EAO | Environmental Assessment Office

Application Information Requirements

and

Terms of Reference

for the federal review under S.67 of *Canadian Environmental Assessment Act*, 2012

Vopak Pacific Canada Project

Proposed by:

Vopak Development Canada Inc.

July 25, 2019

Pursuant to the Environmental Assessment Act, S.B.C. 2002, c.43

BRITISH COLUMBIA

PREFACE TO THE TERMS OF REFERENCE/APPLICATION INFORMATION REQUIREMENTS

Vopak Development Canada Inc. is proposing to develop Vopak Pacific Canada (the Project), a bulk liquid storage facility near Prince Rupert, British Columbia (BC) as described in the Project Description[1]. The Prince Rupert Port Authority (PRPA), acting as a federal authority, and the BC Environmental Assessment Office (EAO), acting as a provincial authority, are coordinating an environmental review of Vopak's Project.

As the Project is proposed on federal lands, environmental effects determinations by federal authorities are required under Section 67 of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). Environmental effects determinations are based on whether the Project is likely to cause potential significant adverse effects to the environment. PRPA will coordinate the Section 67 environmental effects evaluation (EEE) process on behalf of federal authorities. Federal authorities involved in regulating the Project will each be required to make an independent environmental effects determination. These federal authorities are expected to be PRPA, Transport Canada (TC), Environment and Climate Change Canada (ECCC) and Fisheries and Oceans Canada (DFO). The federal authorities will each make a determination on the Project prior to making any decisions on additional permits.

The Project is not a designated activity as defined in *Regulations Designating Physical Activities* (Project List) under the CEAA 2012.

The Project exceeds the energy storage threshold of 3 petajoules (PJ) of stored energy. Therefore, it is subject to a provincial environmental assessment (EA) review under Part 8 of the *Reviewable Projects Regulation (BC Reg 370/02)* of the *BC Environmental Assessment Act* (BCEAA). The EAO issued a section 10 Order to the Proponent on July 26, 2018 confirming that the proposed Project requires an Environmental Assessment Certificate (EAC), pursuant to Section 10(1)(c) of BCEAA.

The purpose of this Terms of Reference (TOR) document is to establish the information that Vopak is required to provide in the EEE and the EAC Application, to be submitted to PRPA and EAO for the EA review. The TOR/AIR incorporates the provincial information requirements as specified in the EAO Application Information Requirements (AIR) template. The EEE document and EAC Application will be submitted as a single document (herein referred to as 'EEE/Application'), to both federal and provincial authorities, and will contain the information requirements as specified in this TOR/AIR.

[1] https://projects.eao.gov.bc.ca/api/document/5b61e5df9daa2a002491f1a7/fetch/Vopak_Pacific_Canada_Project_Description_dated_July_5_2018.pdf

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1 Acronyms and Abbreviations

Term	***Definition***
AIR	Application Information Requirements
BC	British Columbia
BCEAA	*BC Environmental Assessment Act*
BC ENV	BC Ministry of Environment and Climate Change Strategy
BCMCA	British Columbia Marine Conservation Analysis
CAC	Criteria Air Contaminants
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
CEPA	*Canadian Environmental Protection Act, 1999*
CMT	Culturally Modified Tree
CN	Canadian National Railway
CO	Carbon Monoxide
CPP	Clean Petroleum Products
DAS	Disposal At Sea
DFO	Fisheries and Oceans Canada
DGPS	Differential Global Positioning System
EA	Environmental Assessment
EAC	Environmental Assessment Certificate
EAO	Environmental Assessment Office
ECCC	Environment and Climate Change Canada
EED	Environmental Evaluation Determination
EEE	Environmental Effects Evaluation
GHG	Greenhouse Gas
GIS	Geographic Information System
km	Kilometre
LSA	Local Study Area
LPG	Liquefied Petroleum Gas
m	Metre
m^3	Cubic Metres
NOx	Nitrogen Oxides
PAH	Polycyclic Aromatic Hydrocarbons
PEIT	Port Emissions Inventory Tool
PJ	Petajoule
PM	Particulate Matter
PRPA	Prince Rupert Port Authority
RSA	Regional Study Area
SARA	*Species at Risk Act*
SO_2	Sulfur Dioxide
TC	Transport Canada
TEM	Terrestrial Ecosystem Mapping
The Project	Vopak Pacific Canada
TOR	Terms of Reference
VC	Valued Components
VOC	Volatile Organic Compound

TABLES OF CONCORDANCE

The EEE/Application will include a concordance table to demonstrate where the requirements in this TOR/AIR are found in the EEE/Application.

