissions, noise, and light from use of construction equipment ▪ Power generation (use of diesel/generators) ▪ Construction of a two-lane bridge connecting Lelu Island to the mainland (including bridge footings on the mainland)
Vehicle Traffic	▪ Use of the two-lane bridge connecting Lelu Island to the mainland by construction workers and vehicles ▪ Use of roads on and off-site ▪ Air emissions
Dredging	▪ Dredging within the MOF and at the marine terminal

Project Components and Activities	Description

Marine Construction	▪ Construction of a two-lane bridge connecting Lelu Island to the mainland (including bridge footings in Lelu Slough)
	▪ Construction and use of the MOF
	  • Pile driving
	  • Berthing large roll-on-roll off barges and ships
	▪ Construction of the marine terminal
	  • 2.4 km conventional pipe pile supported trestle
	  • Trestle and berth topside infrastructure including a control room, insulated cryogenic piping, pumping equipment, and LNG loading infrastructure
	  • Two LNG carrier berths (capable of berthing two 217,000 m^3 LNG carriers up to 315 m in length)
	  • Loading and off-loading arms
	  • Breakwaters may be constructed

Waste Management and Disposal	▪ Disposal of cleared vegetation, peat, waste rock, and overburden ▪ Wastewater treatment systems (for sewage and oily other effluent) and a pipe connecting the mainland and the Port Edward wastewater sewage treatment facility ▪ Storm water management ▪ Solid wastes (garbage removed from island) ▪ Liquid wastes (effluents) ▪ Hazardous wastes
Disposal at Sea	▪ Removal, transportation, and disposal of dredged sediments in Brown Passage (assumed)
Operational Testing and Commissioning	▪ Air emissions ▪ Noise emissions ▪ Light emissions
Site Clean Up and Reclamation	▪ Post-construction site clean up ▪ Re-vegetation (if appropriate)

Project Components and Activities	Description
Facility Operation	
LNG Facility and Supporting Infrastructure on Lelu Island	▪ Operate 24 hours per day, 365 days per year ▪ Feed gas receiving equipment including pig receiver, pressure let-down station, metering station with telemetry and inlet gas separator ▪ Gas treatment equipment to remove trace amounts of CO_2, H_2S, mercury, and water ▪ LNG production and storage • Up to three identical 6.4 MTPA liquefaction trains (two to be constructed in Phase 1 with provision for a third train in Phase 2) • Two or more nitrogen generation and vaporization packages with liquid nitrogen storage • Up to three 180,000 m^3 full containment LNG storage tanks (two to be construction in Phase 1 with a provision for a third in Phase 2) • Instrument and facility compressed air system • Storage and use of additional facility materials ▪ Operation of gas-fired turbines capable of producing up to 1,100 MW of combined mechanical and electrical power ▪ LNG facility maintenance and testing • Maintenance of equipment to ensure safe and reliable operation • Road and site maintenance • Inspection and maintenance of safety, civil structures, and environmental monitoring devices • Flare system for emergency, start-up hydrocarbon releases, and annual maintenance • Annual maintenance ▪ Use of bridge and roads to the mainland • Increase in road traffic ▪ Physical and chemical treatment of vegetation on Lelu Island and mainland
Marine Terminal Use	▪ 2.7 km conventional pipe pile supported trestle ▪ Trestle and berth topside infrastructure including a control room, insulated cryogenic piping, pumping equipment, and LNG loading infrastructure ▪ Two LNG carrier berths (capable of berthing two 217,000 m^3 LNG carriers up to 315 m in length) ▪ Berthing, hoteling, and loading LNG onto carriers ▪ Loading and off-loading arms
Shipping	▪ Ship and tug activities (including moorage and transit) between the terminal and the Triple Island pilotage station ▪ For the first phase of the proposed Project - approximately one LNG carrier every two days berthed at the terminal ▪ At full build out - this would increase to approximately one LNG carrier per day and 350 per year berthed at the terminal

Project Components and Activities	Description
Waste Management and Disposal	▪ Solid wastes • Domestic wastes • Paper/cardboard waste • Wood and scrap metal from maintenance facility ▪ Liquid wastes • Contaminated storm water or water contaminated in the LNG processes • Water discharge from steam or condensate blow-down • On-site management of run off and grey water ▪ Hazardous wastes • Solvent or hydrocarbon contaminated wastewater and surface runoff • Mercury removed during the natural gas treatment process • Waste catalyst and adsorbents • Waste lubricating oils • Spent solvents • Waste biological treatment facility sludge (if sewage is treated on-site) • Minor miscellaneous wastes included used cartridge filters, batteries, etc.
Fish Habitat Offsetting	▪ Fish habitat constructed as part of the fish habitat compensation plan
Wetland Habitat Compensation	▪ Wetland habitat constructed or enhanced as a component of the wetland compensation plan
Facility Decommissioning	
Dismantling Facility and Infrastructure	▪ Dismantle/recycle facility equipment and infrastructure ▪ Transport and disposal or recycling of materials
Dismantling of Marine Terminal and MOF	▪ Dismantling and disposal of marine terminal and associated component parts
Waste Disposal	▪ Facility components
Site Clean Up and Reclamation	▪ Preparation of the disturbed portion of Lelu Island for other industrial purposes or reclamation to restore ecological values in accordance with the federal crown land lease (PRPA/Transport Canada)

2.4 Activities

Table 2 lists the key project activities associated with construction, operations and decommissioning phases. Construction will commence upon receipt of regulatory and permitting approvals. Operations of the Project will be designed to allow for continuous operation, 24 hours a day, 365 days a year. There are currently no LNG-specific regulations in place related to the decommissioning of an LNG export facility on federal lands. If continued project operation is not feasible at the expected end of facility life (estimated to be a minimum of 30 years), a decommissioning and final rehabilitation plan will be developed in consultation with the PRPA, applicable regulatory authorities, and local Aboriginal groups.

Table 2: Project Activities and Schedule

Project Activities	Timeline	
	Start	Finish
Bridge and Access Road Construction	Q1 2015	Q2 2016
Site Clearing and Preparation	Q1 2015	Q2 2016
Construction Camp	Q2 2015	Q3 2016
Construction of Materials Off-loading Facility (including dredging)	Q1 2015	Q4 2016
Construction of Jetty-Trestle, Berths and Marine Terminal (including dredging)	Q3 2015	Q3 2018
LNG Tank Construction	Q1 2016	Q3 2018
LNG Train 1 Construction and Commissioning (Phase 1)	Q3 2016	Q3 2018
LNG Train 2 Construction and Commissioning (Phase 1)	Q4 2016	Q4 2018
Operations (Phase 1)	Q1 2019	2048+
LNG Train 3 Construction and Commissioning (Phase 2)[a]	TBD	TBD
Decommissioning (or facility refurbish/re-commissioning)	2048+	–

NOTE:
[a] Timing of construction of Phase 2 will depend on market conditions.

3 SCOPE OF THE PROJECT AND ASSESSMENT

3.1 Scope of the Project

The scope of the Project for the purpose of the environmental assessment includes all activities and physical works associated with the construction, operation and decommissioning of the proposed Project as described in Section 2.0.

3.2 Factors to be Considered

The scope of the assessment of the Project includes the Project's potential direct, indirect and cumulative effects. The scope of the assessment focuses on effects for which a reasonable direct causal link can be demonstrated between some aspect of the Project and the resulting effect. The EIS/Application includes factors and requirements specified in the EIS Guidelines pursuant to CEAA 2012, as well as the Application Information Requirements pursuant to BCEAA.

3.2.1 Valued Components

The EIS/Application focusses on those components of the environment that could be most affected by the Project and are identified as a concern by government, stakeholders, the public and Aboriginal groups. The valued components (VC) identified for the Project and potential effects of the Project on these VCs are presented in Table 3 in the same order as found in the EIS/Application. Measurable parameters are identified to facilitate the assessment.

Table 3: Valued Components, Environmental Effects and Measurable Parameters

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Air Quality	Change in criteria air contaminant concentration levels within 15 km of the proposed Project; including Port Edward and Prince Rupert	Concentrations of criteria air contaminants (CACs): ▪ SO_2, NO_2, $PM_{2.5}$, PM_{10}, CO, VOCs and H_2S.
Greenhouse Gas Management	Emission of GHG gases (CO_2, CH_4, N_2O, PFCs, HFCs, SF_6)	▪ Anticipated GHG emissions in relation to current provincial GHG emission levels and federal and provincial policies and targets for GHG reduction
Acoustic Environment	Increase in ambient sound levels	Overall equivalent continuous A-weighted sound level ▪ A-weighted Day (dBA, Ld) ▪ A-weighted Night (dBA, Ln) ▪ A-weighted Day-Night levels (dBA, Ldn)
Ambient Light	Change in ambient light	▪ Light spill- Light output from the proposed Project ▪ Glare- The contrast between project lighting and background lighting ▪ Sky glow- The ratio of upward directed light to total light
Vegetation and Wetland Resources	Change in abundance of plant species of interest	▪ Estimated number of plants from the species of interest affected
	Change in abundance or condition of ecological communities of interest	▪ Area of ecological communities of interest affected (measured in hectares)
	Change in wetland functions	▪ Area of wetland affected (measured in hectares)
Terrestrial Wildlife and Marine Birds	Change in habitat	▪ Change in amount of habitat (quantified in hectares) of ecological communities and/or high or moderate suitable habitat identified for Endangered or Threatened SARA-listed species
	Change in wildlife mortality risk	▪ Qualitative estimate of increased wildlife mortality from the Project
	Alteration of wildlife movements	▪ Change in movement patterns related to placement of project infrastructure
Freshwater Aquatic Resources	Change in (permanent alteration or destruction of) fish habitat	▪ Area of fish habitat permanently altered or destroyed (measured in square metres)
	Increased fish mortality	▪ Estimated number of dead and moribund fish that are linked to a commercial, recreational or aboriginal fishery
	Change in food and nutrient content	▪ Relative contribution of freshwater water output of the watercourses on Lelu Island compared to the output of the Skeena River

Valued Component	Potential Adverse Project Effects	Measurable Parameters
Marine Resources	Change in (permanent alteration or destruction of) fish habitat	▪ Area of fish habitat permanently altered or destroyed (measured in square metres)
	Increased fish mortality and injury of fish or marine mammals	▪ Probability of injuring or killing marine mammals, or fish that are linked to a commercial, recreational or aboriginal fishery
	Change in behaviour of fish or marine mammals due to pressure waves or underwater noise	▪ Timing, duration, and intensity of underwater sound levels
	Change in water and sediment quality	▪ Estimated change in total suspended solids and concentration of contaminants
Economic Environment	Change in labour supply/demand within the LAA	▪ Labour availability (persons) ▪ Skill levels
	Adverse changes to economic activity	▪ Change in economic activity of other sectors
	Adverse changes to municipal finances	▪ Municipal revenue ▪ Cost of services
Navigation and Marine Resource Use	Interference with marine navigation	▪ Magnitude and duration of effect on navigation
	Effects on fishing, recreation and marine use (including marine tourism)	▪ Change in number and types of marine vessels as a result of the proposed Project (vessels/month) ▪ Attribute data on marine uses along shipping channel (i.e., fishing, aquaculture) ▪ Recreational activities/destinations overlapping with project infrastructure and project shipping channels (between the terminal and Triple Island pilotage station)
Infrastructure and Services	Effects on community services and infrastructure	▪ Number of workers and their dependents for each phase ▪ Change in demographic composition ▪ Demand and supply of community infrastructure and services (e.g., education, social services, etc.) ▪ Parameters based on infrastructure and services affected (e.g., police officers/1,000 people)
	Effects on traffic and pressure on transportation infrastructure	▪ Daily traffic volume (vehicle/day) ▪ Air traffic ▪ Traffic incidents in Port Edward and Prince Rupert
	Change in housing availability and affordability	▪ Housing supply and demand (units) ▪ Housing cost
Visual Quality	Change in visual quality	▪ Change in existing visual condition ▪ Change in visual quality objective class ▪ Change in landscape attributes contributing to visual sensitivity

Valued Component	Potential Adverse Project Effects	Measurable Parameters

Community Health and Well-being	Change to social determinants of health	▪ Population (demographics, rate of change)
		▪ Education, employment and income Housing
		▪ Community cohesion
		▪ Physical and mental health conditions (e.g., drug and alcohol use, divorce rates, increased gambling, etc.)
		▪ Supply and demand of health infrastructure and services
		  • Demand associated with physical health
		  • Demand associated with mental health
		  • Demand associated with health and safety site inspections
		▪ Recreation opportunities

	Change in diet and nutrition	▪ Change in the composition of diets (proportion of country foods to market foods)
Health		
Human and Ecological Health	Change in human health	▪ Concentration ratio (non-cancer health risks from inhalation or drinking water exposure) ▪ Hazard Quotient (non-cancer health risks from food/dermal exposure) ▪ Incremental Lifetime Cancer Risk (cancer risks from long-term exposure via inhalation or oral/dermal exposure)
	Change in ecological health	▪ Risk Quotient (health risks to populations from long-term exposure via oral/dermal pathways; or health risks to community based on concentration in exposure medium)
Heritage		
Archaeological and Heritage Resources	Alteration or destruction of heritage sites	▪ Number damaged or destroyed
	Alteration or destruction of archaeological sites	▪ Number damaged or destroyed
	Alteration or destruction of culturally modified trees (CMTs)	▪ Number damaged or destroyed
First Nations and Aboriginal		
Current Use of Lands and Resources for Traditional Purposes	Changes to current use of lands and resources for traditional purposes by Aboriginal people	▪ Quantitative changes in preferred harvested species ▪ Changes in, or restrictions on, preferred identified harvesting methods ▪ Quantity and quality of identified valued traditional use locations and access corridors where use or access to those locations is changed ▪ Quantity, quality, and accessibility of similar alternate locations where traditional use of the land and resources remains unaffected by the proposed Project ▪ Qualitative changes in the experience of using the land and resources for traditional purposes

3.2.2 Spatial and Temporal Boundaries

Local and regional spatial boundaries for the assessment were determined for each of the VCs based on their respective characteristics and anticipated interactions with the proposed Project. Specific spatial boundaries are defined in the relevant sections throughout the EIS/Application and are based on the nature of the VC being assessed. A local assessment area (LAA) is the area within which direct and indirect project effects will occur and can be measured (Figures 4 to 7). A regional assessment area (RAA) is a larger area where potential cumulative effects may arise (Figures 8 to 11).

Temporal boundaries generally coincide with the Project's construction, operation and decommissioning phases and may also include time periods of particular sensitivity for each VC (e.g., breeding, migration).

4 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Alternative means of carrying out the Project were considered for technical and economic feasibility. Technical feasibility was evaluated during preliminary engineering design; economic feasibility was evaluated considering capital, operating and lifecycle (i.e., equipment maintenance and replacement) costs. Environmental effects were considered for technically and economically feasible alternatives and where environmental effects might arise.

Table 4 provides a summary of the alternative means considered and the key selection criteria used. During the stakeholder and public engagement process, the main issue raised was selection of Lelu Island over Grassy Point for development of the facility. PNW LNG considered twenty possible sites; most options were quickly dropped due to inability of pipelines to reach sites or because sites were located close to protected areas. Five of those sites were investigated more closely (described in Table 4) and Lelu Island was selected.

Table 4: Summary of Alternative Means of Carrying Out the Project

Alternative	Options	Feasible?	Key Selection Criteria Differentiation	Preferred
LNG Production Process[1]	DMR	No. Mixed-refrigerant pre-cooling not appropriate for location.	-	
	C3MR	Yes	▪ Full design package assessment (FEED) incomplete	Undecided
	ConocoPhilips Optimized Cascade®	Yes	▪ Full design package assessment (FEED) incomplete	Undecided

Alternative	Options	Feasible?	Key Selection Criteria Differentiation	Preferred
Main Refrigerant Compressor Driver	Aero-derivative gas turbine	Yes	▪ Most efficient gas turbine type	✓
	Heavy industrial gas turbine	Yes	▪ Less efficient gas turbine type	
	All electric motor drive	Yes	▪ Lack of certainty for supply availability ▪ Lack of experience as LNG compressor drivers	
	Steam turbine	No. Water requirements have potential environmental effects.	-	
Source of Electrical Power	Onsite gas turbine	Yes	▪ Higher reliability	✓
	Offsite	Yes	▪ Lack of certainty for supply availability	
Land-based Access to Lelu Island	Northern corridor (northern route)	Yes	▪ Least impact on wetlands and marine habitat ▪ Single bridge and shortest bridge ▪ Least private land	✓
	Northern corridor (southern route)	Yes	▪ Least impact on wetlands and marine habitat ▪ Double bridge and short bridge ▪ Least private land	
	Southern corridor	Yes	▪ Most impacts on marine habitat ▪ Triple bridge and longest bridge ▪ Most private land	

Alternative	Options	Feasible?	Key Selection Criteria Differentiation	Preferred
Placement of Marine Infrastructure	Options 1, 3, 4, 6, 6a	No. Trestle length not economically and environmentally feasible.	-	
	Options 8a, 8b, 8b1	No. Dredging volumes not economically and environmentally feasible.	-	
	Option 8c	Yes	▪ Some navigation effects ▪ Higher costs and environmental effects from dredging	
	Option 8c1	Yes	▪ Some navigation effects ▪ Lower costs and environmental effects from dredging	
	Option F	Yes	▪ Higher costs and environmental effects from dredging ▪ Reduced navigation effects ▪ Better constructability	✓
Disposal of Sediments	Disposal on land	No. Sediment volumes too high and environmental concerns with terrestrial disposal	-	
	Disposal at sea	Yes	-	✓
Location for the Disposal at Sea of Marine Sediments	Offshore Coast Island	No	-	
	Offshore from Barrett Rock	No	-	
	Southwest Kinahan Islands	Yes	▪ Has sufficient disposal volume ▪ Closest of the feasible alternatives ▪ Area is of particular importance for commercial prawn and shrimp harvesting	
	Northwest Kinahan Islands	No	-	
	Southwest corner of PRPA boundaries	Yes	▪ Important area for marine birds ▪ Adjacent to a rockfish conservation area,	

Alternative	Options	Feasible?	Key Selection Criteria Differentiation	Preferred
	North Porcher Island	No	-	
	Between Rachael Islands - Gull Rocks	No	-	
	Stephens Island	Yes	▪ Not well studied ▪ Distant from Lelu Island ▪ Lower disposal volume than Brown Passage	
	Brown Passage	Yes	▪ Previously used/approved for disposal ▪ Highest volume available for disposal ▪ Most well studied area ▪ Fewest nearby commercial fishing areas ▪ Farthest from Lelu Island	✓
Site Location	Port Edward (Lelu Island)	Yes	▪ Good site access ▪ Good existing infrastructure ▪ High dredge volume ▪ Long trestle ▪ Less risk from geomorphological events	✓
	Port Simpson	Yes	▪ High earthworks volume ▪ Potential for faulting and soil liquefaction ▪ High development cost	
	Georgetown Mills	Yes	▪ Potential for shoreline stability issues and erosion ▪ Long pipeline	
	Gobeil Bay	Yes	▪ High earthworks volume ▪ Long, complex LNG carrier transit ▪ High development cost	
	Kitimat	Yes	▪ High earthworks volume ▪ Limited land area available ▪ Long LNG carrier transit ▪ High development cost	

Alternative	Options	Feasible?	Key Selection Criteria Differentiation	Preferred
Site Layout (LNG Tanks)	North side of Lelu Island	Yes	▪ More optimized for updated trestle design	✓
	South side of Lelu Island	Yes	▪ Less optimized for updated trestle design	
Site Layout (Main Flare Stack)	Middle of the northeastern side of Lelu Island	Yes	▪ Closer to LNG processing and storage facilities ▪ May not meet requirements for thermal radiation levels ▪ Dominant southeast winds push flare over the facility	
	Toward the southern tip of Lelu Island	Yes	▪ Further from LNG processing and storage facilities ▪ Meet requirements for thermal radiation levels ▪ Use of the dominant southeast winds to reduce radiation exposure from the flare	✓
Site Layout (LP Flare Stack)	Toward the southern tip of Lelu Island	Yes	▪ Distant from BOG compressor	
	Western corner of Lelu Island	Yes	▪ Close to BOG compressor	✓
Site Layout (Administrative Facilities)	Toward the southern side of Lelu Island	Yes	▪ Close to main flare stack and operational features of facility	
	Middle of the northeastern side of Lelu Island	Yes	▪ Distant from main flare stack and operational features of facility	✓
Site Layout (Warehouse/Workshop/Laboratory)	Toward the southern side of Lelu Island	Yes	▪ Close to main flare stack	
	Peninsula on the northern side of Lelu Island	Yes	▪ Distant from main flare stack	✓
Construction Camp Location	Lelu Island	Yes	▪ Better access to construction site ▪ Camp access easier to control ▪ Less potential for adverse socio-economic effects	✓
	Mainland	Yes	▪ Worker transport issues ▪ Camp access control limited ▪ Potential for adverse socio-economic effects	

NOTES:

Shaded areas indicate preferred option; final selection confirmed with a checkmark.