Table 1: Example Table of Concordance between TOR/AIR and EEE/Application

TOR/AIR Section & Page No.	TOR/AIR Title	TOR/AIR Section Language	EEE/Application Section Title	EEE/Application Volume Section, Sub-Section, Page Number	Relevant Appendix
Pages 22-29	Fish – Approach	The EEE/Application will include description of the study methodology used to assess potential adverse effects on fish.	Fish – Study Methodology	Volume 2 Section 4.1.2 Page 5-55	Volume 6 Appendix K

This Terms of Reference Document represents the scope of the environmental effects evaluation. Table 2 below demonstrates compliance between the sections of this TOR/AIR and the required sections in the EAO's Application Information Requirements (AIR) document which outlines scope requirements for an assessment under the BCEAA.

Table 2: Table of Concordance between AIR Template and TOR/AIR

AIR Section	AIR Title	TOR Section	TOR Section Title
1.0	Overview of Proposed Project Proponent Description	1.2	Proponent information
1.1	Description of Proposed Project	1.1, 2.1, 2.2, 2.3, 2.4, 2.5	Project Overview, Setting and Site Location, Project Components and Related Activities, Schedule, Land and Marine Use, Project Benefits
1.2	Applicable Authorizations	1.4.5	Applicable Authorizations
1.3	Project Design and/or Alternative Means of Carrying out the Project	2.6	Project Design and/or Alternatives Means of Carrying out the Project
1.4	Alternatives to the Proposed Project	2.7	Alternatives to the Project
2.0	Environmental Assessment Process	1.4, 3.0	Regulatory Context Consultation and Engagement
2.1	Provincial EA Process	1.4, 3.0	Regulatory Context, Consultation and Engagement
2.2	Federal EA Process	1.4, 3.0	Regulatory Context, Consultation and Engagement
3.0	Assessment Methodology	4	Methodology

Table 2 (Cont'd): Table of Concordance between AIR Template and TOR/AIR

AIR Section	AIR Title	TOR Section	TOR Section Title
3.1	Issues Scoping and Selection of Valued Components	4.1, 4.2	Selection of Valued Components, Scope of the Assessment
3.2	Assessment Boundaries	4.2.1, 4.2.2	Assessment Boundaries, Subcomponents and Indicators
3.3	Existing Conditions	4.3	Baseline Conditions
3.4	Potential Effects	4.4	Project Interactions and Potential Effects
3.5	Mitigation Measures	4.5	Mitigation Measures
3.6	Characterization of Residual Effects	4.6	Residual Effects Characterization and Proponent Determination of Significance
3.7	Likelihood	4.6	Residual Effects Characterization and Proponent Determination of Significance
3.8	Proponent's Determination of Significance	4.6	Residual Effects Characterization and Proponent Determination of Significance
3.9	Confidence and Risk	4.6	Residual Effects Characterization and Proponent Determination of Significance
3.10	Cumulative Effects Assessment	4.7	Cumulative Effects Assessment
3.11	Follow-up Strategy	4.8	Follow-Up Strategy
4.0	Environmental Effects Assessment	5 5.1 5.2 5.3 5.4 5.5 5.6 5.7	Effects Evaluation Air Quality and Greenhouse Gas Emissions Noise Visual Quality – Including ambient light Marine Resources Soils and Terrain Terrestrial Resources Freshwater Fish and Fish Habitat
5.0	Economic Effects Assessment	5.8	Economic Conditions
6.0	Social Effects Assessment	5.9	Social Assessment
7.0	Heritage Effects Assessment	5.10	Heritage and Archaeology
8.0	Health Effects Assessment	5.11	Human Health
9.0	Accidents and Malfunctions	6.0	Assessment of Potential Accidents and Malfunctions
10.0	Effects of the Environment on the Project	7.0	Effects of the Environment on the Project
12.0	Aboriginal Consultation	8.0	Indigenous Consultation
12.1	Aboriginal Interests	8.0	Indigenous Consultation
12.2	Other Matters of Concern to Aboriginal Groups	8.0	Indigenous Consultation
12.3	Issue Summary Table	8.0	Indigenous Consultation
13.0	Public Consultation	3.1 9.0	Consultation and Engagement – Public Consultation Public Consultation
14.0	Management Plans	10.0	Management Plans

Table 2 (Cont'd): Table of Concordance between AIR Template and TOR/AIR

AIR Section	AIR Title	TOR Section	TOR Section Title
15.0	Monitoring & Follow-up Programs	11.0	Monitoring and Follow-Up Programs
16.0	Conclusions	12.0	Conclusions
16.1	Summary of Residual Effects	12.0	Conclusions
16.2	Summary of Mitigation Measures	12.0	Conclusions
17.0	Reference Material	13.0	References
18.0	APPENDICES	--	As required

ENVIRONMENTAL EFFECTS EVALUATION SUMMARY

The EEE/Application will include the following:

- A summary of the proposed Project including the project scope, project benefits and applicable permit requirements;
- A brief overview of the EA process including project reviewability, the Project Description and TOR/AIR Phase, the EEE/Application Phase and the Determination Phase;
- A brief overview of consultation approaches with Indigenous groups, the public and government agencies to date;
- A summary of key issues raised by Indigenous groups relating to Aboriginal Interests and environmental effects related to section 5(1)(c) of CEAA 2012, including the current use of land and resources for traditional purposes;
- A summary of key adverse effects on Aboriginal Interests and mitigation measures;
- A summary of key effects, proposed mitigation measures and residual and cumulative effects on Valued Components (VCs); and
- Proponent's conclusions regarding the potential for significant adverse effects on VCs.

Part A:

1. PROJECT IDENTIFICATION

1.1. Project Overview

The Environmental Effects Evaluation (EEE)/Application (EEE/Application) will:

- Provide a brief introduction to the Project including the Project location;
- Describe the purpose of the proposed Project from the perspective of the Proponent, and identify whether the objectives of the proposed Project relate to any broader private or public sector policies, plans, or programs; and
- Discuss the relevant history of the proposed Project, including exploratory or investigative history.

Vopak Development Canada Inc. (Vopak), a wholly-owned subsidiary of Royal Vopak, is proposing to construct and operate a new bulk liquids tank storage facility in Prince Rupert, BC. The Project is proposed to be located on Ridley Island within the lands and waters under the jurisdiction of the Prince Rupert Port Authority (PRPA) (Figure 1). The Project will store Liquefied Petroleum Gas (LPG) (i.e., propane), Clean Petroleum Products (CPP) (i.e., diesel and/or gasoline), and methanol on behalf of Vopak's customers. Vopak will build the Project and manage the day-to-day operations of the bulk liquids tank storage facility. All products will be transported from various locations across Western Canada to the Project via the existing Canadian National Railway (CN) line. Customers of Vopak will be scheduling the transportation of the products to the facility and will ship the products from the Project's jetty to international markets.

The physical works and activities of the Project are located entirely on federal lands and waters administered by PRPA. The Project is being built within an area designated for port-related activities within PRPA jurisdiction. Ridley Island falls under the *Port of Prince Rupert 2020 Land Use Management Plan* (AECOM 2011), which refers to the development of a liquid bulk terminal as being a long-term prospect in the port.

1.2. Proponent Information

The EEE/Application will provide background information about Vopak, including history, type of company or organization, affiliations, the address, contact information, and a list of parties involved in the preparation of the EEE/Application.