[1] DMR means dual mixed refrigerant; C3MR means propane pre-cooled mixed refrigerant; FEED means front end engineering design.

5 PUBLIC AND ABORIGINAL CONSULTATION

The objectives of the public and Aboriginal consultation process for the Project have been to:

- Provide information about the Project to members of the general public, stakeholders and interested parties and Aboriginal groups, and seek their input throughout the environmental assessment of the Project.
- Identify, document, and monitor issues and concerns arising from the consultation process.
- Request information on health and socio-economic conditions, physical and cultural heritage, items of archaeological or heritage importance and the current use of lands and resources for traditional purposes by Aboriginal groups in the vicinity of the Project and how those activities might be affected by the Project.
- Identify the need for planning, design and management measures that will mitigate or resolve the issues raised through the consultation process.

5.1 Public Consultation Activities to Date

PNW LNG has engaged in consultation with the public and key stakeholders since September 18, 2012. Consultation activities have included providing general and technical information about the Project through meetings, phone calls, emails and six open houses in Port Edward and Prince Rupert. PNW LNG has also been an active participant in the CEA Agency led Working Group which includes representatives of local municipalities.

5.1.1 CEA Agency Activities

The Canadian Environmental Assessment Agency invited comments from the public and Aboriginal groups during a 30-day public comment period on a Summary of the Project Description (February 19, 2013) and two 30-day public comment periods on the draft Environmental Impact Statement Guidelines (April 8 to May 8, 2013 and August 21 to September 20, 2013). Federal funding was provided to six stakeholder groups to enable their participation in the environmental assessment process. Another 30-day public comment period led by the CEA Agency will be held during the review of the EIS/Application.

5.1.2 BC EAO Activities

The BC Environmental Assessment Office held a 30-day public comment period from November 13 to December 13, 2013 and an open house, with PNW LNG, in Prince Rupert (November 19, 2013) and Port Edward (November 20, 2013) on the draft Application Information Requirements (AIR) document. PNW LNG provided information describing the Project at both open houses and responded to questions raised.

Following the public comment period, PNW LNG provided responses to all questions raised; these responses were made available to the public and Aboriginal groups via posting on the provincial electronic Project Information Centre (www.eao.bc.ca). Another 30-day public comment period led by the BC EAO will be held during the review of the EIS/Application. PNW LNG will be required to respond to comments received at that time.

5.1.3 Proponent Activities

One hundred and thirty-three stakeholder groups and 508 individual stakeholders have been identified. Seventy-four meetings were held with local businesses and community groups and 25 meetings were held with individual land owners. Since November 6, 2012, six open houses have been hosted, including those for the provincial and federal processes, and 293 participants attended. Key means of consulting with public and other key stakeholders included a marine workshop, presentations and meetings with local governments and community organizations and establishing a community office in Prince Rupert.

Public communication materials include: a Community Outreach Office, a website (www.pacificnorthwestlng.com); newsletters mailed to residents of Port Edward and Prince Rupert; e-newsletters; information boards; fact sheets; graphics outlining the natural gas liquefaction process; info graphic providing an overview of the overall value chain of the Project; maps illustrating the Project and study areas; toll-free phone line; public e-mail address; comment cards; and an online comment form.

5.2 Aboriginal Engagement Activities to Date

PNW LNG has engaged with the five Aboriginal groups listed in the CEAA 2012 EIS Guidelines and in Schedule B of the BC EA section 11 Order. These include Metlakatla First Nation, Lax Kw'alaams First Nation, Gitxaala Nation, Kitselas First Nation, and Kitsumkalum First Nation. Engagement with these Aboriginal groups has included information presentations, meetings with representatives, correspondence (by letter and email) and exchange of technical information.

5.2.1 CEA Agency Activities

The CEA Agency invited comments from the public and Aboriginal groups during a 30-day public comment period on a Summary of the Project Description (February 19, 2013) and two comment periods on the draft Environmental Impact Statement Guidelines (April 8 to May 8, 2013 and August 21, to September 20, 2103). Federal funding was provided to each of the five Aboriginal groups to enable their participation in the environmental assessment process. Another 30-day public comment period will be held during the review of the EIS/Application.

The CEA Agency also participated in the open house (with BC EAO and PNW LNG) in Prince Rupert (November 19, 2013) and Port Edward (November 20, 2013) on the draft Application Information Requirements (AIR) document (Section 5.2.2).

5.2.2 BC EAO Activities

BC EAO held a 30-day public comment period from November 13 to December 13, 2013 and an open house, with PNW LNG, in Prince Rupert (November 19, 2013) and Port Edward (November 20, 2013) on the draft Application Information Requirements (AIR) document. Feedback was sought on:

- If proposed studies, methods, and information included in the draft AIR satisfy the public's interests and concerns
- Any further interests and concerns the public would like to be included in the Application.

Another 30-day public comment period will be held during the review of the EIS/Application.

5.2.3 Proponent Activities

PNW LNG invited all five Aboriginal groups listed in Schedule B of the BC EAO section 11 Order to open houses in Port Edward and Prince Rupert on three separate occasions (November 2012, June 2013 and November 2013). PNW LNG also offered to hold open houses in Aboriginal communities. Metlakatla First Nation invited PNW LNG to present project information to the Metlakatla Stewardship Committee on March 18, 2013 in Metlakatla Village. The other four Aboriginal groups did not provide PNW LNG with an opportunity to present to their communities.

On September 17, 2013 Gitga'at First Nation was added to Schedule C the BC EAO's section 11 Order. PNW LNG was also informed by the CEA Agency that Gitga'at First Nation members use resources within the Prince Rupert Harbour area, and so Gitga'at First Nation is included in the assessment of Current Use of Land and Resources for Traditional Purposes.

During participation on the Working Group, jointly chaired by the BC EAO and the CEA Agency, Aboriginal groups raised concerns about consultation on Aboriginal rights and title, strength of claim assessments (Kitsumkalum First Nation, Kitselas First Nation, Gitxaala Nation), timelines for the environmental assessment process, and ability of the environmental assessment process to discharge the Crown's duty to consult. PNW LNG provided capacity funding to assist with Aboriginal participation on the Working Group and the environmental assessment process. PNW LNG has committed to considering all issues raised by the five Aboriginal groups.

Aboriginal groups have also been invited to participate in several studies in the area around Lelu Island. The studies included marine intertidal and foreshore biological surveys, marine sediment sampling programs, country foods baseline assessments, fresh water fisheries inventories, migratory bird surveys, archaeological investigations on the mainland, baseline soil and vegetation acidification surveys.

Engagement has also included, in the case of Lax Kw'alaams First Nation and Metlakatla First Nation, the opportunity to monitor archaeological inventory surveys, to participate in investigative geotechnical programs on Lelu Island and to tour the project site.

6 ENVIRONMENTAL EFFECTS ASSESSMENT METHOD

The EIS/Application follows a standard approach to assessing the Project's effects on each VC, consistent with CEA Agency and BC EAO guidance (see Figure 12). Any residual environmental effects of the Project are characterized using specific criteria (context, magnitude, geographic extent, duration, frequency and reversibility) that are defined for each VC (described in detail in the EIS/Application). The significance of project-specific residual effects is determined for each VC using relevant thresholds, regulatory standards, or professional judgment (e.g., socio-economic VCs such as physical and cultural heritage). The significance of the Project's contribution to cumulative effects, in combination with other past, present or future projects and activities, is also addressed.

An overview of the effects assessment for each VC follows and a summary of residual effects and their significance is presented in Appendix 1.

7 SUMMARY OF THE VALUED COMPONENTS

7.1 Air Quality

This assessment is based on the requirements of the British Columbia Ministry of the Environment *Guidelines for Air Quality Dispersion Modelling in British Columbia* or the "Guidelines". BC regulatory agencies use a variety of ambient air quality objectives (AAQOs) developed at the national and provincial level to inform decisions on the management of criteria air contaminants (CACs).The air contaminants for which objectives have been established are referred to as CACs. The LAA was a 30 km by 30 km square centered on the facility footprint; the RAA was 50 km by 50 km square centered on the facility footprint.

The current ambient air quality within the RAA is an aggregated effect of the emissions from both natural and anthropogenic sources and existing facilities. Background levels representing ambient air quality conditions based on air contaminant concentrations were measured at specific monitoring stations. Baseline levels predicted through dispersion modeling of existing air emission sources contributed to dispersion model analyses.

The region is characterized by frequent cloud cover and substantial precipitation during the cooler winter months. Background temperatures and precipitation patterns are strongly influenced by westerly flow from the Pacific Ocean. The precipitation patterns can change abruptly when the flow changes and the outflow winds from inland BC prevail.

Following a review of the data, it was determined that existing monitoring data in Prince Rupert and Kitimat are not representative of site conditions. Much of the Prince Rupert data was collected at a time when facilities (i.e., pulp mill) known to emit significant quantities of air emissions were operational, but have since been decommissioned. The full analysis of available monitoring data is provided in the EIS/Application.

Key issues of concern raised during stakeholder and Aboriginal engagement were related to monitoring and reporting on air quality and mitigation measures to be taken.

During construction, the main sources of air emissions will include ground disturbance, site clearing, operation of heavy construction equipment, and the delivery of equipment and supplies to the project site. Following commissioning, land-based emissions will be produced by gas compressor drivers, power generators, thermal oxidizers, and flares. Marine-based sources of air emissions will include LNG carrier vessels and a team of assist tugboats.

The primary air quality effect is the potential increase in airborne concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate materials (PM_{10}, $PM_{2.5}$), and hydrogen sulfide (H_2S) collectively known as criteria air contaminants (CACs) and volatile organic compounds (i.e., readily evaporate into the air) - collectively known as criteria air contaminants (CAC).

Residual effects of the project CAC emissions on ambient air quality due to increases in CAC emissions are characterized in the EIS/Application. The residual effects of individual substances

emitted by the Project vary in magnitude from low to moderate; the potential for 'acid rain' is considered negligible and unlikely. All predicted CAC concentration maxima from operations are below the most stringent applicable air quality objectives. The effects of individual substances emitted by the Project vary in magnitude from low to moderate. Most of these effects occur in the immediate vicinity of the facility adjacent to the property line or vessel loading area. The Project will not result in any exceed applicable air quality objectives, therefore the residual effects are not significant.

The approach to the air quality dispersion model was conservative. For example, the model assumed that the emission sources are continuous and the equipment operating at full load. In reality, actual emissions vary from hour-to-hour and day-to-day. Similarly, marine emissions for existing and approved projects were predicted based on present day emissions. These predictions do not account for the reductions in emissions that will result from MARPOL requirements for the industry to move to low sulfur fuel.

Throughout construction and operations, PNW LNG plans to limit the air quality effects due to CAC emissions from project activities by incorporating best achievable technology (BC MOE 2012) into final project design. Key mitigation strategies include:

- Control technologies will focus on managing NO_X emissions. Smokeless flare technology will manage $PM_{2.5}$ emissions. CO and hydrocarbon emissions (e.g., VOCs) will be reduced by optimizing combustion. Thermal oxidizers will oxidize H_2S (negligible H_2S emission), oxidize VOCs, and vaporize any hydrocarbon solids in the waste gas stream before venting.
- LNG carriers and assist tugs will use low-sulphur fuel in compliance with applicable marine emission standards (MARPOL 2008). Vehicle and off-road equipment will use low-sulphur fuel, when available, will undergo regular tuning and maintenance, and will limit vehicle idling times.

The cumulative effects assessment dispersion modelling results indicate that the overlap of effects from current and reasonably foreseeable future projects in the assessment area have an effect near the project site, but the cumulative effect on Air Quality is not significant. Based on the quality and conservative approach to air quality modelling, the level of confidence in this prediction is high.

7.2 Greenhouse Gas Management

Greenhouse gas (GHG) is included in this assessment because the Project will contribute GHG emissions. The content and material included in this section follows the guidelines of the Canadian Environmental Assessment Agency (CEAA) method for incorporating GHG considerations in environmental assessments (CEAA 2003) and global best practices for calculating GHG emissions. The relevant project GHGs include carbon dioxide, methane and nitrous oxide. The boundaries of the LAA and RAA are administrative, recognizing the global nature of GHG emissions, and the framework established by applicable provincial and federal GHG policy and legislation.

Canada's National Inventory Report (NIR) indicates that in 2011 Canada emitted about 702 million tonnes (Mt) CO_{2e} of total GHG emissions. The most recent BC GHG inventory (BC MOE 2013) reported 62.2 Mt CO_{2e} for the same year. Most emissions are attributed to transportation-type activities (23 Mt CO_{2e}) and combustion sources (19 Mt CO_{2e}).

In order to assess the effect of project GHG emissions, CEA Agency guidance recommends comparing project specifics with a representative industry profile. However, the industry profile that provides the most appropriate benchmark for this Project is LNG projects that are under development or have been recently proposed.

Sources of GHG emissions during construction include removal of vegetation and release of diesel engine exhaust. During operations, GHG emissions will be released mainly through natural gas combustion, with smaller contributions from project-related activities.

Public response to the draft EIS Guidelines and Application Information Requirements identified concerns with GHG emissions and their effect on climate change and the Canada and BC greenhouse gas reduction targets.

At full build-out the Project will release 5.28 million t CO_{2e} per year, which requires annual reporting to the BC MOE. It is estimated that the Project will increase the provincial and national GHG emission totals by 8.5% and 0.75%, respectively.

Project GHG emissions will be reduced by implementing a comprehensive GHG management plan which includes:

- Commitment to reduce, where possible, the GHG emissions intensity of the Project
- Compliance with relevant GHG emissions management and reporting legislation
- Compliance with requirements outlined under the BC carbon tax
- Implementation of a facility specific Fugitive Emission Management Program.

The GHG emissions management plan will reflect PNW LNG's support for the development of technologies and management practices that reduce GHG emissions and will identify reporting and measurement systems.

7.3 Acoustic Environment

The Acoustic Environment is a VC because project operations (at the LNG facility, the marine terminal, the access bridge to the mainland and shipping activities) will generate noise which could affect the health and well-being of humans and wildlife. Noise effects are addressed in municipal (District of Port Edward), provincial (BC OGC), and federal (Health Canada) guidelines.

The District of Port Edward Noise Control Bylaw No. 520, 2011 discourages noises, nuisances, or sounds without providing any quantitative noise limits. The BC OGC noise guideline recommends that nighttime sound levels from industrial facilities not exceed the permissible sound level (40 dBL) at a distance of 1.5 km from the facility, or at the nearest receptor, whichever is closer. Health Canada's approach to noise assessment is based on determining the %highly annoyed.

The LAA is the area within 2.0 km of the PDA and the shipping routes so that acoustic emissions from the facility are fully characterized at various points of reception. The RAA is a buffer that extents 5 km from the LNG facility fence line and within 2 km of the potential shipping route. Three shipping routes (primary, alternate north, and alternate south) are considered in the assessment.

The ambient acoustic environment near the project area and the nearby community of Port Edward is characterized by a combination of natural sounds (wind, tree rustling, birds) and human activities (rail traffic, aircraft flyovers, local business and industry, and local vehicle traffic).

During the construction phase, the main noise emissions are due to site preparation, onshore construction, dredging, and marine construction. In the operations phase, noise emissions are predicted from shipping, marine terminal use, LNG facility, power generation and other supporting infrastructure. In the decommissioning phase, noise emissions from the dismantling of marine terminal, facility and support infrastructure are expected to have less noise effects in comparison to the construction phase.

There are sixteen noise sensitive receptors identified within the LAA. Changes in noise emissions will be apparent to the nearest receptors (three residences and a community school). Although residual effects of noise will be adverse during construction and operations, acoustic modelling indicates that standards used by Health Canada and BC OGC to assess the potential for noise disturbance is not exceeded at these receptors. Residual effects of a change in the acoustic environment during all phases of the Project are rated not significant.

The reasonably foreseeable projects and activities in the RAA, in combination with the project residual noise effects, are expected to meet the regulatory guidelines. Therefore, cumulative effects have therefore been rated as not significant.

7.4 Ambient Light

Ambient Light is a VC with respect to the overall visual effects from the Project on sensitive receptors within the respective viewshed. Concerns with respect to light are primarily associated with effects of stray light and disorientation of migrating birds. Although there are no legal requirements (e.g., regulations, guidelines or policies) in place in BC that regulate the amount of obtrusive light being emitted from facilities, the International Commission on Illumination has developed recommended maximum values for light spill and glare.

The LAA is the area within 8 km of the Project; the RAA includes the LAA plus those areas beyond 8 km, from which project lighting is visible at night.

C-style lighting is used in Port Edward and Prince Rupert. Dockside facilities in both communities have luminaires that cast glare and light spill on adjacent properties. Port Edward does not have a sufficient number of facilities that use highly intense lighting to cause problems to residents in the viewshed. Some facilities, such as the grain elevator, are of an older design style with limited regard for lighting design. Newer facilities, such as the proposed Canpotex facilities, have incorporated lighting assessment into their environmental assessment process. The baseline conditions reflect past designs where this was likely not the case.

These readings show a large variation between the levels in the town (urban to suburban) and outside (rural to natural). Industrial lighting on Ridley Island is an aesthetic factor; that is, it can be seen in one sector of the horizon, but is far enough away that it does not add substantially to the nighttime lighting levels in Port Edward.

The main issue is the potential for an increase in light spill, glare and sky glow due to the construction and operation of the project infrastructure and associated activities. Operation of the

LNG facility and the marine terminal and related shipping has the potential to change ambient light for area residents. This is a concern for the nearest receptors on the north and south ends of Lelu Island and in Port Edward who will be able to see some components (e.g., storage tanks, flare stacks). However, the amount of light spill, glare and sky glow will be reduced due to the use of dark sky fixtures, cut-off design and, in some instances, the topography of the Island and surrounding lands.

By following the Canada Green Building Council guidelines for the design of floodlit facilities, the effect of construction and operation lighting should be minimal. Vessels such as cruise ships, which frequent this area, are extensively illuminated; however LNG carriers are not. The use of navigational lighting on shore facilities and on the LNG carriers will be planned in conformance with the restrictions and standards applied by Transport Canada. An increase in project-related light emissions to a level where sky glow would be typical of an urban environment is not expected, and significant adverse residual effects on ambient light are not expected.

There is potential for lighting from other projects and future projects to interact cumulatively with the proposed project-related effects on ambient light. Provided that other industries subscribe to the energy efficient and reduced lighting design guidelines, the effect of growing industrialization of Lelu and Ridley islands are anticipated to produce effects that are not significant on a cumulative basis.

7.5 Vegetation and Wetland Resources

Vegetation and Wetland Resources is a VC because of their ecological, aesthetic, and recreational value, as well as their importance to Aboriginal groups. Wetlands include marshes, swamps, fens, bogs, and shallow open water. The ecological resources considered in this assessment consist of:

- Plant species at risk (as defined by the Federal *Species at Risk Act* [SARA] and the BC Conservation Data Centre [BC CDC])
- Non-native invasive plant species (as listed in the *Weed Control Act* and associated Regulation, or the Northwest Invasive Plant Council)
- Provincially-listed ecological communities at-risk (as defined by the BC CDC)
- Traditional use plants (identified through Aboriginal engagement)
- Old forests
- Wetlands.

The LAA for vegetation encompasses an area of approximately 200 ha, including Lelu Island, Stapledon Island, and the portion of the mainland southwest of Skeena drive across from Lelu Island and Stapledon Island. The RAA encompasses approximately 50,000 ha and provides landscape-scale context for assessing potential cumulative effects on vegetation and wetland resources in the region since it contains similar ecosystems to those found within the LAA.

The LAA contains ten distinct plant communities, approximately 65% of which are classified as wetland. Three dominant communities cover 84% of the LAA and include:

- Western redcedar–western hemlock/salal upland forest (63.8 ha or 32%)
- Shore pine–yellow-cedar/sphagnum bog (55.4 ha or 28%)

- Western redcedar–yellow-cedar/goldthread bog forest (48.6 ha or 24%).

There were no SARA, red- or blue-listed vascular plants, mosses, or lichens found within the LAA. Plant species found within the LAA that are used by Aboriginal communities for traditional purposes include six tree species, ten shrub species, three herbs and one fern. No weeds on the noxious weeds list or the Northwest Invasive Plant Council's list of target invasive plant species were found within the LAA. Approximately 2.7 ha of a blue-listed community, 86 ha of old forest and 119 ha of wetland area will be lost due to project construction.

Thermal oxidizers will be used to oxidize H_2S, the source of acidification (i.e., "acid rain"); this will result in negligible H_2S emissions and negligible potential for acidification risk to vegetative communities. Emissions will also increase the amount of acid and nitrogen deposition; however, a study on soils in the area found that the buffering capacity of the soils would make this effect negligible. Sensitive communities in this area will be monitored for changes in plant composition.

During construction, a Species at Risk Discovery Contingency Plan will be developed and followed to address any chance-discoveries of plant species that are at risk. Given the abundance of plant species and ecological communities of management concern elsewhere in the RAA and implementation of these mitigation measures, only low magnitude residual effects are expected on plant species and ecological communities of management concern. The Project will adhere to the *Federal Policy on Wetland Conservation* by developing a Wetland Habitat Compensation Plan which, when implemented, will result in no net loss of wetland function. Residual effects on vegetation and wetland resources are therefore expected to be not significant.