Table 3: Proponent Contact Information

Project Name	Vopak Pacific Canada
Proponent	Vopak Development Canada Inc.
Address	444 5th Ave SW, Suite 1460 Calgary, AB T2P 2T8 www.vopak.com Project website: https://www.vopak.com/vopak-pacific-canada Project email: vopakpacificcanada@vopak.com
Project Lead	Peter Keeshan Business Development Director Email: peter.keeshan@vopak.com Phone: (403) 870 8469
Principal Contact	Marina Spahlinger Manager, Regulatory and Stakeholder Relations Email: marina.spahlinger@vopak.com Phone/Fax: (587) 355 7874

1.3. Preparation of the EEE/Application

The EEE/Application will include a list of parties involved in the preparation of the EEE/Application including their qualifications.

1.4. Regulatory Context

The EEE/Application will provide additional detail about the regulatory context and process for review of the Project, including:

- A statement that the proposed Project is subject to review under the BC *Environmental Assessment Act* (BCEAA) and *Canadian Environmental Assessment Act, 2012* (CEAA 2012), identifying the trigger(s) for the review under the regulations or provisions of BCEAA and CEAA 2012;
- A statement that the EEE/Application has been developed pursuant to the Terms of Reference (TOR)/Application Information Requirements (AIR) approved by the BC Environmental Assessment Office (EAO) and complies with relevant instructions provided in the section 11 Order and any other direction provided by PRPA and EAO; and
- A table documenting applicable milestones, including, but not limited to, issuance of section 10 and section 11 Orders, working group meetings, any public comment periods or open houses and the issuance of the TOR/AIR, including links to documents on EAO's public website.
- A list of guidance used to inform the EEE/Application including:
    - *Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012,* CEA Agency, November 2015.
    - *Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under the CEAA, 2012,* CEA Agency, December 2015.
    - *Considering Aboriginal Traditional Knowledge in Environmental Assessments conducted under CEAA 2012.*
    - *Preparing a Project Description,* BC EAO, April 2016.

- *Guidelines for the Selection of Valued Components and Assessment of Potential Effects,* BC EAO, September 2013.
- *Application Information Requirements Template,* BC EAO, August 2015.
- *Guidance for Requirements under CEAA 2012 Paragraph 5(1)(c),* BC EAO, November 2015.
- *Guidance for Requirements of CEAA Paragraphs 5(1)(a), 5(1)(b), 5(2)(a), and 5(2)(b),* BC EAO, November 2015.
- *Assessment of Effects to Section 5(1)(c),* BC EAO, August 2015.
- *Cumulative Effects and BC Environmental Assessment,* BC EAO, 2017.
- *Cumulative Effects Assessment Practitioners' Guide*, Canadian Environmental Assessment Agency, 2016: http://www.ceaa.gc.ca/.
- *Cumulative Effects Framework and Cumulative Effects Assessments*, BC EAO, February 2017.
- *Procedures for Mitigating Impacts on Environmental Values, BC EAO, May 2014.*

1.4.1. Federal Process

As the Project will be built on federal lands it will require environmental effects determinations under Section 67 of CEAA 2012:

- "67 An authority must not carry out a project on federal lands, or exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a project to be carried out, in whole or in part, on federal lands, unless:

(a) the authority determines that the carrying out of the project is not likely to cause significant adverse environmental effects; or

(b) the authority determines that the carrying out of the project is likely to cause significant adverse environmental effects and the Governor in Council decides that those effects are justified in the circumstances under subsection 69(3)."

Environmental effects on federal lands, as defined in CEAA 2012, Section 5(1)(a-c), are considered:

(a) "a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:

(i) *fish and fish habitat as defined in subsection 2(1) of the Fisheries Act;*
(ii) *aquatic species as defined in subsection 2(1) of the Species at Risk Act;*
(iii) *migratory birds as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994; and*
(iv) *any other component of the environment that is set out in Schedule 2.*

(b) a change that may be caused to the environment that would occur:

(i) *on federal lands;*
(ii) *in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out; or*
(iii) *outside Canada.*

(c) with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on:

(i) *health and socio-economic conditions;*
(ii) *physical and cultural heritage;*
(iii) *the current use of lands and resources for traditional purposes; or*
(iv) *any structure, site or thing that is of historical, archaeological, paleontological or architectural significance."*

As currently described, the Project is not defined under the CEAA 2012 *Regulations Designating Physical Activities (SOR/2012-147)*. Criteria defining physical activities under the CEAA 2012 regulations that were considered include:

14 The construction, operation, decommissioning and abandonment of a new:

(d) facility for the liquefaction, storage or regasification of liquefied natural gas, with a liquefied natural gas processing capacity of 3 000 t/day or more or a liquefied natural gas storage capacity of 55 000 t or more;
(e) petroleum storage facility with a storage capacity of 500 000 m^3 or more; or
(f) liquefied petroleum gas storage facility with a storage capacity of 100 000 m^3 or more.