Overall, the Project would affect less than 1% of the total area of ecological communities at risk and/or old forest within the RAA. This is considerably below the regional ecosystem based planning objectives which have set management targets that allow for a loss of 30% (ecological communities at risk) and 40% (old forest), respectively. Neither the project-specific residual effects, nor the Project's residual effects acting cumulatively with other projects would threaten the regional sustainability of the vegetation and wetland resources identified in this assessment.

Consequently, the cumulative effects on vegetation and wetland resources are considered to be not significant.

7.6 Terrestrial Wildlife and Marine Birds

Terrestrial Wildlife and Marine Birds are a VC because of their potential interactions with project activities and because of their recreational, ecological, and aesthetic value. Terrestrial wildlife and marine birds are also important to Aboriginal groups, regulators, and the public.

The LAA extends 1.5 km from the perimeter of Lelu Island, 500 m from the marine terminal, and 2 km on both sides of the proposed primary and alternate shipping route between the marine terminal and Triple Island. The RAA is the Kaien Landscape Unit of the Central and North Coast Ministerial Order. The marine component of the RAA includes the PRPA boundary and the waters extending 10 km on both sides of the shipping route from the marine terminal to the Triple Island pilotage station.

Lelu Island is a gently sloping island which supports a moderately productive forest composed of western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). The center of the island

is vegetated with a mosaic of shrubby blanket bogs, woodlands and low productivity forests composed of western hemlock, mountain hemlock (*Tsuga mertensiana*), yellow-cedar (*Chamaecyparis nootkatensis*), western redcedar and shore pine (*Pinus contorta contorta*). In some areas of the island, trees grow in stunted "bonsai" forms. Vegetation communities on Lelu Island and adjacent areas provide forest and wetland habitat for a variety of mammals, birds, and amphibians.

The waters around the island support eelgrass beds and an extensive mudflat known as Flora Bank. Nearby Important Bird Areas at Lucy Islands, Big Bay and Grey and Green islets provide estuaries, mudflats, and rocky shores sustaining globally significant populations of waterfowl and seabirds (IBA 2013). There is potential for 33 wildlife species of federal or provincial management concern to occur within the LAA (BC CDC 2013).

Potential effects on terrestrial wildlife and marine bird resources include changes in habitat availability, change in mortality risk, and alteration of movement patterns. Construction will result in direct loss or alteration of seasonal and year-round breeding, foraging, or shelter habitat for terrestrial wildlife and marine birds. The PDA will remove 164 ha of terrestrial habitat and 97 ha of marine habitat. Mortality risks are primarily associated with vegetation clearing for construction of the PDA and light-induced avian mortality at the LNG facility and marine terminal. Construction and operations activities, including noise produced at the LNG facility and by vessels along the shipping route have the potential to alter seasonal migration and local dispersal patterns.

The Wetland Habitat Compensation Plan, when implemented, will provide compensation for wetland habitats removed; blasting will be restricted to non-breeding periods to comply with the Migratory Birds Regulations and the BC *Wildlife Act*; construction noise emissions will follow standards set by the BC Oil and Gas Commission; and, vessels will adhere to reduced speeds to lower noise emissions. A bird mortality monitoring plan will be instituted to monitor for potential light-induced collision mortality. These measures are expected to result in low to moderate magnitude residual effects.

The Project's contribution to overall development within the RAA is 261 ha (or 0.1%). Although the Project will increase vessel transportation by up to 350 LNG carriers per year (upon completion of Phase 2) the effects will be mainly localized and terrestrial wildlife and marine birds are expected to habituate to noise and disturbance over time. In consideration of proposed mitigation, the residual effects on terrestrial wildlife and marine birds are predicted to be not significant.

Changes in habitat availability, mortality, and alteration of movement due to the Project will be local and will affect a small portion of the regional population; these changes will not influence the long-term sustainability of local or regional wildlife populations. Consequently, the cumulative effects on terrestrial wildlife and marine bird resources are determined to be not significant.

7.7 Freshwater Aquatic Resources

Freshwater Aquatic Resources is a VC because fish are an important component of the local recreational, commercial, and Aboriginal fisheries (including food, social and ceremonial purposes) and are also important indicators of overall aquatic ecosystem health. The project site contains a number of watercourses draining Lelu Island that will be affected by the construction of the facilities.

The Freshwater Aquatic Resources LAA includes the watercourses on Lelu Island, from their headwaters to their confluence with surrounding estuaries. The RAA for Freshwater Aquatic

Resources encompasses waters in Chatham Sound that are under the influence of outflow from the Skeena and Nass rivers.

Most watercourses on Lelu Island were too small to be considered streams. Criteria used to assess the watercourses identified two as streams (i.e., more than 100 m long, well-defined banks, signs of flow, or permanent channel connecting to near shore waters) with potential for fish presence and fish habitat.

Construction of the Project will result in infilling of two watercourses on Lelu Island that provide fish habitat. This will reduce freshwater fish habitat availability, remove food and nutrient contribution to the near-shore estuarine areas, and may increase fish mortality risk during construction. The habitat quality in these watercourses is rated as marginal, and the loss of habitat will be compensated through implementation of a Fish Habitat Offsetting Strategy. No net reduction in productive capacity of fish habitat is expected as a result of the Project. The near shore waters around Lelu Island are under heavy influence of the Skeena and Nass rivers and removal of freshwater streams on Lelu Island is not expected to cause any measurable reduction in food and nutrient content in near shore waters around the island.

A monitoring program will be implemented as part of the Fish Habitat Offsetting Strategy. In consideration of the proposed mitigation, the Project is expected to have no significant adverse residual or cumulative effects on Freshwater Aquatic Resources.

7.8 Marine Resources

Marine Resources is a VC because of project-related interactions with marine fish and fish habitat, marine species at risk, sediment and water quality, and the intrinsic connection to the local commercial fisheries and local communities. The marine waters surrounding Port Edward and Prince Rupert provide diverse habitats supporting many species that contribute to the ecological, cultural and economic well-being of the region. Fish (and fish habitat) and marine mammals are the key components of this VC. Marine sediment and water quality are components of fish habitat. The focus of this assessment is on fish species of commercial, recreational, cultural or conservation concern, and related habitats. The LAA and RAA includes the PDA, potential shipping routes, plus a 10 km buffer on both sides of the potential shipping routes to assess potential effects of underwater noise.

Marine habitats and species within the LAA are typical of the north coast of BC. The physical oceanography of the region, including the seafloor topography and substrata, water conditions and currents, are similar to those found elsewhere on the north coast. The LAA is strongly influenced by the Skeena River which affects currents, salinity, and turbidity and influences species and community assemblages in the area.

Commercial, recreational and Aboriginal fisheries may have affected fish populations. Contaminant levels in sediment and water have been affected by historical and current industrial activities such as a pulp mill (now closed), terminals and port facilities, fish processing facilities and a log dump, and by release of sanitary waste and storm water from developed areas.

During the stakeholder and public engagement process, the primary issues raised by stakeholders were potential effects on water quality due to dredging and disposal at sea, effects on fish and fish populations, and loss of fish habitat on Flora Bank.

Dredging activities will comply with water quality guidelines for the protection of marine life. Dredged materials must be tested for contamination and disposed at approved sites under appropriate permits. Brown Passage is a designated disposal at sea site proposed for project use according to Environment Canada requirements for disposal at sea. PNW LNG designed the marine terminal to avoid Flora Bank to the greatest extent possible; therefore, potential effects on the eel grass habitat are predicted to be low. PNW LNG will offset fish habitat permanently altered as a result of the Project through implementation of the Fish Habitat Offsetting Strategy.

Potential effects on Marine Resources (marine habitats and species) during all project phases include change in fish habitat, direct mortality or physical injury to fish or marine mammals, change in fish or marine mammal behaviour due to underwater noise, and change in sediment or water quality. Introduction of invasive species through disposal of ballast water is prevented under Ballast Water Control and Management Regulations under the *Canada Shipping Act.*

In total, approximately 125 ha of marine habitat will be permanently lost or altered during marine construction, including approximately 1.8 ha (0.15%) of eelgrass habitat on Flora Bank. This loss of fish habitat will require regulatory authorization and fish habitat offsetting measures under the *Fisheries Act*. Direct mortality or injury may result due to blasting, crushing or burial during construction activities, or underwater noise if impact pile driving was used (sudden pressure causing swim bladder rupture in fish or auditory injury of marine mammals).

A Fish Habitat Offsetting Plan will be prepared in consultation with DFO to offset net loss of fish habitat. DFO's Blasting Guidelines (Wright and Hopky 1998) will be followed, incorporating a 500 m safety radius and least-risk timing windows and Dungeness crabs will be relocated during construction. A low noise pile driving technique (such as a vibratory hammer) will be used to install piles to reduce underwater noise, if feasible. Otherwise an impact driver encased in a bubble curtain will be used and safety zones will be monitored to minimize injury to marine mammals. LNG carriers, tugs and barges will be required to reduce speeds to 10 knots within the LAA and 6 knots when approaching the Triple Island boarding station. A number of measures will be employed to reduce sediment plumes, such as silt curtains, sediment fences, and seabed armouring.

Changes to fish habitat and sediment and water quality will be localized, and mitigation measures (including implementation of the Fish Habitat Offsetting Strategy) are considered effective. Mitigation measures will substantially reduce the potential for mortality and injury, and residual effects are not expected to affect population viability of any species. Changes in sediment or water quality will be short-term during maintenance dredging and berthing operations and are not expected to affect fish health or marine resources in general. Overall, with the measures proposed to mitigate effects on water and sediment quality and to offset net loss of fish habitat, the Project is not expected to affect the sustainability of fish populations.

Cumulative effects on direct mortality or physical injury are potentially high in magnitude, due to potential increases in injury to fish and marine mammals caused by overlap in pile driving schedules with other projects. This has a low to moderate likelihood and is not expected to have an effect on population viability. This cumulative effect is therefore not significant. Underwater noise from pile driving will likely deter marine mammals from the area before injury occurs.

Cumulative effects to water quality are likely to occur if there is any spatial and temporal overlap of dredging and disposal of marine sediment with other proposed projects. These effects on water quality are short-term and local and are predicted to be not significant.

7.9 Economic Environment

Economic Environment is a VC considering the inter-related economic effects that may result from project construction, operation and decommissioning. The LAA and RAA consists of

- City of Prince Rupert
- District Municipality of Port Edward
- Skeena-Queen Charlotte RDEAs A and C
- Lax Kw'alaams IR 1 (Lax Kw'alaams First Nation)
- S1/2 Tsimpsean IR 2 (Metlakatla First Nation)
- Dolphin Island 1 (Gitxaala Nation).

The economy supports fishing, forestry, energy, transportation and tourism. With the closure of the Skeena Cellulose Pulp Mill in 2001 and the decline in fisheries, Port Edward and Prince Rupert have seen an overall decline in the workforce and increasing unemployment. There has been an increase in service industry employment and a loss of skilled labour through outmigration. In 2011, there were 6,980 people aged 15 years and older in the labour force and, of these, 65.5% were employed or actively seeking work and 15.0% were unemployed (about 1,045) in the RAA. Other than housing costs, the cost of living in the region is 22% higher than in Vancouver, while income is lower.

Potential effects on the economic environment during all project phases include change in regional employment, change in earnings and income, change in education and training, change in regional economic diversification and change in municipal government finance.

During the stakeholder and public engagement process, the primary issues raised were potential effects on the availability of local labour, inflation of wages and the boundary of the assessment being broad enough to capture all communities and economic sectors. The assessment captures all the communities near enough to the Project to supply labour, goods and services. The local population currently has a high percentage of service sector labour. Regional employment is projected to increase due to direct, indirect and induced work created within the area for the duration of the Project. Because a portion of project-related work will require greater skills than those presently available in the region, earnings and income, as well as education levels will improve. This could occur through in-migration of skilled employees or through education and training of local workers. It is estimated that during construction approximately 200 annual direct jobs, 100 annual indirect jobs and 40 annual induced jobs will be filled by regional residents. During operations approximately 260 annual direct jobs, 140 annual direct-contract jobs, 120 annual indirect and 160 annual induced jobs will be filled by regional residents. During operations it is expected that an additional 120 direct and direct-contract jobs will be filled by in-migrating workers.

The creation of new industrial jobs during operations will attract roughly 120 workers and their families to Port Edward and Prince Rupert and help diversify and expand the regional economy, leading to increased economic stability and tax revenues for municipal government. Higher levels of individual and household income realized during project construction and operation is estimated to increase local spend and result in 160 induced jobs. Cost of living increases are expected to be negligible due to small increases in the number of jobs, incomes and local spend relative to the regional economy. The predicted influx of workers would return local populations to 2006 levels;

however, when combined with other future developments in the area, there could be increased pressure on housing and higher demands for infrastructure and services (offset by higher tax revenues). Any adverse economic effects associated with an increase in workers will not be significant.

PNW LNG has committed to developing a community investment program that will support social, environmental and community projects. The cumulative adverse effects on the economic environment are predicted to be not significant.

7.10 Navigation and Marine Resource Use

Navigation and Marine Resource Use is a VC because project-related activities have the potential to interfere with the public's right to navigate and to affect recreational, commercial, and Aboriginal fisheries and use of marine resources, particularly in the vicinity of Lelu Island. The RAA includes the PRPA boundary and the waters extending 10 km from either side of the potential shipping routes from the marine terminal to the Triple Island Pilotage Station. In the RAA, there are five industrial terminals (e.g., Fairview Terminal) and seven marine facilities, including marinas with public wharves, yacht clubs and coastal ecotourism and fishing lodges. A number of cruise ships, ferries and water taxis also stop in Prince Rupert Harbour. Commercial, recreational and Aboriginal fisheries, mainly for crabs, shrimp and salmon, are important to the local economy and traditions. Ecotourism and recreational boating are also common marine uses.

Vessels in the area used for commercial shipping of cargo include tankers, barges, tugboats, bulk carriers, and ships designed to transport specific raw materials and finished products. BC Ferries runs year-round scheduled services from Prince Rupert to both Port Hardy and Skidegate. Navigational traffic is aided by the CCG through Marine Communications and Traffic Services (MCTS).

During the stakeholder and public engagement process, the primary issues raised were loss of access to fishing (i.e., exclusion zones or restricted access), impact of vessel wake on shoreline habitat and harvesters, and general mariner safety. The bridge between Lelu Island and the mainland at Skeena Drive will be designed for 11 m clearance above high water which will accommodate clearance for most recreational boats and gillnetters. The trestle will also have one passage zone which is of sufficient height and width to allow safe vessel passage, therefore allowing traditional routing across the north end of Flora Bank in adverse weather. The height and frequency of wake waves generated by LNG carriers, and associated escort tugs in this area, are well within the range of naturally occurring wind and swell generated waves. A Marine Communications Plan will detail local marine communications and emergency preparedness.

Temporary safety zones would be established around construction support vessels (e.g., for cranes, tug boats, drill rig, vibrohammer excavator and dredger) if required. Although LNG carriers will travel between Triple Island and the terminal every day (when the facility is operating at full capacity), increasing vessel traffic, it will be a minor interference with current mariner traffic in the region given standard PRPA vessel management procedures including mandatory pilotage. A safety zone that might preclude fishing activities in close proximity to the marine structures may be applied. If a safety zone is applied (assumed to be 50 to 100 m from structures) it would affect less than 0.1% of the area used for crab, shrimp and salmon fishing for commercial, recreational and Aboriginal fishers in

the region. Since the population viability of fish species will not be affected, a decline in the quality of fisheries is not expected.

The PRPA plans to increase shipping into Prince Rupert from less than 1,000 ships in 2013 to 2,000 ships by 2025 from all proposed projects including PNW LNG. All shipping traffic into both the Prince Rupert Harbour and Kitimat will follow shipping lanes around Triple Island, potentially causing some congestion. Overlap with other facilities generating vessel traffic within the region is expected to be negligible based on current and planned levels, and the separation distances between the Project and other existing and proposed projects. Given the capacity to expand to accommodate increased vessel traffic, standard vessel traffic management procedures, and design mitigation to allow small vessels to pass under the trestle, residual adverse effects on Navigation and Marine Resource Use are predicted to be not significant.

7.11 Infrastructure and Services

Infrastructure and Services is a VC because the quality and capacity of infrastructure and services contribute to the overall standard of living and quality of life in a community. Changes in demographics can affect the availability and quality of infrastructure and services through changes in demand.

The LAA includes the District of Port Edward and the City of Prince Rupert and Highway 16 up to and including the Northwest Regional Airport Terrace-Kitimat. The RAA includes the mainland portion of the SQCRD and Highway 16 up to and including the Northwest Regional Airport Terrace-Kitimat.

Existing infrastructure and services in the RAA meet or exceed current levels of demand. Recent changes to Highway 16 between Prince Rupert and Terrace have increased highway capacity; road infrastructure and air service meet current levels of demand; whereas, ferry service, while able to accommodate current use, has limited capacity for increased demand. Rental housing has limited availability and increased project related demand could result in insufficient availability; however, a sufficient supply of land exists to increase residentially zoned areas for building starts. Delivery of waste services, sewer, education and recreational services meet or exceed demand in both Port Edward and Prince Rupert; pay-per-use services offset potential capacity issues related to increased demand. The District of Port Edward water treatment plant has current capacity for approximately 2,400 m^3/day. The District's wastewater treatment system also has current capacity to treat approximately 2,400 m^3/day.

During the stakeholder and public engagement process, the primary issues raised were: transportation (air, and road) corridors; housing availability and municipal capacity to increase residentially zoned areas; capacity of community services (waste management, water and sewer services); emergency services (police and fire); education; communications and recreation.

This assessment considers the effects of the Project on housing, accommodation, transportation, waste management, water and sewer services, emergency services, education, and other community services and infrastructure. Workers engaged in construction activities are not anticipated to permanently relocate to the project area and will be housed in a construction camp on Lelu Island; thus increased demand on local housing and related services will be greatly reduced. During operation it is estimated that 120 workers and their families will in-migrate to either Port Edward or

Prince Rupert. Increased demand from in-migrating workers is not expected to exceed the available supply of housing; it is expected that most in-migrating workers will choose to construct new houses.

Increased demand for community services and infrastructure during construction is anticipated to be minimal based on worker accommodation and transportation plans (the use of a camp on Lelu Island with crews transported by bus or crew-cab trucks to and from airports). During operation increased demand on community services and infrastructure caused by the in-migration of 120 workers and their families will be mitigated through advance communication with municipal planners and local service providers. During construction and operation, traffic along Highway 16 and Skeena Drive (Highway 599R) will increase but is not expected to exceed current capacity or affect levels of service (LOS). Mitigation measures in the form of transportation plans will further reduce the magnitude of potential and residual effects. PNW LNG has committed to repairing/reconstructing any roadways affected during project construction. Residual effects on Infrastructure and Services are predicted to be not significant.

Other projects are likely to increase demand for rental housing, hotels, and motels, contributing to low vacancy rates. Increased demand is largely temporary and not expected to affect the availability of housing over the long term. Advanced planning and communication between proponents and municipal infrastructure and service providers will reduce the potential for adverse cumulative effects. Community infrastructure and services are also expected to be able to accommodate increased cumulative demand through pay-for-use and additional tax revenue generated from proposed projects in the LAA. Overall, infrastructure and services in Port Edward and Prince Rupert are considered resilient to fluctuations in increased demand; therefore, cumulative effects on infrastructure and services are predicted to be not significant.

7.12 Visual Quality

Visual Quality is a VC because of potential project-related effects on local viewscapes. The Project is adjacent to the community of Port Edward, Aboriginal communities, tourism businesses, and a major shipping channel used by BC Ferries and cruise ships. The LAA for Visual Quality includes all lands and waters within 8 km of the PDA and the primary and alternate shipping routes. The RAA for Visual Quality includes the LAA along with the area beyond the LAA where there is a potential view of project components within the background.

The area is characterized by vegetation variety, expansive water views and relatively intact landscape, aside from a limited view of larger scale industrial development on Ridley Island. Changes in visual quality due to construction and operation of the LNG facility and introduction of lighting may reduce Aboriginals', visitors' and recreationalists' enjoyment of the area, potentially lowering revenues generated by the tourism industry.

During the stakeholder and public engagement process, the primary issues raised were concern about the visual impact of the Project on the views from Port Edward and from marine vessels.

Field studies indicated that the project site is moderately to highly visually sensitive as Lelu Island and much of the land visible from the assessed viewpoints are relatively intact and generally have limited human interventions. A computer simulation was used to evaluate how visual quality will change from key viewpoints. The facility and marine terminal will be visible to some residents in Port Edward; businesses along Skeena Drive; visitors to Kitson Island, North Pacific Cannery National

Historic Site; recreational and commercial fishers and mariners; tourism operators in the Inverness Passage; and travelers on BC Ferries and cruise ships travelling to Prince Rupert. LNG carriers will be visible for 30 minutes to 5 hours, depending on the viewpoint location; however, the prominence in the view is moderate to low with the preferred shipping route being rated low. The project site infrastructure will be prominent due to the low topography of Lelu Island and 80% clearing of island vegetation.