24 The construction, operation, decommissioning and abandonment of a new:

(c) marine terminal designed to handle ships larger than 25 000 DWT unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation.

25 The construction, operation, decommissioning and abandonment of a new:

(a) railway line that requires a total of 32 km or more of new right of way; and
(b) railway yard with seven or more yard tracks or a total track length of 20 km or more.

The Canadian Environmental Assessment Agency (CEA Agency) and Environment and Climate Change Canada (ECCC) Minister McKenna considered the Project for referral under Section 14 of *CEAA* 2012. In a letter dated November 8, 2018, Minister McKenna confirmed that she would not designate the project for an environmental assessment under Section 14 of *CEAA* 2012. In her decision, the Minister acknowledged the ongoing efforts to consult Indigenous communities in the Prince Rupert area being carried out by the PRPA, ECCC, Fisheries and Oceans Canada (DFO), and Transport Canada (TC) to fulfill their obligations under section 67 of *CEAA* 2012, as well as the provincial environmental assessment being carried out by the British Columbia EAO. Therefore, the Project does not require an environmental assessment under Section 13 of CEAA 2012.

PRPA will coordinate the Section 67 process on behalf of federal authorities. Federal authorities involved in regulating the Project will each be required to make an independent environmental effects determination. These federal authorities are PRPA, TC, ECCC and DFO. The federal authorities will each make a determination on the Project prior to making any decisions on the permits outlined below. The EEE/Application will be prepared by Vopak following the guidance of federal authorities and using federal guidance as provided in *Projects On Federal Lands: Making a determination under section 67 of the Canadian Environmental Assessment Act, 2012,* (Canadian Environmental Assessment Agency (CEA Agency), 2014).

While the TOR/AIR provides for information to fulfill both the federal and provincial review processes, federal determinations will consider only the information provided in the EEE/Application that relates to a determination of likelihood of significant environmental effects under section 67 of CEAA 2012.

1.4.2. Provincial Process

The provincial EA process in BC is administered by the BC EAO. Projects that are considered reviewable pursuant to the BCEAA are specified in the *Reviewable Projects Regulations* (regulations).

The EEE/Application will include a statement that the proposed Project is subject to review under BCEAA and will identify the trigger(s) for the review under the Act. As currently described, the Project exceeds the energy storage threshold of 3 PJ of stored energy as specified under Part 4, Table 8 of the regulations. The Project also will require dredging of an area larger than 2 hectares of foreshore or submerged land, which exceeds the shoreline modification threshold specified under Part 5, Table 9 of the regulations.

An assessment pursuant to the BCEAA supports a process for identifying and evaluating the potential adverse environmental, economic, social, heritage, and health effects that may occur during the life of a reviewable project. The Provincial Minister of Environment and Climate Change Strategy and the Minister of Energy, Mines & Petroleum Resources will be the decision makers for the Project's environmental assessment.

1.4.3. Coordinated Environmental Assessment Process

The EEE/Application will describe the coordinated EA review process by PRPA and EAO.

1.4.4. List of Reviewing Agencies

The following government agencies, Indigenous Groups and the public will have had the opportunity to review and comment on the draft TOR/AIR:

Federal Agencies:

- Prince Rupert Port Authority;
- Department of Fisheries and Oceans Canada;
- Transport Canada;
- Environment and Climate Change Canada; and
- Health Canada.

Provincial Agencies:

- Climate Action Secretariat;
- Ministry of Environment and Climate Change Strategy;
- Ministry of Energy, Mines and Petroleum Resources;
- Ministry of Forests, Lands and Natural Resource Operations and Rural Development;
- Ministry of Transportation and Infrastructure;
- Northern Health; and
- BC EAO.