A 30 m vegetation buffer will be retained around the perimeter of Lelu Island which will mitigate effects of the Project on visual quality.

Lelu Island is designated a future industrial site in the Prince Rupert Land Use Management Plan. While it is expected that the change in visual quality associated with the Project will be a cause for concern by some stakeholders, the Port Edward 2013 Official Community Plan indicates that the community is generally supportive of LNG development on Lelu Island; thus, the residual and cumulative environmental effects of this Project are considered to be not significant.

7.13 Community Health and Well-Being

Community Health and Well-Being is a VC because project interactions may change population demographics, social determinants of health (living and working conditions) and affect the composition of local diets consisting of country foods. Community health and well-being is influenced by the environment and by the socio-economic status of individuals and households within a community. The LAA includes the following communities: Metlakatla, Lax Kw'alaams, Gitxaala, the District of Port Edward and the City of Prince Rupert. The RAA consists of the communities within the mainland portion of the Skeena Queen Charlotte Regional District (SQCRD).

Community health and well-being is measured through an array of socio-demographic characteristics, including the proportion of residents of a given age group, life expectancy in a community, access to medical care and personal income. Physical and mental well-being is associated with a person's quality of life and happiness, reflected in the incidence of crime, drug and alcohol abuse and social cohesion (poverty and homelessness).

Local labour force participation rates for the population of Port Edward and Prince Rupert declined by 2% between 2006 and 2011, primarily due to the closure of the region's largest employer, Skeena Cellulose Pulp Mill in 2001. A decline in commercial fisheries is also associated with outmigration. Median income for non-Aboriginal residents in the Skeena-Queen Charlotte Regional District (SQCRD) as of 2010 was $53,018. The median income for Aboriginal residents living on reserve was $29,441 (based on Dolphin Island 1 IR) and $45,238 for Aboriginal people living off reserve. Rates of income assistance among youth and adults in Prince Rupert are among the highest in BC. Income levels are often positively correlated with educational attainment. On average, education levels in Port Edward and Prince Rupert are lower than that of the province. The rate of drug and alcohol use, serious crimes and serious drug crimes in Prince Rupert is also higher than provincial averages. Life expectancy is also shorter in Prince Rupert than in the rest of the province. Leading causes of death in in the Northwest Health Service Delivery Area (Northwest HSDA) include cancer, smoking attributed deaths, unintended injuries and endocrine, nutritional and metabolic attributed deaths. Rates of depression are higher in the Northwest HSDA than in the rest of BC. Per capita rates of youth, child and adult serious violent crime in Prince Rupert are of the highest in BC.

During stakeholder and public engagement, concerns were raised regarding the effects on community health and well-being associated with an influx of 3,500 workers (most of who would be employed on rotational schedules), rates of children and youth-at-risk, changes in housing affordability, aggregation of Aboriginal groups' data with non-Aboriginal groups, and geographic boundaries for the assessment. Project design to include a self-sufficient construction camp on Lelu Island will reduce potential effects on community health and well-being and housing affordability during project construction and operation. It is anticipated that 120 workers and their families will in-migrate to either Port Edward of Prince Rupert for project operations; potential exists for these individuals to affect local social determinants of health. Data on Aboriginal people were disaggregated from non-Aboriginals wherever separate statistics were available. The geographic boundary for the assessment was expanded to include Metlakatla, Lax Kw'alaams and Gitxaala communities.

Changes in access to Lelu Island and adjacent marine areas will affect the ability of local Aboriginal and non-Aboriginal residents to hunt, fish, and harvest country foods. Restricted access to Lelu Island and surrounding marine areas as well as potential effects on the availability of country foods due to project activities could result in changes to the composition of local diets consisting of country foods. However, considering the magnitude of affected areas (that of Lelu Island and surrounding marine areas) the ability of local residents to secure country foods within the LAA is not anticipated to result in changes in access and availability such that composition of local diets is affected.

Potential positive effects of the Project include increased household income, reduced unemployment (direct and in-direct), expansion of social services, improved mental and physical health of employees, increased training and education and reduced percentages of household income spent on housing. PNW LNG has committed to a public education campaign that will notify local residents of employment opportunities, skill requirements and timing of employment needs, and will provide training to increase local employability. In addition, management plans, such as housing, industry participation, project engagement and transport management, will be developed to mitigate impacts of the Project.

Other projects could overlap with the PNW LNG Project causing a cumulative demand on regional health services and infrastructure resulting in excess demand over the short-term with potential effects on levels of service. Potential shortages will be mitigated by proponents through advanced planning and communication with municipal service providers to accommodate increased demands. The capacity and nature of health services will likely improve in the long-term in response to increased activity in the region. Greater pressure on recreational space could promote development of more public recreational spaces.

With planned mitigation measures and predicted improvements to community health and well-being over time, any adverse residual project-related and cumulative effects are predicted to be not significant.

7.14 Human and Ecological Health

Human and Ecological Health is a VC because certain project-related emissions could create health effects, change noise levels and change ambient light. Chemicals in the environment can be transferred to humans and biological receptors, either from direct exposure to air, water, soil and

marine sediment, or through food sources. Changes to levels of noise may disturb local people and marine and terrestrial wildlife. Changes to ambient light may disturb people and disorient migrating birds.

The LAA is a 30 km by 30 km square area centered on the project facility on Lelu Island; the RAA includes the LAA and extends out another 20 km (i.e., 50 km by 50 km square area). Within the LAA, the only interaction between the Project and human or ecological receptors occurs through effects on air quality, light and noise. The baseline air quality is well below all applicable Ambient Air Quality Objectives for criteria air contaminants. Baseline noise levels recorded in 2012 at eight locations near Lelu Island - three on Ridley Island and five in Port Edward - were consistent with quiet rural environments (i.e., similar to sound levels in a quiet room). Although both Port Edward and Prince Rupert communities are close to large areas where ambient light levels are extremely low, they are affected by municipal lighting and dockside facilities that cast glare and light spill on adjacent properties.

During the stakeholder and public engagement process, concerns were raised regarding increased health risks due to effects of burning fossil fuel on air quality and health risks due to release of chemical contaminants to the marine environment during dredging potentially impacting country foods.

Release of Criteria Air Contaminants (CACs) or vehicle dust during construction could affect the risk to human and ecological health. With the use of flare reduction and dust suppression, there are no predicted exceedances of any standards for all human and ecological receptors, suggesting that the human and ecological health risk from CACs and consumption of country foods is minimal.

Baseline sediment analysis indicates that dioxin and furan (PCDD/F) concentrations are below the level which could affect marine fish. PCDD/Fs are present in the top 1.5 meters, and undetected to a depth of 12.0 meters. Dredging will reach a depth of 12.0 meters at the MOF and 15.6 meters at the marine berth. Dredging activities will remove surficial sediments that contain traces of PCDD/Fs, and expose the underlying sediments. These conditions suggest that project activities interacting with sediment quality are not anticipated to affect ecological health because there is no potential for PCDD/F concentrations in the sediments to increase.

A sediment plume will be present in the water column during dredging and will result in sediment deposition in the surrounding area. The release of suspended sediment to the water column during dredging will expose marine biota to sediments containing traces of PCDD/F. The health risk to marine life from the exposure to suspended sediments containing PCDD/Fs is considered low. This is based on the low solubility of PCDD/Fs in the water column and that dermal uptake for PCDD/Fs is considered minor compared to dietary uptake. Baseline PCDD/Fs in the tissues of crabs, prawns and clams are currently below tissue residue guidelines designed to protect marine mammals and birds. With no potential for PCDD/Fs to increase in the sediments, the likelihood of PCDD/F increases in marine invertebrates is low. Subsequently, the likelihood of changes in health risks to humans, marine mammals and birds consuming these foods is low. Noise levels during construction meet Health Canada's suggested thresholds for humans, though they may cause avoidance behaviour in terrestrial wildlife and marine birds adjacent to the site. With noise mitigation measures (vibratory hammer, if technically feasible, or an impact driver encased in a bubble curtain), the

magnitude of the residual environmental effect of a change in the acoustic environment will be reduced.

Marine shipping, security and other required lighting will induce a change in ambient light. The storage tanks and flares will be visible to human receptors located in Port Edward and directly across from and to the north of Lelu Island, while the marine terminal and associated exterior lighting and the ships will likely not be visible. Local topography, vegetation and project design will help reduce the amount of light that reaches surrounding areas, resulting in low magnitude residual effects.

No changes to human health or ecological health are expected from cumulative effects to air quality. Since noise effects are limited to Lelu Island, no cumulative effects are expected. Existing lighting in Port Edward will continue to be the greatest source of light pollution in the area. There are no significant effects on human and ecological receptors from the Project.

7.15 Archaeology and Heritage Resources

Archaeological and Heritage Resources are a VC based on their cultural importance to Aboriginal people and their historical significance in the area, and because of potential project-related effects on these resources on Lelu Island. Archaeological and heritage resources are of importance to Aboriginal people because they demonstrate the long-term use of their traditional territories and provide a physical link to their cultural history. These resources are also important to scientific communities and the public.

The LAA includes Lelu Island, Stapledon Island, and the portion of the mainland southwest of Skeena Drive across from Lelu and Stapledon Islands. It is very unlikely that potential effects on heritage sites would extend outside of the PDA, which includes Lelu Island and a portion of the mainland where ground disturbance will occur during the construction of a bridge to the island.

Over 430 culturally modified trees have been identified across Lelu Island. No other archaeological or heritage sites were identified on land; however, if they are present, they are vulnerable to disturbance or damage during site clearing on land and dredging in the intertidal area.

During consultation, concerns were raised about disturbance or destruction of culturally modified trees or other archaeological and historic sites and the potential for vessel wake to lead to the destruction and alteration of heritage sites, archaeological sites or culturally modified trees. Impacts to archaeological and heritage resources can be mitigated through standard practices which also take into account commitments made with local Aboriginal communities through consultation. The shoreline habitats in the vicinity of the Project are exposed to large open ocean swells and wind generated waves from Hecate Strait. Although Chatham Sound is somewhat sheltered by offshore islands, the results of previous wake effects studies suggest that the height and frequency of wake waves generated by LNG carriers, and associated escort tugs in this area, are well within the range of naturally occurring wind and swell generated waves.

Any unmitigated disturbance or destruction of culturally modified trees could result in site-specific adverse residual effects of low to moderate magnitude. Approximately 55% of the CMTs recorded to date on Lelu Island occur within the PDA and will be removed during construction. Most of the remaining CMTs will be retained within the 30 m vegetation buffer around the perimeter of Lelu Island. It is anticipated that any adverse effects to archaeological or heritage resources would be

mitigated through data or artifact recovery, or other standard practices. If sites are encountered, work affecting such features will cease until the archaeological or heritage site can be properly assessed by a professional archaeologist. Culturally modified trees on Lelu Island that will be affected by the Project will be offered to Aboriginal communities for their removal and use.

As culturally modified trees are the only known archaeological and heritage resources that will be affected by the Project and standard data or artifact recovery practices will be applied on a site-specific basis to mitigate these effects, the likelihood of potential cumulative effects of past, present and future projects and activities associated with unrecorded resources is low.

Given the use of standard data recovery and archaeological monitoring, none of the information regarding traditional aboriginal, terrestrial and intertidal use will be lost. Residual project-specific and cumulative effects on culturally modified trees and/or other Archaeological and Heritage Resources, therefore, are not significant.

7.16 Current Use of Lands and Resources for Traditional Purposes

The Current Use of Lands and Resources for Traditional Purposes is a VC because of the importance of the project area for traditional use by Aboriginal people and because of potential project-related effects on these lands and resources. The combined LAAs and RAAs for air quality, marine resources, and human and ecological health were used to assess this VC. The LAA includes Lelu Island, Flora Bank, Chatham Sound, Prince Rupert Harbour, the mouth of the Skeena River and sections of Porcher Island, Melville Island and Stephens Island.

The land and waters in the LAA and RAA have been inhabited and used for thousands of years by Aboriginal people for hunting, fishing, marine harvesting, tree-cutting, and gathering of plants for food, medicinal and technological uses. Ancient village sites and seasonal resource-gathering sites are found throughout the RAA. Aboriginal peoples' continuing traditional activities in the LAA include (but are not limited to) fishing for salmon, halibut and eulachon; harvesting seaweed and marine plants; gathering of berries, bark and medicinal plants; and, hunting birds and wildlife (including marine mammals). Several Aboriginal groups hold communal commercial fishing licenses for Flora Bank and around Lelu Island, targeting halibut, salmon, rockfish, herring, red sea urchin, crab, shrimp, and prawn. Thirty archaeological sites (e.g., shell middens, culturally modified trees) have been recorded within a 5 km radius of Lelu Island and more than 430 culturally modified trees have been identified on Lelu Island. Throughout Lelu Island there is evidence of historic logging, recently logged trees, and an abandoned cabin. Inverness Passage is currently used as an important marine route for Aboriginal people travelling between the Skeena River, Prince Rupert Harbour and Aboriginal communities to the northwest.

During the engagement process, Aboriginal groups raised a number of concerns including project-related and cumulative effects on: traditional harvesting activities and access to traditional use areas; the quality of, and access to, country foods; fishing, fish habitat and the health of fish species; air quality; marine traffic; and, the qualitative experience of using lands and resources.

Effects on traditionally harvested species on Lelu Island and in the waters immediately surrounding it are predicted; however, the viability of harvested species is not expected to be compromised within

the LAA due to the application of a fish habitat offsetting strategy and wetland habitat compensation plan. While the number of available traditional use harvest locations will be locally reduced, high-value traditional harvesting areas elsewhere will be unaffected.

Moderate local interference with access corridors and navigation routes in the LAA are predicted due to the trestle and bridge. The bridge between Lelu Island and the mainland at Skeena Drive will be designed for 11 m clearance above high water which will accommodate clearance for most small vessels and gillnetters. Similarly, the trestle will have one passage zone which is of sufficient height and width to allow safe passage for recreational boats and gillnetters to maintain traditional north-south routing between Lelu Island and Flora Bank.

All predicted criteria air contaminant concentrations from operations are below the most stringent applicable air quality objectives. Observable light will affect the qualitative experience of using lands and resources for traditional purposes for Aboriginals who are located very close to the PDA and project shipping route(s); however, local topography, vegetation and project design will help reduce the amount of light that reaches surrounding areas.

With the implementation of proposed mitigation measures and reasonable accommodation for predicted losses, the residual effect of the Project on current use of lands and resources for traditional purposes will not be significant.

8 ACCIDENTS AND MALFUNCTIONS

Identification of credible worst-case project-related accident or malfunction scenarios were determined based on the EIS Guidelines and professional judgment of PNW LNG. The Project will be built in accordance with the BC *Oil and Gas Activities Act* and associated Pipeline and Liquefied Natural Gas Facility Regulation (2010), which dictates that an LNG facility must be built according to the design requirements and operational parameters of the Canadian Standards Association. The accidents/malfunctions considered in this assessment include:

- Emergency flaring and LNG facility shutdown
- Explosion or fire
- Fuel or hazardous material spill
- LNG spill (at the storage or loading facilities)
- Marine vessel allision (vessel striking another fixed vessel or object), grounding, or collision (two moving vessels).

Responses to emergencies due to the Project are classified as Tier 1, Tier 2 or Tier 3; appropriate responses and roles and responsibilities are developed for each emergency and included in an Emergency Response Plan. PNW LNG will help establish a joint Emergency Response Team with other facilities in the vicinity of the Project and Port Edward.

A range of project design measures will act to reduce risks for possible accidents or malfunctions, including:

- Engineering controls and protection barriers (valves, alarms, detectors, emergency shutdown systems) on facility infrastructure

- Spill prevention and containment measures (valves, cryogenically stable materials, primary and secondary containment, berms, impoundments areas, drainage systems)
- Fire prevention and protection measures (fire resistant materials, fire rated control mechanisms, fire water monitor, firefighting equipment and personnel)
- Use of vessel pilots and tugs
- Cargo containments systems on LNG carriers
- Safe work procedures.

Stakeholder consultation identified concern associated with assessing scenarios, particularly operational spills to the marine environment (e.g., oily bilge discharge) that could affect fish and fisheries. Spilled fuel could potentially affect vegetation, soil or sediment, water, and wildlife; the full effect would depend on the material spilled. An LNG spill would cause localized freezing, followed by a vapour cloud extending 1,700 m to 1,850 m from the spill (GHG emission), but no soil contamination. LNG is non-toxic, evaporates rapidly under ambient environmental temperatures, and causes no long-term environmental or human health effects. An explosion or fire due to release of natural gas would likely not extend beyond the boundaries of the LNG facility due to onsite containment and the surrounding channels, or beyond the immediate vicinity of an LNG carrier. An explosion on an LNG carrier could affect fish and marine mammals, if present at the time. The volume of SO_2 and other hazardous emissions that will be released during the worst-case emergency flaring and shutdown scenario (for all three trains) will be short-term (under an hour) and below the ambient air quality objectives for 1-hour and 24-hour periods. Collisions could result in release of fuel or LNG product. Only a fuel release could potentially cause harm to the environment, particularly marine birds. Of the marine mammals present, humpback whale populations may be vulnerable to a lethal accidental collision with an LNG carrier in transit to the Project. Any accident or malfunction that affects fish populations, or leads to a fishery closure, could affect fishers, with potential effects on the economic environment and current use for traditional purposes.

Accidents or malfunctions are unlikely, unplanned, infrequent and generally short-term in nature. The environmental effects of any potential project accidents or malfunctions that may occur can be addressed with appropriate environmental management and contingency response planning. Provided that the Emergency Response Plan is developed and implemented, if necessary, significant adverse environmental effects are not likely to occur.

9 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The primary mitigation tools to prevent or reduce the severity of adverse effects of the environment on the Project are sound engineering design and planning so that the facility systems can withstand routine and extreme physical environmental conditions. All engineering design must meet the standards set by the National Building Code of Canada and the Canadian Standards Association. These standards form the basis for proper engineering design, which incorporate the effects of site-specific environmental exposure. For example, engineering design must plan for high wind and storm effects and include material selection that inhibits corrosion.

Environmental factors that could potentially affect the Project, resulting in disruption of operations, damage to infrastructure or subsequent adverse effects to VCs include: climate effects (e.g., extreme weather such as precipitation, high wind, fog); tidal conditions (e.g., heavy wave action during high tide events); climate change (e.g., sea level rise or increased storm events); seismic events potentially causing a tsunami or damage to infrastructure; and forest fire.

All facility components will be designed to relevant engineering codes and earthquake standards. The facility design will take into account extreme weather events and potential sea level increases due to climate change. Operation of LNG carriers and operational schedules and weather forecasting will address potential extreme weather events and heavy seas.

Given current design standards, operational strategies (including contingency planning), LNG carrier selection, facility maintenance and employee training, the effects of the environment on the Project during any phase (construction, operations and decommissioning) are predicted to be not significant.

10 MITIGATION MEASURES

Mitigation measures were identified to reduce the adverse effects of the Project on each VC such that significant adverse effects would not result. . Each VC assessment in the EIS/Application includes a discussion of potential mitigation measures to be applied. Proposed mitigation measures and commitments are outlined in Section 28 of the EIS/Application. Appendix 1 (of this summary) includes a brief overview of proposed mitigation measures and characterizes the remaining residual effects.

11 CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative environmental effects are those effects that are likely to result from the residual effects of the Project in combination with other physical activities that have been or will be carried out. Table 5 lists all the other past, present and future projects in the LAA and RAA considered in the cumulative effects assessment. A check mark indicates that there is a potential for the Project to contribute to cumulative effects on VCs. Where the potential for interaction exists, the linkage between the residual effects of the Project and residual effects of other past, present or future actions is considered.

During engagement with Aboriginal groups, concerns were raised regarding the long term effects on the baseline over time and total health of a VC due to multiple projects' effects. While a number of projects have the potential to act cumulatively with the effects of the Project on VCs, these effects will generally be low in magnitude or negligible. There will be a measurable cumulative effect on Navigation and Marine Resources due to changes in access to fishing around Lelu Island and Porpoise Channel and increased shipping activities in the Prince Rupert area and Chatham Sound. Raising the trestle and bridge to allow access to fishing for vessels with a clearance below 11 m and notice to mariners of shipping activities (i.e., scheduling of LNG carrier transport of LNG product) will help to reduce impacts such that the overall cumulative impact will be negligible.

Given the mitigation proposed for this Project which will prevent or reduce residual adverse environmental effects, the cumulative effects of the Project and other projects and activities are deemed to be low in magnitude, temporary (i.e., can be restored upon decommissioning), and not significant.