Local Governments:

- City of Prince Rupert;
- District of Port Edward; and
- North Coast Regional District.

Indigenous Groups:

- Lax Kw'alaams;
- Metlakatla;
- Kitselas;
- Kitsumkalum;
- Gitxaala; and
- Gitga'at

1.4.5. Applicable Authorizations

The EEE/Application will include a list of applicable licenses, permits and/or approvals that are already received or required for the phases of the proposed Project, and the associated responsible regulatory body.

Federal permitting authorities will be required to make environmental effects determinations on the significance of the Project's effects prior to making any decisions on the below permits.

Provincial permit needs will be included in the EEE/Application should any be identified. Currently no provincial permits have been identified as required due to the Project's location within federal jurisdiction.

Identified list of required authorizations, to the extent that is known at the time, is available below in Table 4.

Table 4: Applicable Authorizations

Permit, Notification or Approval	Regulator	Description
PRPA Lease Agreement under the *Canada Marine Act*	PRPA	Lease to occupy and use PRPA-administered lands.
Approval under *Navigation Protection Act* (NPA)	TC	Approval for the construction of Project components that would impact navigation (marine facility, dredging, etc.).
Authorization under *Fisheries Act*	DFO	Marine-based activities and infrastructure causing disturbance or loss of fish habitat in the marine environment require an Authorization from DFO.
Disposal at Sea (DAS) permit under *Canadian Environmental Protection Act*	ECCC	Permit authorizing disposal of excavated or dredged material at sea.
Section 79 notification under Species at Risk Act	The competent minister (e.g., DFO, ECCC)	The proponent will notify the competent minister without delay if any critical habitat or listed species are identified likely to be affected by the Project prior to the competent minister making its determination on the Project under Section 67 of CEAA 2012.
Section 73 permit under *Species at Risk Act*	The competent minister (e.g., DFO, ECCC)	Permit authorizing activities affecting a threatened or endangered species, any part of its critical habitat or the residences of its individuals.
Environmental Assessment Certificate	BC EAO	Approval of a designated project pursuant to BCEAA.
Environmental Effects Determinations	PRPA, TC, ECCC, DFO	Environmental Effects Determination under Section 67 of CEAA 2012.

2. PROJECT DESCRIPTION

The EEE/Application will summarize the scope of the Project as defined in the Project Description (Vopak, 2018).

2.1. Setting and Site Location

The EEE/Application will provide a brief description of the Project, including:

- Location, including geographic coordinates, with maps showing both regional context and specific location of the Project.
- Ownership/jurisdiction of Ridley Island and Coast Island.
- Describe the location of the proposed Project relative to Indigenous groups' traditional territories.

2.2. Project Components and Related Activities

The EEE/Application will include details regarding the physical components and related activities at each phase (i.e., construction, operations and decommissioning) of the Project, including figures of on-site and off-site components. The physical components and related activities identified within this section of the EEE/Application will support the assessment of potential effects on relevant VCs.

The scope of the Project includes the receiving and unloading of customer products from CN rail cars on six rail tracks into the Project's rail unloading area and into Project storage facilities. From the storage facilities the product is loaded via pipeline along the Project's jetty to a berthed ship ready to take the products to their final destination. The Project includes all physical works and activities associated with the construction, operation and decommissioning of the bulk liquids storage facility, the jetty and supporting infrastructure. The physical works and activities are located entirely on federal lands and waters, administered by PRPA.

2.2.1. Project Components

The EEE/Application will include a description of Project components similar to those described in the Project Description:

Table 5: Project Components

Component Category	Project Components
Bulk liquids tank storage facility	• Up to 50 rail car unloading racks along the PRPA Road Railway Utility Corridor; • Gas generators capable of producing up to 2.7 megawatt of electrical power combined for LPG cooling; • LPG cooling equipment and de-ethanizer; • Emergency ground flare; • Six pressurized LPG bullets of 1,000 cubic metres (m^3) each; • One full containment LPG storage tank of 90,000 m^3; • Carbon steel storage tanks (CPP: 2 tanks at 40,000 m^3 and 6 tanks at 30,000 m^3, Methanol: 4 tanks at 40,000m^3 and 2 tanks at 30,000 m^3); and • Process control and safety systems.