Table 5: Scoping of Potential Cumulative Environmental Effects

Name of Project/Activity	Air Quality	Greenhouse Gas Management	Acoustic Environment	Ambient Light	Vegetation and Wetland Resources	Terrestrial Wildlife and Marine Birds	Freshwater Aquatic Resources	Marine Resources	Economic Environment	Navigation and Marine Resource Use	Infrastructure and Services	Visual Quality	Community Health and Well-Being	Human and Ecological Health	Heritage and Archaeological Resources	Current Use of Land and Resources for Traditional Purposes
Atlin Terminal		✓		✓			✓		✓	✓	✓	✓	✓	✓		✓
Canpotex Potash Export Terminal	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
CN Rail Line	✓	✓	✓	✓	✓	✓						✓				✓
Douglas Channel LNG		✓				✓		✓			✓	✓				✓
Enbridge Northern Gateway		✓				✓		✓			✓	✓				✓
Fairview Container Terminal Phase I	✓	✓			✓	✓		✓	✓	✓	✓	✓	✓			✓
Fairview Container Terminal Phase II	✓	✓			✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
Kitimat LNG Terminal		✓				✓		✓		✓	✓	✓				✓
LNG Canada		✓				✓		✓		✓	✓	✓				✓
Mount McDonald Wind Power		✓			✓	✓		✓	✓		✓		✓			✓
Naikun Wind Energy		✓		✓	✓	✓		✓			✓	✓	✓			✓
Northland Cruise Terminal	✓	✓				✓		✓		✓	✓	✓	✓			✓

Name of Project/Activity	Air Quality	Greenhouse Gas Management	Acoustic Environment	Ambient Light	Vegetation and Wetland Resources	Terrestrial Wildlife and Marine Birds	Freshwater Aquatic Resources	Marine Resources	Economic Environment	Navigation and Marine Resource Use	Infrastructure and Services	Visual Quality	Community Health and Well-Being	Human and Ecological Health	Heritage and Archaeological Resources	Current Use of Land and Resources for Traditional Purposes
Odin Seafood		✓				✓		✓				✓				✓
Pinnacle Pellet Inc.		✓	✓		✓	✓		✓		✓		✓				✓
Prince Rupert LNG Facility	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓		✓
Prince Rupert Gas Transmission		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓			✓
Prince Rupert Ferry Terminal	✓	✓				✓		✓		✓	✓	✓	✓			✓
Prince Rupert Industrial Park		✓	✓		✓	✓										✓
Prince Rupert Grain Limited	✓	✓	✓	✓	✓	✓		✓		✓		✓				✓
Ridley Island Log Sort		✓	✓		✓	✓				✓	✓		✓			✓
Ridley Terminals Inc.	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			✓
Rio Tinto Alcan Aluminum Smelter and Modernization		✓				✓		✓		✓		✓				✓
Watco Pulp Mill		✓	✓		✓	✓		✓		✓	✓	✓	✓			✓
Westcoast Connector Gas Transmission		✓	✓		✓	✓		✓		✓	✓	✓	✓			✓
Westview Pellet Terminal		✓														

12 FOLLOW-UP AND MONITORING

A Follow-up Program is designed to verify the accuracy of the EIS/Application predictions and determine the effectiveness of the measures implemented to mitigate the adverse environmental effects of the Project. Follow-up programs generally include environmental effects monitoring but can also include environmental compliance monitoring which involves monitoring of activities to confirm compliance with all the regulatory requirements and self-imposed environmental commitments.

In addition to verification of environmental effects prediction and effectiveness of mitigation measures, a follow-up program is also used to support the implementation of adaptive management measures to address unanticipated adverse environmental effects and support environmental management systems.

During the stakeholder and public engagement process, concerns were raised regarding accountability for monitoring all environmental effects resulting from the Project and to ensure commitments made by PNW LNG in the EIS/Application will be enforced. If the Project is granted an Environmental Assessment Certificate by the province, PNW LNG will be required to meet legally-binding conditions attached to the certificate, overseen by the BC EAO and partner agencies. CEAA 2012 also requires that commitments in the Minister of the Environment's Decision Statement are adhered to, overseen by the CEA Agency. Both the province and Canada can inspect works, issue advisories or warnings, and implement a range of potential sanctions such as stop work orders and fines to ensure proponents are adhering to their conditions.

The EIS/Application for the Pacific Northwest LNG Project proposes follow-up and monitoring programs as summarized in Table 6. Table 7: Compliance Monitoring and Reporting lists the compliance monitoring expected to be required for the Project.

Table 6: Summary of Follow-up and Monitoring Programs

No.	Follow-up Programs	Valued Component	Project Phase	Application Section or Supporting Document
1	Acidification and Eutrophication: ▪ A follow-up program would be implemented to determine whether a measurable effect to vegetation communities and freshwater bodies occurs due to deposition of acidifying and eutrophying compounds.	Vegetation and Wetland Resources Terrestrial Wildlife and Marine Birds Freshwater Aquatic Resources	Operations	10.7
2	Sediment Quality: ▪ Physical and chemical characterization of marine sediment will be completed for the marine terminal dredge area. This will be completed as part of the disposal at sea permit application, and will include modelling of sediment plumes and sedimentation rates during dredging and disposal of sediment to confirm predictions of the assessment.	Marine Resources	Permitting	13.7

No.	Follow-up Programs	Valued Component	Project Phase	Application Section or Supporting Document
3	Fish and Fish Habitat: ▪ Monitoring as part of the Fish Habitat Offsetting Strategy ▪ Monitoring of the Flora Bank eelgrass bed for change in extent and density to confirm predictions of the assessment. ▪ Monitor underwater noise during pile driving to confirm effectiveness of mitigation and effects on marine mammals.	Freshwater Aquatic Resources Marine Resources	Construction Operations	12.7 13.7

Table 7: Compliance Monitoring and Reporting

Compliance Monitoring and Reporting	Project Phase	Application Section
Air Quality: ▪ Project-specific compliance monitoring and reporting requirements will be defined by BC Ministry of Environment and BC Oil and Gas Commission as a permit condition.	Operations	6
Greenhouse Gas Management: ▪ Annual greenhouse gas emissions will be reported to the BC Ministry of Environment and Environment Canada, including third-party verification of emissions accounting, as required.	Operations	7
Ambient Light: ▪ A qualified professional will monitor the implementation of ambient light mitigation measures outlined in the Noise, Vibration, and Ambient Light Management Plan. ▪ Follow-up monitoring during all phases of the Project will be on a complaint-driven basis so specific light spill issues can be addressed.	Construction Operations	9
Vegetation and Wetland Resources: ▪ A weed control program will be implemented and will include ongoing monitoring and control of weeds in the project development area.	Construction Operations	10
Marine Resources ▪ TSS and turbidity will be monitored during dredging and disposal of marine sediment and during operations to monitor compliance with water quality guidelines.	Construction Operations	13
Navigation and Marine Resource Use ▪ Compliance audits or inspections will be required to ensure compliance with the requirements of Transport Canada, the Canadian Coast Guard, and Prince Rupert Port Authority.	Construction Operations	15
Archaeological and Heritage Resources: ▪ A chance find protocol will be developed for any new CMTs or archaeological and heritage resources. ▪ In the unlikely event that a new CMT or archaeological site is identified, archaeological monitoring or systematic data recovery studies will be completed.	Construction	20

13 OPERATIONAL AND MANAGEMENT PLANS

Prior to the commencement of construction activities, PNW LNG will develop an Environmental Management System (EMS) for the proposed Project which includes a number of environmental management plans to manage environmental risks and achieve environmental performance objectives for the proposed Project. Each environmental management plan will include the written procedures, specifications, and controls which provide direction towards construction, and operations activities, and will:

- Comply with all of the project specific environmental obligations and assurances including, without limitation, those set forth in the EAC.
- Identify roles and responsibilities of the environmental management team.
- Identify monitoring and reporting requirements.
- Comply with the EMS framework, including detailed construction and operations environmental management plans.
- Be expanded and updated throughout the term of the contract to reflect changes in scheduling, site conditions, and weather-dependent contingency measures.

The management plans will guide the development of environmental work plans for construction, including construction activities, and any required site-specific management plans, and will provide effective environmental protection during operational activities during the construction and operations phases of the Project.

Each key environmental aspect or activity identified for the Project, as well as project related training, monitoring, operations management and spill and emergency response, will have a separate EMP which details the best management practices, mitigation measures, monitoring requirements and reporting procedures associated with that aspect or activity. The list of EMPs that will be developed for the Project includes, but is not limited to the following:

- Air Quality and Greenhouse Gas Management Plan
- Noise, Vibration, and Ambient Light Management Plan
- Emergency Response Plan
- Transportation Management Plan
- Marine and Freshwater Resources Management Plan
- Vegetation Management Plan
- Waste Management Plan
- Blasting Management Plan
- Pile Driving Management Plan
- Dredging Management Plan
- Archaeological and Heritage Resources Management Plan
- Environmental Monitoring Management Plan
- Accomodation Plan.

14 BENEFITS TO CANADIANS

In addition to meeting regulatory requirements, the environmental assessment process has resulted in various benefits to Canadians, including the community, interested stakeholders and Aboriginal groups, with asserted traditional territory, in the Port Edward and Prince Rupert regions of British Columbia. In particular, the process has created opportunities to maximize environmental and social benefits, and has increased scientific knowledge and technological awareness.

14.1 Changes to the Project Since Initially Proposed

Through the provincial and federal environmental assessment processes, PNW LNG has improved the Project based on a better understanding of potential effects and local and traditional knowledge about the environment and based on the influence of consultation with stakeholders, the public and Aboriginal groups. Table 8 summarizes the key benefits to the environment due to project design changes.

Table 8: Environmental Benefits of Project Changes

Project Feature	Project Change	Benefits of Change
Site Layout	A vegetated riparian buffer will be maintained that extends 30 m inland from the high-water mark around Lelu Island	▪ Avoids removal of CMTs ▪ Provides visual barrier for the Project ▪ Maintains habitat on Lelu Island ▪ Protects a red-listed estuarine plant community
Siting of main flare stack	Moved to southeast location	▪ Mitigates potential visual quality, ambient light and acoustic effects
Gas turbines	Switched from industrial gas turbines to aero-derivative gas turbines	▪ Reduces GHG and air emissions
Bunker fuel	Bunker refuelling removed	▪ Eliminates risk of bunker fuel spill while refuelling ▪ Eliminates potential effect on marine and terrestrial species and habitats
Propane Use and Storage	Propane use and storage removed from the project design	▪ Reduces the quantity of hazardous materials stored on site ▪ Reduces the complexity and safety risks associated with unloading of propane from marine vessels ▪ Reduces marine traffic
Marine terminal	Shortened from 2.7 km to 2.4 km	▪ Reduces navigational effects of terminal ▪ Makes LNG carrier loading safer
Marine terminal	Increased clearance near Lelu Island to 11 m	▪ Allows passage of gillnetters and smaller vessels ▪ Reduces navigational effects of terminal
Bridge from Lelu Island to mainland	Increased clearance to 11 m	▪ Allows passage of gillnetters and smaller vessels ▪ Reduces navigational effects of the bridge

14.2 Benefits of the Project

The proposed Project as well as the environmental assessment provides opportunities for a number of benefits to the local community, Aboriginal groups, the province and Canada. Participants have benefitted from a transparent process used to contribute to sustainable development. All phases of the Project can lead to improved public participation, increased scientific knowledge, community and social benefits and economic benefits. Table 9 summarizes the key social benefits due to the Project.

Table 9: Social Benefits of the Project

General Benefits	Specific Examples		
Contribution to the Concept of Sustainable Development	Environmental and socio-economic considerations taken into account in project design to maximize project return on investment		
Public Participation	Clearance under trestle and bridge influenced by consultation		
Technological awareness	LNG production is new in BC and could result in knowledge transfer from this Project		
Increases in scientific knowledge	Studies improved knowledge of biophysical and socio-economic environment, making the Project more responsive to local conditions		
Community and social benefits	Involvement of the regional labour force. Estimated employment is as follows: ▪ Construction: 340 annual jobs for local RAA residents (200 direct, 100 indirect, 40 induced); 22,650 person years (PY) of employment in British Columbia (8,000 direct, 8,655 indirect, 5,995 induced), and an additional 10,235 PY indirect and 5050 PY induced employment in the rest of Canada. ▪ Operation: 680 jobs for local RAA residents (260 direct, 140 direct-contract, 120 indirect, 160 induced); 1,200 jobs in British Columbia (650 direct, 155 indirect, 395 induced); 175 jobs in the rest of Canada (45 indirect, 130 induced).		
Community Development	Mutual aid agreement with local fire and rescue services First Nations and Community Training and Employment Strategy Road improvement		
Economic Benefits	**Revenues in Canada**		
Revenues paid to Canadian businesses	Construction: $3.4 billion labour, goods and services Operations: $2.5 billion/year labour, goods and services		
Tax Revenues to Government		**Construction ($million)**	**Operation ($million/year)**
	Canada: Income tax	$423	$615
	Canada: GST	$47	$18
	Canada: Other taxes	$31	$5
	BC: Income tax	$122	$424
	BC: PST	$313	$85
	BC: Other taxes	$42	$244
	Municipal: Property tax	$15 (/year)	$15

15 PROPOSED SIGNIFICANCE CONCLUSIONS

With the implementation of the proposed mitigation measures, adverse residual environmental effects of routine project activities are predicted to be not significant for all VCs. The environmental effects of any potential project accidents or malfunctions that may occur can be addressed with appropriate environmental management and contingency response planning. Provided that the mitigation outlined in the EIS/Application is implemented, and provided that appropriate response plans are in place, no significant adverse environmental effects are likely to occur as a result of project-related accidents and malfunctions.

In summary, the Project is not likely to result in significant adverse residual environmental effects, including cumulative effects, provided that the proposed mitigation, monitoring and follow-up programs are implemented.

The Project is particularly important for Port Edward and Prince Rupert, given the need for opportunities to generate employment and income for these communities to prosper. Pacific NorthWest LNG Limited Partnership will continue to work with interested stakeholders and Aboriginal groups to develop the Project in a manner that is environmentally sustainable and socially and economically beneficial to the Project and society alike.

16 POTENTIAL IMPACTS ON ABORIGINAL RIGHTS AND RELATED INTERESTS

16.1 Aboriginal Rights

The following five Aboriginal groups have potential or established Aboriginal rights and related interests on Lelu Island and the surrounding area:

- Metlakatla First Nation
- Lax Kw'alaams First Nation
- Gitxaala Nation
- Kitselas First Nation
- Kitsumkalum First Nation

Kitselas First Nation is the only one of the five potentially-affected Aboriginal groups that has not specifically asserted that they also have Aboriginal title to areas of land within the LAA.

The proposed Project has the potential to affect consumptive harvesting rights, such as hunting, fishing and tree-cutting, through changes in preferred harvested species, changes or restrictions on preferred harvesting methods, changes in use or access to valued traditional use locations, and changes in the experience of using land and resources for traditional purposes.

Interference with consumptive harvesting rights-protected activities will largely be restricted to the PDA, the coastlines of Lelu Island, part of Flora Bank, Porpoise Channel, and along Lelu Slough. Effects related to increased vessel traffic may occur along the project shipping route. Interference with certain rights-protected activities may be temporary (e.g., vessel congestion interfering with fishing in waters near Lelu Island) or continuous (e.g., vegetation gathering on Lelu Island). These

effects on certain rights-protected consumptive harvesting activities will likely last for at least a generation or longer.

Measures to mitigate potential impacts on Aboriginal interests include Fish Habitat Offsetting, Wetland Compensation (incorporating traditional use plants), notice to mariners (LNG carriers' presence), restrictions on LNG vessel speeds and 11 m clearance under the trestle to accommodate small vessel traffic along Flora Bank. PNW LNG is currently making good faith efforts to negotiate Impact Benefit Agreements with potentially affected Aboriginal groups in recognition of predicted effects on Aboriginal rights.

The nature, extent, and exact location of Aboriginal title lands within the LAA are uncertain. Project-related activities may affect existing Aboriginal title rights by interfering with ownership or other rights relating to use and control of land associated with Aboriginal title, if that title is proven. The highest intensity of interference would occur in the PDA. PNW LNG will continue seek direction from both provincial and federal regulators with regard to asserted Aboriginal title claims within areas potentially affected by the Project.

16.2 Other Matters of Concern

Traditional Aboriginal governance systems can depend on consumptive harvesting activity (e.g., fishing, hunting) and can be affected by the ownership, access to, and control of key harvesting locations. The Project may have indirect adverse effects on traditional Aboriginal governance systems due to the potential to adversely affect preferred harvested species and the potential to interfere with the use of and access to, traditional use locations and marine harvesting areas.

Predicted localized effects on harvested species will not threaten their sustainability due to the application of a fish habitat offsetting strategy. While the number of available traditional use harvest locations will be locally reduced, high-value traditional harvesting areas elsewhere will be unaffected. Traditional economic activities (e.g., trading) by Aboriginal groups that depend on consumptive harvesting could also be minimally affected. PNW LNG predicts that any project-related effect on traditional Aboriginal governance structures and trading of the relevant Aboriginal groups will be minimal with application of proposed mitigation measures.

The Project could potentially interfere with spiritually important areas. However PNW LNG has determined that it is unlikely that the Project will result in added measurable levels of interaction with these areas.

17 FIGURES

Please see the following pages.

- City
- Project Location
- Provincial Road or Highway
- Watercourse
- Waterbody

Pacific NorthWest LNG

Project Location

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 19-FEB-14	PROJECTION: BC ALBERS
FIGURE ID: 123110537-561	DATUM: NAD 83
DRAWN BY: K. POLL	CHECKED BY: A. POMEROY

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **1**

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Potential Shipping Route
Lelu Island
Airport
Pilotage Station
Electrical Power Transmission Line
Ferry Route
Highway
Railway
Watercourse
Indian Reserve
Prince Rupert Port Authority Boundary
Protected Area
Waterbody

Pacific NorthWest LNG

Lelu Island and Surrounding Area

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 19-FEB-14
FIGURE ID: 123110537-562
DRAWN BY: K. POLL
PROJECTION: UTM - ZONE 9
DATUM: NAD 83
CHECKED BY: A. POMEROY

PREPARED BY: Stantec
PREPARED FOR: Pacific NorthWest LNG
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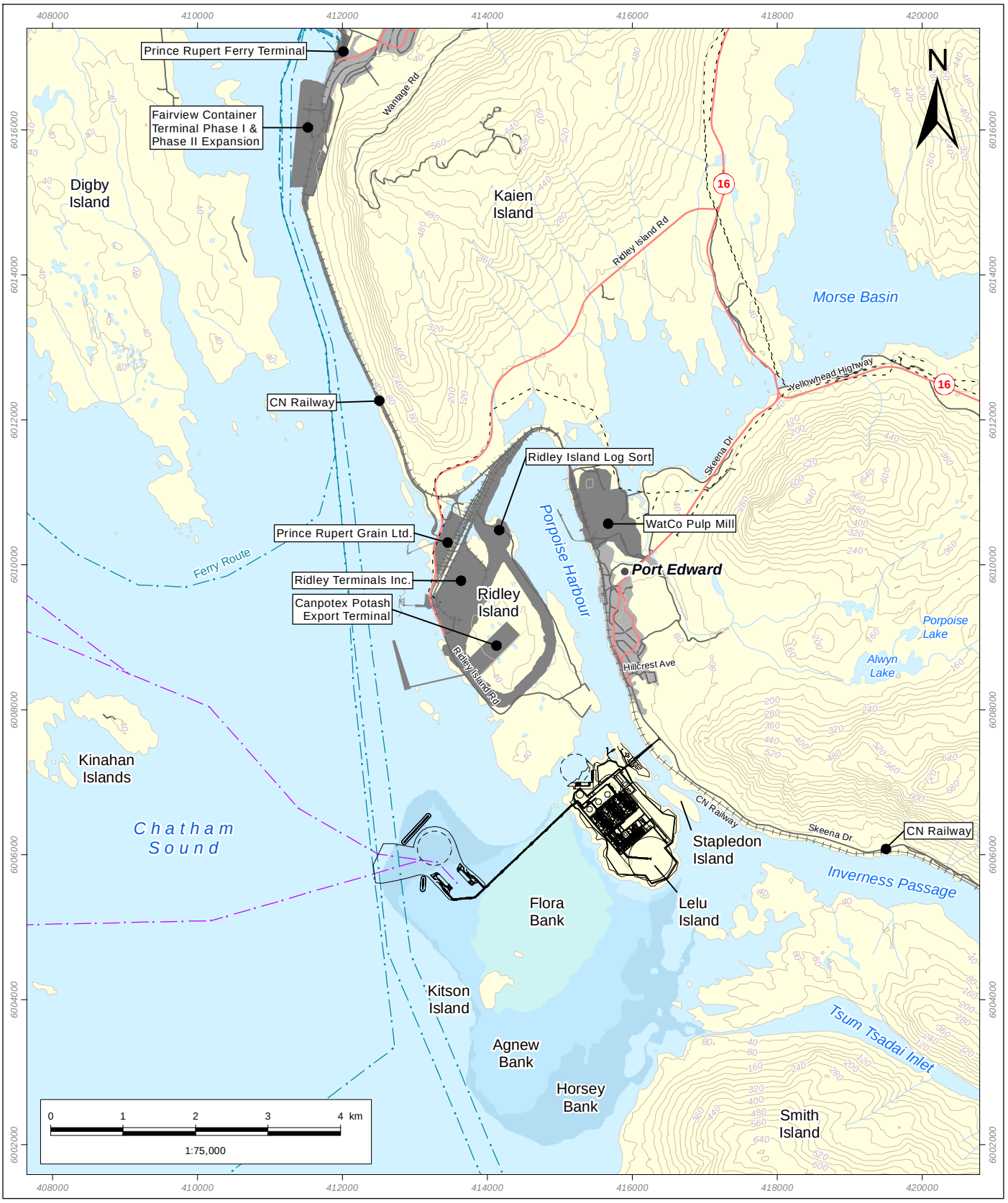

Potential Shipping Route
Project Component
Turning Basin
Past, Present, or Approved Project
Contour (m)
Electrical Power Transmission Line
Ferry Route
Highway
Railway
Secondary Road
Watercourse
Urban Area
Waterbody
Shoals
Agnew Bank
Flora Bank
Horsey Bank

Pacific NorthWest LNG

Project Plot Plan and Surrounding Area

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Canadian Hydrological Service (CHS), 1995.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **3**

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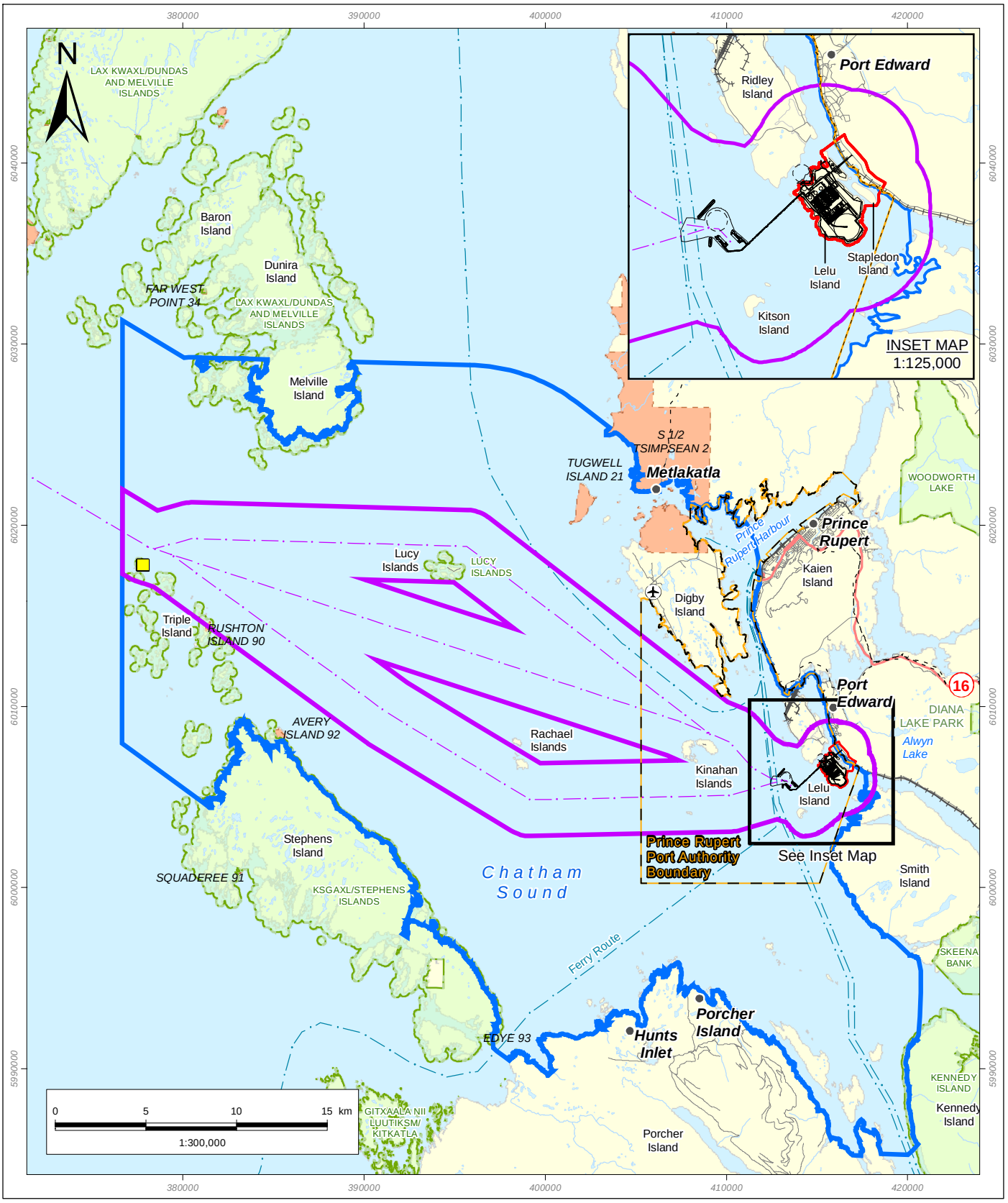

Biological Local Assessment Areas (LAAs)

- Marine Resources
- Vegetation and Wetland Resources & Freshwater Aquatic Resources
- Terrestrial Wildlife and Marine Birds
- Potential Shipping Route
- Project Component
- Turning Basin

- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Ferry Route
- Highway
- Railway
- Secondary Road
- Watercourse

- Indian Reserve
- Prince Rupert Port Authority Boundary
- Protected Area
- Waterbody

Pacific NorthWest LNG

Biological Local Assessment Areas (LAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

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FIGURE NO: **4**

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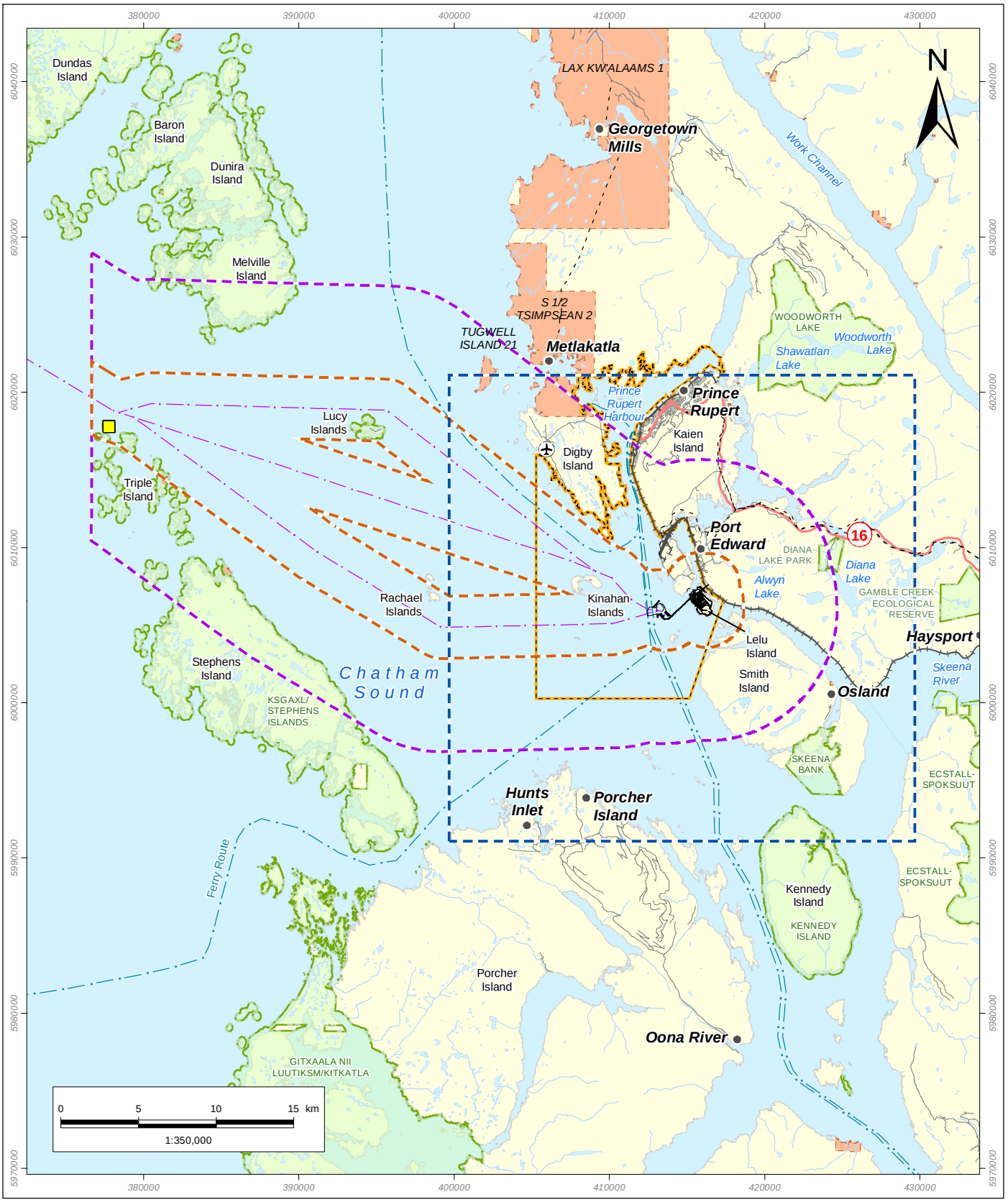

Physical Environment

Local Assessment Areas (LAAs)

- Acoustic Environment
- Air Quality
- Ambient Light
- Potential Shipping Route
- Project Component

- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Ferry Route
- Highway
- Railway
- River or Stream
- Secondary Road
- Indian Reserve
- Prince Rupert Port Authority Boundary
- Protected Area
- Waterbody

Pacific NorthWest LNG

Physical Environment Local Assessment Areas (LAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

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FIGURE NO: **5**

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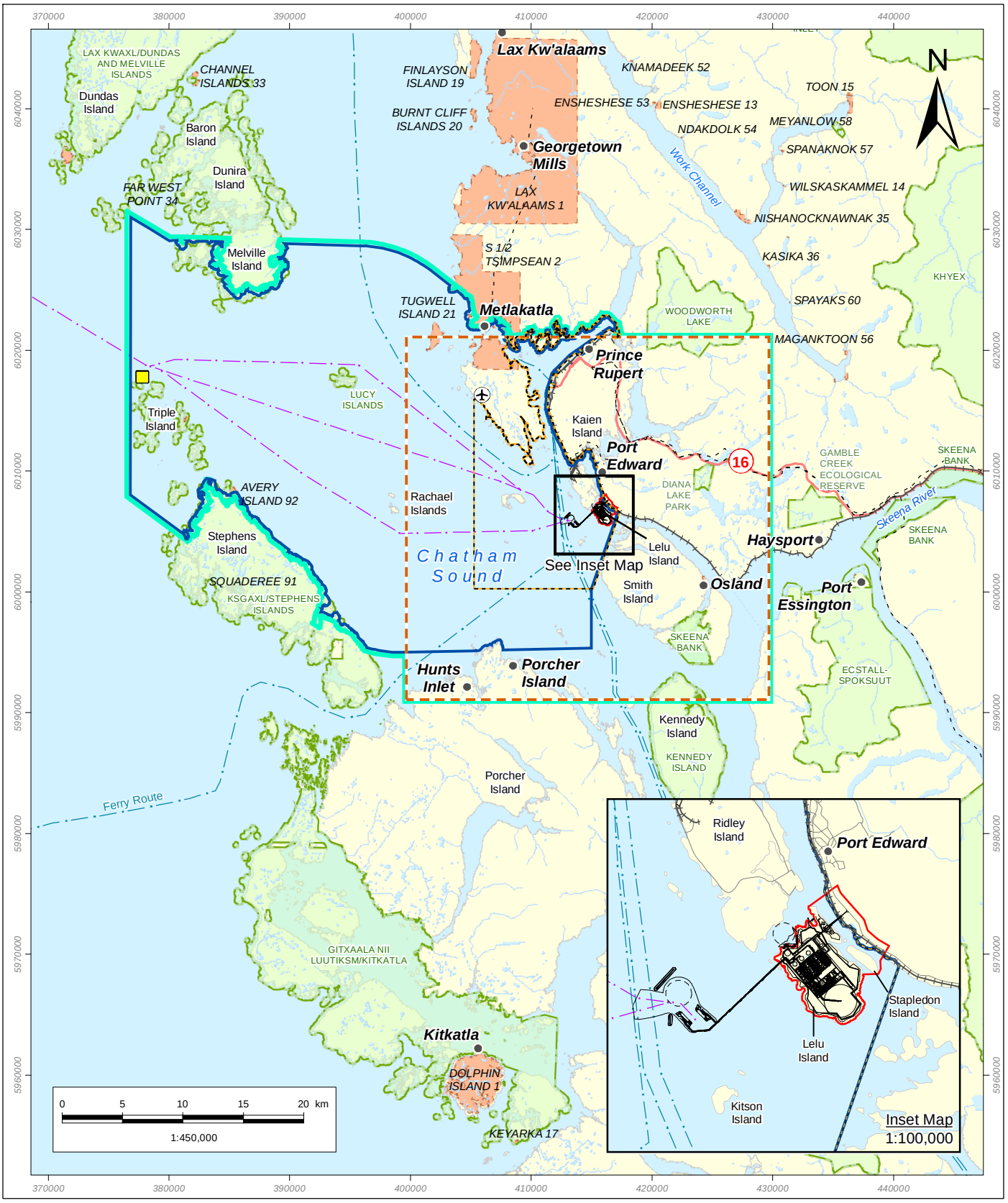

Human Environment

Local Assessment Areas (LAAs)

- Current Use of Lands and Resources for Traditional Purposes
- Archaeological and Heritage Resources
- Human and Ecological Health
- Navigable Waters and Marine Resource Use
- Potential Shipping Route

- Project Component
- Turning Basin
- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Ferry Route
- Highway
- Railway

- Watercourse
- Indian Reserve
- Prince Rupert Port Authority Boundary
- Protected Area
- Waterbody

Pacific NorthWest LNG

Human Environment (Set 1 of 2) Local Assessment Areas (LAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

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PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **6**

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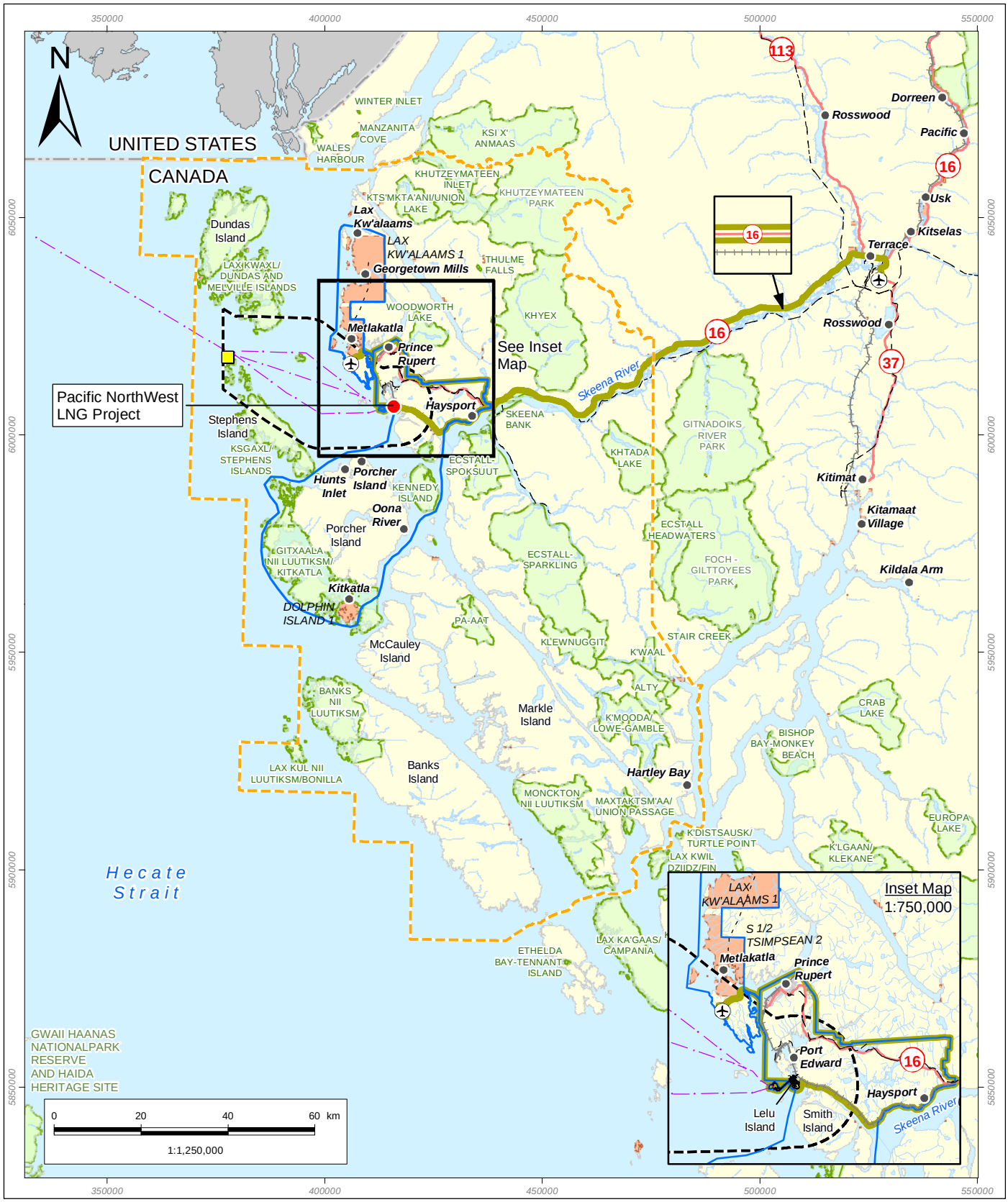

Project Location

Human Environment

Local Assessment Areas (LAAs)

- Community Health and Well Being
- Economic Environment
- Infrastructure and Services
- Visual Quality
- Potential Shipping Route

- Project Component
- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Highway
- International Boundary
- Railway
- Watercourse

- Indian Reserve
- Protected Area
- United States of America
- Waterbody

Pacific NorthWest LNG

Human Environment (Set 2 of 2) Local Assessment Areas (LAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

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PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

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Biological Regional Assessment Areas

- Freshwater Aquatic Resources
- Marine Resources
- Terrestrial Wildlife and Marine Birds
- Vegetation and Wetland Resources
- Potential Shipping Route
- Project Component
- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Ferry Route
- Highway
- Railway
- Watercourse
- Indian Reserve
- Protected Area
- Waterbody

Pacific NorthWest LNG

Biological Regional Assessment Areas (RAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

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FIGURE NO: **8**

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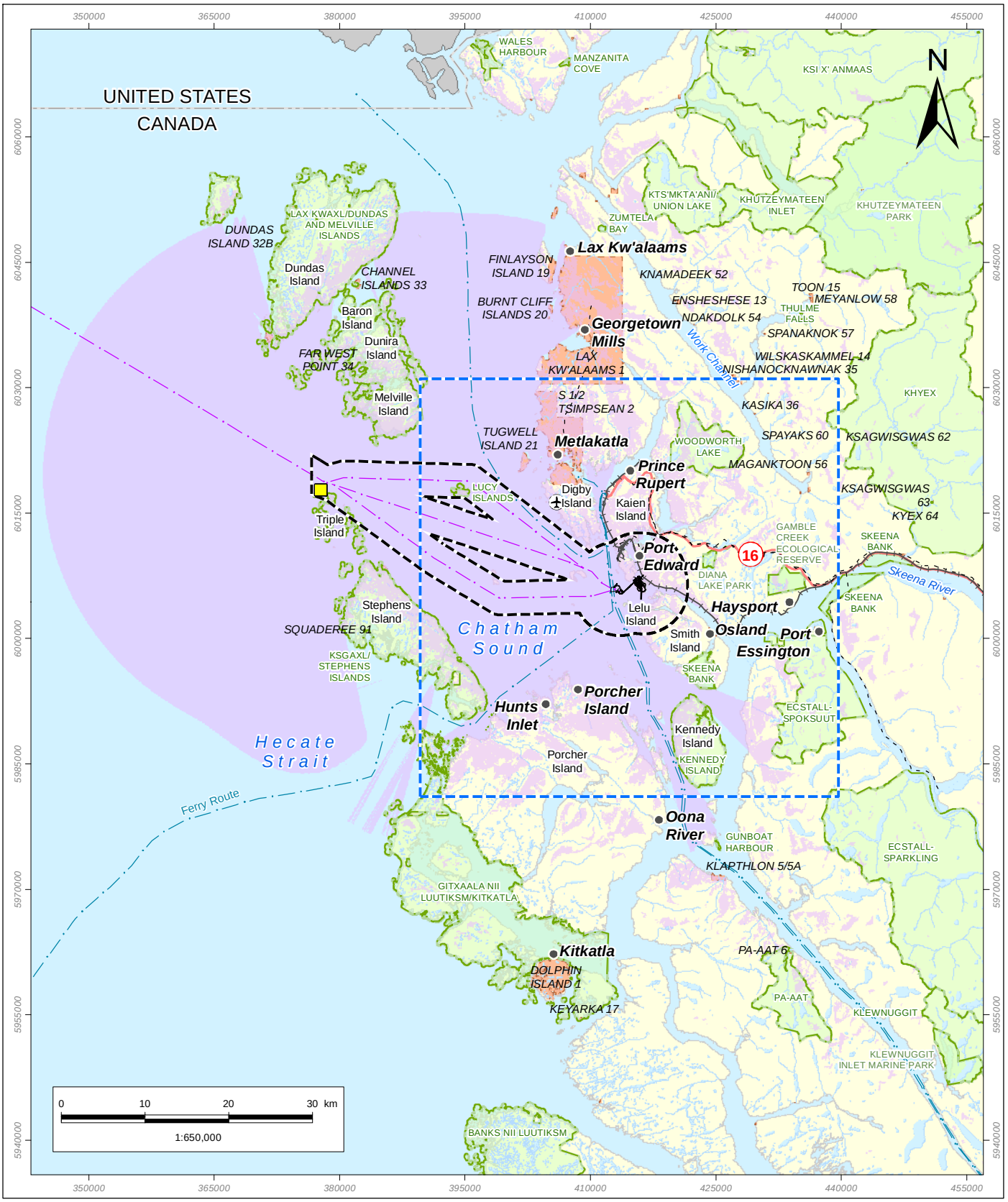

Physical Environment

Regional Assessment Areas (RAAs)

- Acoustic Environment
- Air Quality
- Ambient Light
- Potential Shipping Route
- Project Component
- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Ferry Route
- Highway
- International Boundary
- Railway
- Watercourse
- Indian Reserve
- Protected Area
- United States of America
- Waterbody

Pacific NorthWest LNG

Physical Environment Regional Assessment Areas (RAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 20-FEB-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-568	DATUM: NAD 83
DRAWN BY: K. POLL	CHECKED BY: A. POMEROY

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **9**

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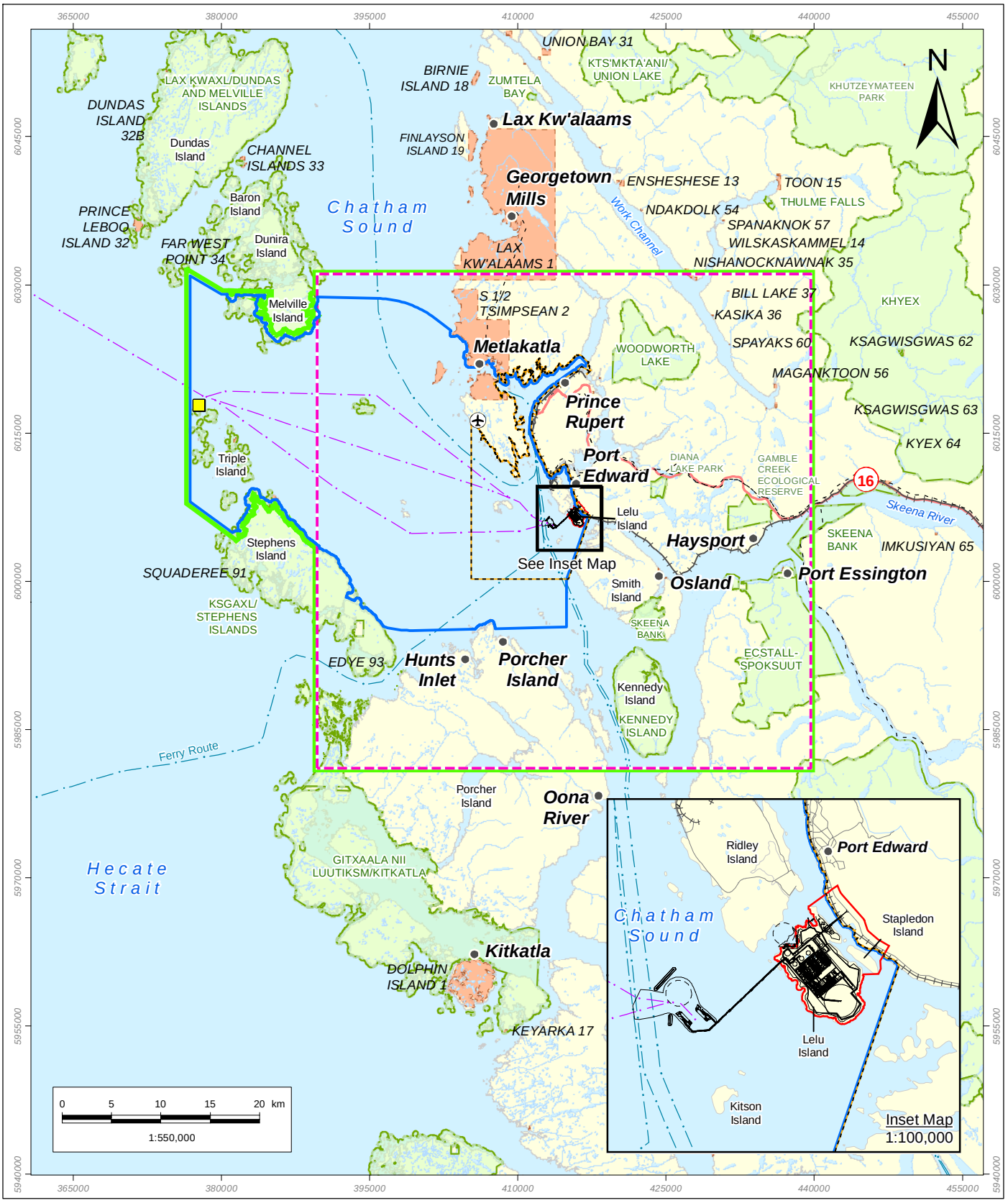

Human Environment

Regional Assessment Areas (RAAs)

- Current Use of Lands and Resources for Traditional Purposes
- Archaeological and Heritage Resources
- Human and Ecological Health
- Navigable Waters and Marine Resource Use
- Potential Shipping Route

- Project Component
- Turning Basin
- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Ferry Route
- Highway
- Railway

- Watercourse
- Indian Reserve
- Prince Rupert Port Authority Boundary
- Protected Area
- Waterbody

Pacific NorthWest LNG

Human Environment (Set 1 of 2) Regional Assessment Areas (RAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 19-FEB-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-569	DATUM: NAD 83
DRAWN BY: K. POLL	CHECKED BY: A. POMEROY

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **10**

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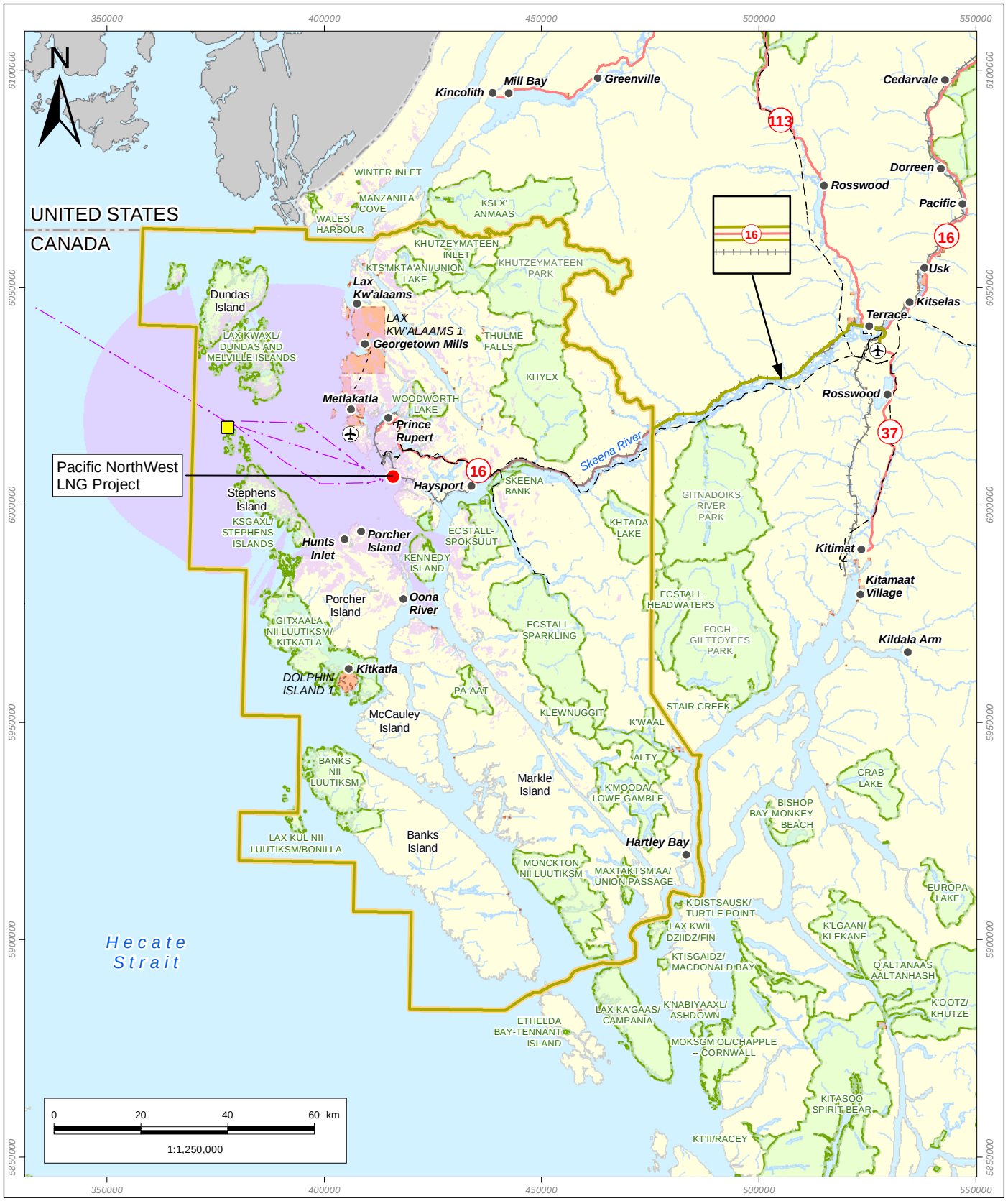

Project Location

Human Environment

Regional Assessment Areas (RAAs)

- Community Health and Well Being & Economic Environment
- Infrastructure and Services
- Visual Quality
- Potential Shipping Route

- Airport
- Pilotage Station
- Electrical Power Transmission Line
- Highway
- International Boundary
- Railway
- Watercourse

- Indian Reserve
- Protected Area
- United States of America
- Waterbody

Pacific NorthWest LNG

Human Environment (Set 2 of 2) Regional Assessment Areas (RAAs)

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 19-FEB-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-571	DATUM: NAD 83
DRAWN BY: K. POLL	CHECKED BY: A. POMEROY

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **11**

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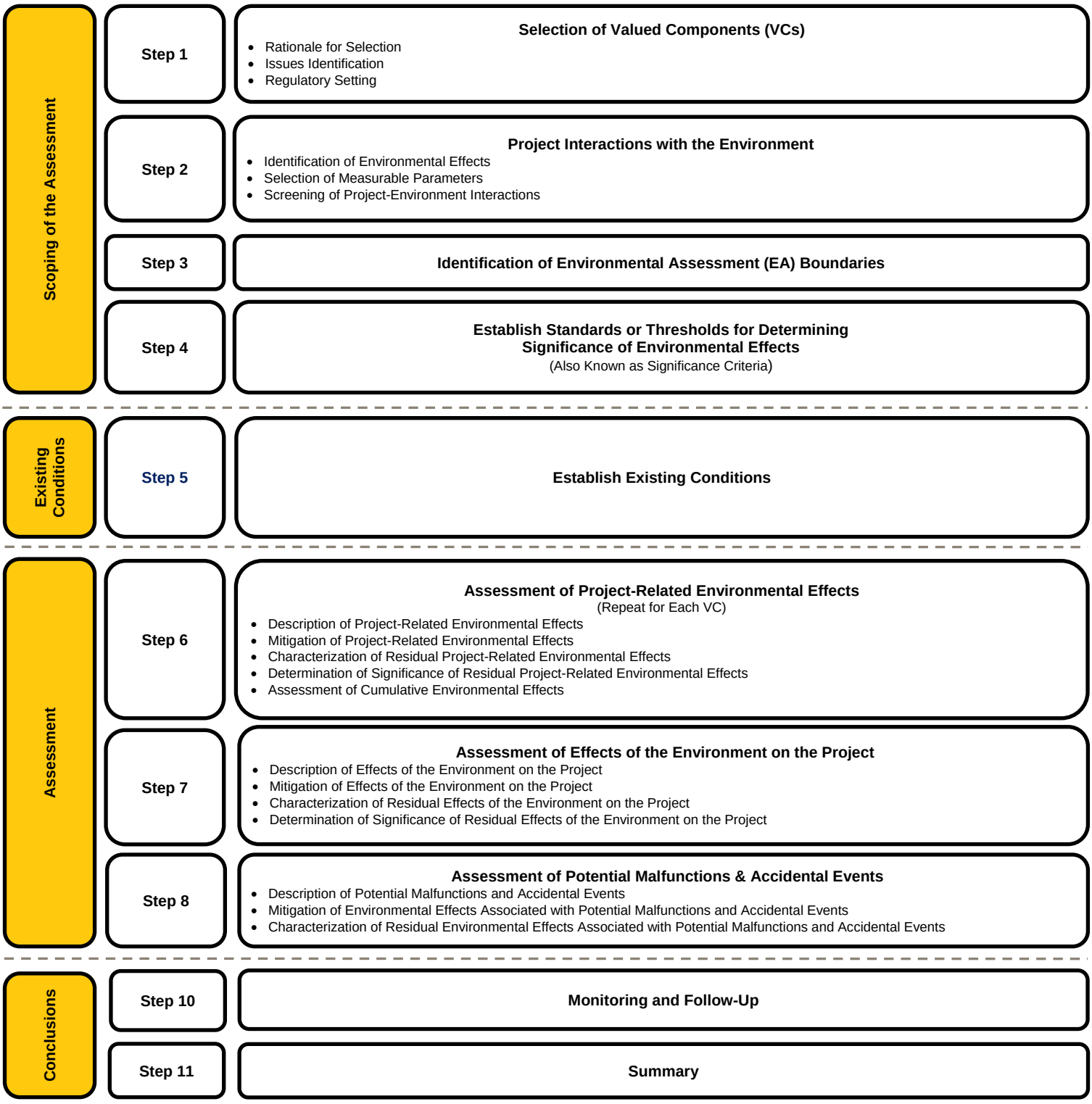

Figure 12: Environmental Assessment Method Overview

APPENDIX 1

Summary of the Assessment

Pacific NorthWest LNG

Stantec

Table 1-1: Summary of Potential Effects, Proposed Mitigation Measures, Residual Adverse Effects, and their Significance

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Air Quality				
Increase in criteria air contaminant (CAC) concentrations	**Construction** Site preparation Onshore construction Vehicle traffic Dredging **Operations** LNG facility Marine terminal use Shipping	▪ Best achievable technology ▪ Best management practices. ▪ Natural gas leak detection program. ▪ Thermal oxidizer operation. ▪ Dust suppression. ▪ Equipment maintenance and low sulfur fuel. ▪ Vehicle idling restrictions. ▪ Adherence to the International Convention for the Prevention of Pollution from Ships (MARPOL).	▪ The ecological context is that the atmosphere is expected to demonstrate a **high degree of resilience** to change in air quality. ▪ **Low** in magnitude (effect is detectable but within normal variability of baseline conditions) ▪ **Local** in geographic extent (restricted to the LAA) ▪ **Medium-term** in duration (effect occurs for the life of the Project) ▪ Reversible ▪ Is **continuous** in frequency ▪ The likelihood of a residual effect of an increase in criteria air contaminant concentrations is **high.**	**Not significant** with a high level of confidence
Greenhouse Gas Management				
Emission of GHG gases (CO_2, CH_4, N_2O) from LNG facility	**Construction** Site preparation Onshore construction Vehicle traffic Dredging Marine construction **Operations** LNG facility Marine terminal use Shipping	▪ Develop and implement a GHG Management Plan.	▪ The contribution of GHG emissions from the Project would cause a small material change relative to the total global emissions.	**Not significant**

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Acoustic Environment				
Increase in noise levels	**Construction** Site preparation Onshore construction Dredging Marine construction **Operations** LNG facility Marine terminal use Shipping **Decommissioning** Dismantling project infrastructure	▪ Nighttime construction activity will be limited to low noise activities (no impact type pile driving or blasting). ▪ Pile driving using vibro-hammer, where feasible. ▪ Noise Management Plan. ▪ Use of building enclosures and/or silencers on large machinery and equipment. ▪ Closure of building windows. Closure of doors when not in use. ▪ Implementation of a noise complaint mechanism. ▪ Specification of acoustic performance of noise emission equipment (not exceeding 85 dBA at 1 m from equipment and 120 dBA for emergencies).	▪ The ecological context is of **moderate resilience** (the effect takes place in an area currently disturbed by human development) ▪ **Moderate** in magnitude (effect is perceptible compared to baseline) ▪ **Regional** in extent (effects extend into the RAA for three receptors) ▪ **Medium-term** in duration (effect occurs for the life of the Project) ▪ Reversible ▪ Is **continuous** in frequency ▪ The likelihood of a residual effect of an increase in noise levels is **high**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Ambient Light				
Increase in ambient lighting	**Construction** Site preparation Onshore construction Vehicle traffic Operational testing and commissioning **Operations** LNG facility Marine terminal use	▪ Fixtures selected to reduce wasted or stray light. ▪ Adherence to design specifications. ▪ Use of a centralized lighting control system. ▪ Maintain a 30 m vegetation buffer.	▪ The ecological context is of **moderate resilience** (the effect takes place in an area currently disturbed by human development). ▪ **Low** in magnitude (effect is detectable but reduced through design mitigation) ▪ **Local** in extent (effects are within the LAA) ▪ **Medium-term** in duration (effect occurs for the life of the Project) ▪ Reversible ▪ Is **continuous** in frequency ▪ The likelihood of a residual effect of an increase in ambient lighting is **high.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Vegetation and Wetland Resources				
Change in abundance of plant species of interest	**Construction** Site preparation	▪ Incorporate traditional use plants into wetland compensation plans wherever possible and practical. ▪ Incorporate weed and invasive plant control measures during construction and operations. ▪ Implement a Species-at-Risk Discovery Contingency Plan.	▪ The ecological context is of **moderate resilience** (the effect takes place in an **undisturbed** area). ▪ **Low** in magnitude ▪ Occurs within the **PDA** ▪ Long term ▪ Change in plant abundance is **reversible** ▪ Occurs **once** ▪ The likelihood of a residual effect of a change in abundance of plant species of interest is **high.**	**Not Significant** With a moderate level of confidence
Change in abundance or condition of ecological communities	**Construction** Site Preparation **Operation** LNG facility	▪ During construction, ecological communities of management concern located outside of the PDA will be marked and protected. ▪ Design and implement drainage and erosion control techniques to maintain the local surface and groundwater hydrology. ▪ Implement monitoring program to monitor effects of air emissions on ecological communities.	▪ The ecological context is of **moderate resilience** (the effect takes place in an **moderately disturbed** area) ▪ **Low** in magnitude ▪ **Regional** in extent (potential effects of emissions extend to the RAA) ▪ Permanent ▪ Loss of plant communities within the PDA are **irreversible** ▪ Is **continuous** in frequency (effects from facility emissions) ▪ The likelihood of a residual effect of a change in abundance or condition of ecological communities is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Change in wetland functions	**Construction** Site Preparation	▪ Delineate wetlands outside the PDA as environmentally sensitive areas, mark with fencing, and restrict construction access. ▪ Develop and implement the wetland compensation plan. ▪ Drainage and erosion control techniques designed to maintain the local surface and groundwater hydrology will be designed and implemented.	▪ With compensation there are **no residual effects** on loss of wetland function. ▪ The ecological context is of **low resilience** (the effect takes place in an **undisturbed** area). ▪ **Medium-term** in duration (including time to restore wetland function through compensation) ▪ **Reversible** (with compensation) ▪ The likelihood of a residual effect of a change in wetland function is **low.**	**Not significant** With a high level of confidence
Terrestrial Wildlife and Marine Birds				
Change in wildlife habitat availability	**Construction** Site preparation Onshore construction Dredging Marine construction Disposal at sea **Operations** LNG facility Marine terminal use Shipping **Decommissioning** Dismantling project infrastructure	▪ Maintain a 30 m vegetation buffer. ▪ Limit clearing limits of the PDA and temporary work space. ▪ Apply mitigation measures for acoustic environment. Implement Wetland Habitat Compensation and Fish Habitat Offsetting Strategies. ▪ Vessels will not exceed a speed of 16 knots within the LAA. ▪ Implement a Blasting Management Plan.	▪ The ecological context is of **moderate** resilience (effect occurs in a stable ecosystem and/or moderately disturbed environment). ▪ **Moderate** in magnitude (many individuals or hectares of habitat in a regional population are affected) ▪ **Local** in extent (potential effects are within the LAA) ▪ **Long-term** in duration (occurs across multiple breeding seasons/generations and project phases) ▪ Reversible ▪ Occurs **once** in frequency ▪ The likelihood of a residual effect of a change in wildlife habitat availability is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Risk of mortality	**Construction** Site preparation Dredging Marine construction **Operations** LNG facility Marine terminal use	▪ Maintain 30 m vegetation buffer. ▪ Limit clearing to the PDA and temporary work space. ▪ Clearing activities will occur outside of the breeding season for terrestrial birds, amphibians, and bats. If clearing is required during these breeding periods, bird surveys will be conducted in advance. ▪ Removal of raptor nests within the clearing limits of the PDA will be subject to permit approval. ▪ Erect permanent fencing around the Project. ▪ Store waste and recycling materials on-site in wildlife-proof containers for permanent disposal at an approved facility. ▪ Prohibit feeding and harassment of wildlife. ▪ Provide wildlife education and awareness training. Reduce traffic between Prince Rupert, Port Edward, and the project site through the use of buses, crew cab trucks, water taxis, and other group transportation options when practical. ▪ Adhere to posted speed limits on road and vessel transportation routes. ▪ Apply lighting mitigations. ▪ Implement Management Plans (e.g. Blasting Management Plan).	▪ The ecological context is of **moderate** resilience (effect occurs in a stable ecosystem and/or moderately disturbed environment). ▪ **Moderate** in magnitude (many individuals or hectares of habitat in a regional population are affected) ▪ **Local** in extent (potential effects are within the LAA) ▪ **Long-term** in duration (occurs across multiple breeding seasons/generations and project phases) ▪ Reversible ▪ Occurs at **multiple** times at an **irregular** frequency ▪ The likelihood of a residual effect of increased risk of mortality is **medium.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Alteration of movement or behaviour patterns	**Construction** Site preparation Onshore construction Dredging Marine construction **Operations** LNG facility Marine terminal use **Decommissioning** Dismantling project infrastructure	▪ Limit clearing limits of the PDA and temporary work space. ▪ Vessels will not exceed a speed of 16 knots within the LAA. ▪ Apply mitigation measures for acoustic environment. ▪ Equipment will be properly maintained. ▪ Implement Management Plans (e.g. Blasting Management Plan).	▪ The ecological context is of **moderate** resilience (effect occurs in a stable ecosystem and/or moderately disturbed environment). ▪ **Low** in magnitude (few individuals or hectares of habitat in a regional population are affected) ▪ **Local** in extent (potential effects are within the LAA) ▪ **Long-term** in duration (occurs across multiple breeding seasons/generations and project phases) ▪ Reversible ▪ Occurs at **multiple** times at an **regular** an **irregular** frequency ▪ The likelihood of a residual effect of alteration of movement or behaviour pattern is **high.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Freshwater Aquatic Resources				
Change in (permanent alteration or destruction of) fish habitat	**Construction** Site preparation Onshore construction **Operations** LNG facility	▪ The extent of infilling of water courses will be reduced, where practical. ▪ Infilling lower sections of watercourses (near the intertidal area) will be avoided, where practical. ▪ Sedimentation and erosion control plan will be in place to avoid downstream effects. ▪ Undertake fish habitat offsetting. ▪ A 30 m vegetation buffer will be maintained around Lelu Island.	▪ The ecological context is of **high** resilience (effect occurs in an undisturbed environment). ▪ **Low** in magnitude (effect is measurable, but on low quality, marginal or non-critical habitat) ▪ Occurs within the **PDA** ▪ **Long-term** in duration (the effect extends from 1 to 5 years including time to restore habitat through compensation) ▪ Irreversible ▪ Occurs **once** ▪ The likelihood of a residual effect of a change in fish habitat is **low .**	**Not significant** With a high level of confidence
Change in food and nutrient content	**Construction** Site preparation Onshore construction **Operations** LNG facility	▪ A 30 m vegetation buffer will be maintained around Lelu Island. ▪ Undertake fish habitat offsetting.	▪ The ecological context is of **high** resilience (effect occurs in an undisturbed environment). ▪ **Low** in magnitude (effect is measurable, but on low quality, marginal or non-critical habitat) ▪ Occurs within the **PDA** ▪ **Long-term** in duration (the effect extends from 1 to 5 years including time to restore habitat through compensation) ▪ Irreversible ▪ Occurs **once** ▪ The likelihood of a residual effect of a change in food and nutrient content is **low.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Increased risk of fish mortality	**Construction** Site preparation Onshore construction **Operations** LNG facility	▪ Fish salvage program during construction.	▪ The ecological context is of **high** resilience (effect occurs in an undisturbed environment). ▪ **No effect** (No measurable adverse effect on the function or use of the habitat; no measurable reduction in size of the fish population) ▪ Occurs within the **PDA** ▪ **Short-term** in duration (the effect is less than 1 week) ▪ Irreversible ▪ Occurs **once** ▪ The likelihood of a residual effect of an increased risk of fish mortality is **low.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Marine Resources				
Change in sediment or water quality	**Construction** Dredging Marine construction Disposal at sea **Operations** Marine terminal use	▪ A 30 m vegetation buffer around Lelu Island. Sediment and erosion control measures will be used. ▪ TSS and turbidity will be monitored, the rate of the activity will be adjusted, or additional mitigation measures implemented as required. ▪ Dredge operations will be conducted using methods that reduce sediment spill. ▪ Sediment will be disposed in an area distant from the area used on the previous trip (within the disposal site). ▪ A portion of the seabed will be armoured in marine terminal berth area. ▪ Arrivals and departures of LNG carriers will be avoided at low water slack tide and as the tide rises from low water up to mean sea level. ▪ Use of tugs with less sediment scour-inducing propulsion systems (such as the Voith-Schneider design), will be evaluated.	▪ The ecological context is of **moderate** to **high** resilience (under baseline conditions, the marine resources occasionally or often experience anthropogenic effects and are sensitive to them, with changes triggering small and short-term ecological effects, or are unaffected by them). ▪ **Low** to **moderate** in magnitude (effects result in a measurable change outside the range of natural variability but not posing a risk to population viability) ▪ Occurs within the **LAA** ▪ **Long-term** in duration (the effect continues for more than two years) ▪ Reversible ▪ Occurs either **continuously** or at **multiple** times at **regular** intervals ▪ The likelihood of a residual effect of a change in sediment or water quality is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Change in (permanent alteration or destruction of) fish habitat	**Construction** Dredging Marine construction Disposal at sea **Operations** Marine terminal use **Decommissioning** Dismantling project infrastructure	▪ Hard multi-facetted shoreline protection material will be used where needed (e.g., at the trestle abutment) to promote colonization by marine biota. ▪ Habitat offsetting will be implemented to achieve no net loss of productivity. ▪ The outer limits of foreshore construction areas will be demarcated.	▪ The ecological context is of **moderate** resilience (under baseline conditions, the marine resources are occasionally exposed to anthropogenic effects and are sensitive to them). ▪ **Moderate** in magnitude (measurable change outside the range of natural variability but not posing a risk to population viability) ▪ Occurs within the **LAA** ▪ Permanent ▪ Reversible ▪ Occurs **once** ▪ The likelihood of a residual effect of a change in fish habitat is **low.**	**Not significant** With a high level of confidence
Direct mortality or physical injury to fish or marine mammals	**Construction** Dredging Marine construction Disposal at sea **Operations** Marine terminal use	▪ DFO's Blasting Guidelines will be implemented. ▪ Blasting will be conducted within DFO least-risk timing windows. ▪ Dungeness crabs will be relocated from construction zones. ▪ Material from the dredge area that is suitable for construction or habitat compensation will be used, where possible. ▪ Implement a Pile Driving Management plan to outline low noise techniques to be used to install piles. If an impact pile driver is used a marine mammal observation program will be implemented.	▪ The ecological context is of **moderate** resilience (under baseline conditions, the marine resources are occasionally exposed to anthropogenic effects and are sensitive to them). ▪ **Moderate** in magnitude (measurable change outside the range of natural variability but not posing a risk to population viability) ▪ Occurs within the **LAA** ▪ **Long-term** in duration (effect continues through all project phases) ▪ Reversible ▪ Occurs continuously ▪ The likelihood of a residual effect of direct mortality or physical injury to fish or marine mammals is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Change in behaviour of fish or marine mammals	**Construction** Dredging Marine construction Disposal at sea **Operations** Marine terminal use Shipping **Decommissioning** Dismantling project infrastructure	▪ Vessels will not exceed a speed of 16 knots within the LAA. ▪ LNG carrier vessel speed will be reduced to 6 knots when approaching the Triple Island Pilot Boarding Station.	▪ The ecological context is of **low** to **moderate** resilience (under baseline conditions, the marine resources are either rarely or occasionally exposed to anthropogenic effects and are sensitive or highly sensitive to them). ▪ **Moderate** in magnitude (measurable change outside the range of natural variability but not posing a risk to population viability) ▪ Occurs within the **LAA** ▪ **Long-term** in duration (effect continues through all project phases) ▪ Reversible ▪ Occurs either **continuously** or at **multiple** times at **regular** intervals ▪ The likelihood of a residual effect of a change in behaviour of fish or marine mammals is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Economic Environment				
Changes in regional labour supply and demand	**Construction** **Operations** **Decommissioning**	▪ Work with training and educational facilities so that programs necessary to prepare regional residents for work on the Project are available. ▪ Require that all of workers complete grade 12 or have an appropriate equivalency. ▪ Develop career pathways that would allow local construction workers to transition into operational employment. ▪ Facilitate hiring and employment opportunities for RAA residents. ▪ Work with EPCC contractors to remove barriers to employment for RAA residents. ▪ Identify work packages that would be consistent with the capabilities of local and regional businesses to maximize local procurement opportunities. ▪ Work with First Nations to identify partnership or other arrangements that would increase the opportunities for their participation.	▪ The context is within a **moderate** level of resilience. ▪ **Moderate** in magnitude ▪ **Regional** in extent ▪ **Long-term** in duration ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of changes in regional labour supply and demand is **low.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Changes in cost of living and economic activity	**Construction** **Operations** **Decommissioning**	▪ Develop a project closure strategy that would reduce the adverse effects that project closure would have upon regional workers	▪ The context is within a **moderate** level of resilience. ▪ **Moderate** in magnitude ▪ **Regional** in extent ▪ **Long-term** in duration ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect is **low.**	**Not significant** With a high level of confidence
Changes to municipal government finances	**Construction** **Operations** **Decommissioning**	▪ Consultations with municipal governments will continue to monitor whether the Project is creating issues, in terms of effects on municipal finances or demands for infrastructure or services. ▪ A community investment program will be developed.	▪ The context is within a **moderate** level of resilience. ▪ **Low** in magnitude ▪ **Regional** in extent ▪ **Long-term** in duration ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of changes to municipal government finances is **low.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Navigation and Marine Resource Use				
Interference with marine navigation	**Construction** Dredging Marine construction **Operations** Marine terminal use **Decommissioning** Dismantling project infrastructure	▪ Implement a Marine Communications Plan. ▪ Establish safety zones during construction. ▪ Lighting design to reduce stray lighting. ▪ Installation of navigational aids. ▪ Updated navigational charts. ▪ Sufficient clearance (11 m above HHW) for gillnetters will be provided beneath the Lelu Island bridge and the trestle spans that best supports navigation to and from Porpoise Channel over Flora Bank. ▪ Use of escort vessels to confirm the route is clear and that other vessels do not intrude safety zones. ▪ Tugs will be used for the safe transit and docking of LNG carriers. ▪ Limits on environmental conditions under which operations can be conducted safely (visibility, day-time operations, wind) will be set. ▪ Traffic management and routing options will be assessed to determine if de-confliction of LNG carrier routes is necessary for small craft.	▪ The context is within a **low** level of disturbance. ▪ **Moderate** in magnitude ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of interference with marine navigation is **moderate.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Effects on fishing, recreation and marine use (including marine tourism)	**Construction** Dredging Marine construction **Operations** Marine terminal use Shipping **Decommissioning** Dismantling project infrastructure	▪ A Marine Communications Plan will be implemented. ▪ Sufficient clearance (11 m above HHW) for gillnetters will be provided beneath the Lelu Island bridge and the trestle spans that best supports navigation to and from Porpoise Channel over Flora Bank. ▪ Effects related to navigation (see Section 15.5.2.2) will be mitigated. ▪ Other effects related to marine resources will be mitigated (see Section 13 Marine Resources).	▪ The context is within a **moderate** level of disturbance. ▪ **Moderate** in magnitude ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of effects on fishing and recreation and marine use is **moderate.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Infrastructure and Services				
Change in traffic and pressure on transportation infrastructure	**Construction** Site preparation Onshore construction Vehicle traffic Waste management and disposal	▪ A Transportation Management Plan will be implemented to outline preferred ground transportation corridors, provide policies for the movement of loads, outline policies and procedures for the use of the Prince Rupert Airport and the Northwest Regional Airport Terrace-Kitimat, provide policies for the movement of workers, and require PNW LNG to engage in frequent communication between MOTI, RCMP, PRPA and the council members of Port Edward and Prince Rupert.	▪ The context is within a **moderate** level of resilience (infrastructure and services are able to accommodate changes with minor impacts to viability). ▪ **Low** in magnitude (effects cannot be distinguished from baseline) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of change in traffic and pressure on transportation infrastructure is **moderate.**	**Not significant** With a moderate level of confidence
Change in housing availability and affordability	**Construction** Onshore construction	▪ A camp will be used to house workers during construction. ▪ An accommodation plan will be implemented to establish communication with city and district planners in Port Edward and Prince Rupert, provide housing policies for non-local temporary workers who are not housed in the construction camp on Lelu Island, and outline camp management policies and practices.	▪ The context is within a **moderate** level of resilience (infrastructure and services are able to accommodate changes with minor impacts to viability). ▪ **Low** in magnitude (effects cannot be distinguished from baseline) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of change in housing availability and affordability is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Change in infrastructure and community services	**Construction** Onshore construction Waste management and disposal	▪ A First Nations and community training and employment strategy will be implemented that will ensure that local communities, including First Nations, have access to training and employment opportunities provided by the Project. ▪ A community crime prevention initiative between RCMP and PNW LNG will be developed ▪ A PNW LNG Project engagement plan will be implemented. ▪ An emergency response plan will be established and implemented with BC OGC, PRFR, PEFD, PRPA, and the RCMP. ▪ Mandatory awareness programs for employees will be implemented regarding fire suppression systems. ▪ Recreational facilities will be provided on site at the construction camp. ▪ Waste management, disposal, and recycling programs of construction and domestic waste will be implemented.	▪ The context is within a **high** level of resilience (infrastructure and services are well developed and able to accommodate change). ▪ **Moderate** in magnitude (a measurable change that can be accommodated elsewhere in the RAA) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of change in infrastructure and community services is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Visual Quality				
Reduction in visual quality	**Construction** Site preparation Onshore construction Dredging Marine construction **Operations** LNG facility Marine terminal use Shipping	▪ A 30 m mature vegetation buffer will be retained around Lelu Island, except at access points, and will reduce the visual impact of the Project.	▪ The context is within a **moderate** level of resilience. ▪ **High** in magnitude (a measurable change exceeds visual quality objectives) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of reduction in visual quality is **high.**	**Not significant** With a moderate level of confidence
Community Health and Well-Being				
Changes in social determinants of health	**Construction** Site preparation Onshore construction Dredging Marine construction **Operations** LNG facility Marine terminal use Shipping	▪ Provide training, employment and business opportunities. ▪ Provide an employee assistance program. ▪ Implement a vaccination policy. ▪ Enforce workplace hygiene policies. ▪ Provide contractor information sessions. ▪ Non-local construction workers will be housed in an accommodation camp.	▪ The context is within a **resilient** community. ▪ **Moderate** in magnitude (effect is measurable and will not affect quality of life) ▪ **Regional** in extent (effects extend to the RAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of changes in social determinants of health is **high.**	**Not significant** With a moderate level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Change in diet and nutrition	**Construction** Site preparation Onshore construction Marine construction Operational testing and commissioning **Operations** LNG facility Marine terminal use Shipping	▪ Mitigation measures presented in biophysical, land and marine use and human health sections of the application serve as mitigation measures reducing residual effects on change in diet and nutrition. ▪ Public awareness and informational sessions will be available.	▪ The context is within a **resilient** community. ▪ **Moderate** in magnitude (effect is measurable and will not affect quality of life) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Irreversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of change in diet and nutrition is **high.**	**Not significant** With a moderate level of confidence
Human and Ecological Health				
Change in human health	**Construction** Dredging **Operations** LNG facility Marine terminal use Shipping	See mitigations for Air Quality, Acoustic Environment, Ambient Light, and Marine Resources in Table 28-2.	▪ The context is **low** resilience due to the potential effects on sensitive receptors. ▪ **Low** in magnitude (exposures are near health-based guidelines) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of change in human health is **low.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Changes in ecological health	**Construction** Dredging **Operations** LNG facility Marine terminal use Shipping	See mitigations for Air Quality, Acoustic Environment, Ambient Light, and Marine Resources in Table 28-2.	▪ The context is of **moderate** resilience (effect occurs in a stable ecosystem and is not likely to contribute to change ecological health). ▪ **Low** in magnitude (exposures are near health-based guidelines) ▪ **Local** in extent (effects are within the LAA) ▪ **Long-term** in duration (effects last for the life of the Project) ▪ Reversible ▪ **Continuous** in frequency ▪ The likelihood of a residual effect of change in ecological health is **low.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Heritage and Archaeological Resources				
Destruction or disturbance of culturally modified trees	**Construction** Site preparation Onshore construction	▪ Systematic Data Recovery (SDR) studies for CMT sites will be conducted by systematically recording a representative sample of CMT features. ▪ Use of a Chance Find Protocol during project construction.	▪ The Project is within a largely **undisturbed** context (there negligible disturbances within the PDA). ▪ **Low/moderate** in magnitude (could be low or moderate in magnitude, depending on the archaeological context) ▪ **Local** in extent (effects are within the PDA) ▪ Effects are permanent and irreversible ▪ Occurs **once** ▪ The likelihood of a residual effect of destruction or disturbance of CMTs is **low.**	**Not significant** With a high level of confidence
Destruction or disturbance of archaeological or heritage sites	**Construction** Site preparation Onshore construction Dredging Marine construction	▪ Work affecting archaeological or heritage sites will cease until the site can be properly assessed by a professional archaeologist. ▪ Systematic Data Recovery (SDR) studies on affected heritage sites (if found). ▪ Archaeological or heritage resources of low significance may also be mitigated. ▪ Use of a Chance Find Protocol during project construction.	▪ The Project is within a largely **undisturbed** context (there negligible disturbances within the PDA). ▪ **Low/high** in magnitude (could be low or high in magnitude, depending on the archaeological context) ▪ **Local** in extent (effects are within the PDA) ▪ Effects are permanent and irreversible ▪ Occurs **once** ▪ The likelihood of a residual effect of destruction or disturbance of archaeological or heritage sites is **low.**	**Not significant** With a high level of confidence

Potential Effects	Project Phase/ Contributing Project Activity or Physical Works	Proposed Mitigation/Commitments	Residual Effects	Significance
Current Use of Land and Resources for Traditional Purposes				
Change in the use of land and resources for traditional purposes by Aboriginal people	**Construction** Site preparation Onshore construction Dredging Marine construction Disposal at sea Site clean-up and reclamation **Operations** LNG facility and supporting infrastructure on Lelu Island Marine terminal use Shipping **Decommissioning** Dismantling facility and infrastructure Dismantling of marine terminal and MOF Site clean-up and reclamation	▪ PNW LNG will make good faith efforts to negotiate impact benefit agreements. ▪ Other mitigation measures for effects on the Current Use of Land and Resources for Traditional Purposes are found in the following valued components: Vegetation and Wetland Resources, Terrestrial Wildlife and Marine Birds, Marine Resources, Navigation and Marine Resource Use, Freshwater Aquatic Resource, Human and Ecological Health, Archaeological and Heritage Resources, Air Quality, Ambient Light, Acoustic Environment, and Visual Quality.	▪ The Project is within a largely **moderately resilient** context (Aboriginal rights exercised by approximately 30-60% of community members and there is moderate interference with those rights; traditional community structures in place; some use of Aboriginal languages by community members). ▪ **Moderate** in magnitude (varies from baseline and may result in noticeable changes to traditional practices, traditional knowledge or community perceptions of traditional territory, practices or knowledge [particularly on Lelu Island and immediately surrounding waters]; moderate exacerbation of existing conditions) ▪ **Local** in extent (effects are within the LAA) ▪ Effects are **long term** (certain effects extend beyond project closure) ▪ Reversible ▪ Occurs **continuously** in frequency ▪ The likelihood of a residual effect of change in the use of lands and resources for traditional purposes by Aboriginal people is **high.**	**Not significant** With a moderate level of confidence