Table 5 (Cont'd): Project Components

Component Category	Project Components
Jetty	• A 200 metre (m) long causeway; • A 800 m long trestle; • A pipe rack for the insulated pipelines for products and utilities; • Two berths for vessels up to 85,000 m^3 capacity (80,000 dead weight tonnes); • Two loading platforms including all required equipment and systems; and • One auxiliary platform for the firewater pump house, spill boom shed and electrical building.
Supporting Infrastructure	• Roads and car parking; • Drainage and wastewater treatment system; • Nitrogen for safety and maintenance purposes; • Office including central control room, maintenance and utilities buildings; • Electrical substation and connection to the BC Hydro grid; and • Natural gas connection to Pacific Northern Gas for compressors, gas generators and heating of buildings.

2.2.2. Construction Activities

The EEE/Application will provide a description of Project activities during construction including worker accommodation and transportation to and from site. The anticipated construction activities will include:

- Site clearing and grading;
- Construction of Project facilities on land (civil, mechanical and electrical and instrumental work);
- Construction of marine jetty and berths, including dredging;
- Disposal of surplus organics, waste rock and dredge material, including transit to and from the disposal site;
- Post-construction clean-up and on-site ground reclamation; and
- Commissioning.

2.2.3. Operation Activities

The EEE/Application will provide a description of Project activities and workforce accommodation and transportation to and from site during operation. Activities during operations include:

- Railway operations associated with Project inbound train unloading and outbound train staging within the Port of Prince Rupert;
- LPG cooling process;
- Product storage;
- Vessel berthing;
- Cargo loading;
- General terminal operations; and
- Associated off-site shipping activities along the marine access route between the Project marine berths and the pilot boarding area near Triple Island.

Routine inspections and maintenance of all systems will be completed on an ongoing basis, including:

- Maintenance of equipment to ensure safe and reliable operations;
- Inspection of equipment and facilities to ensure mechanical integrity is maintained; and
- Inspection and maintenance of safety, civil structures and environmental monitoring devices.

Associated off-site shipping and rail activities will be the responsibility of Vopak's customers and within the care of the infrastructure service providers. A description of the known infrastructure service providers related to off-site shipping and rail activities will be provided in the EEE/Application.

2.2.4. Decommissioning Activities

The EEE/Application will provide a description of Project activities during decommissioning. Activities during decommissioning include:

- Cleaning of tanks and infrastructure;
- Removal of tanks and infrastructure;
- Removal of buildings and utilities infrastructure;
- Removal of jetty topside (jetty structure itself is expected to remain); and
- Soil sampling and soil remediation if required.

2.3. Schedule

The EEE/Application will provide a schedule of activities for all phases of the Project.

- Construction – Two years;
- Operation – Minimum of 50 years; and
- Decommissioning – 12 months.

2.4. Land and Marine Use

The EEE/Application will summarize existing and planned land and marine use that overlaps or may be potentially impacted by the Project components and activities, including:

- Land ownership e.g., private land, provincial land, federal land (including Indian Reserves);
- Provincial, Federal, Indigenous land or marine use plans (e.g., Land and Resource Management Plans) and provincial, federal or Indigenous land use designations and provincial, federal or Indigenous land/marine use management objectives;
- Local government zoning or plans;
- Tenures (municipal, provincial, federal), licenses, permits or other authorizations;
- Non-tenured current land uses;
- Current and planned marine use plans;
- Federal land use plans (e.g., PRPA Land Use Management Plan);
- Other development or activities, whether or not directly related to the Project;
- Maps showing location of other uses referenced above in relation to the Project; and
- References to the EEE/Application section that assesses land/marine use and potential overlaps/impacts in more detail.

2.5. Project Benefits

The EEE/Application will describe the Project's economic benefits.

- Capital construction cost estimates, including:
    - Breakdown of costs (e.g. land, buildings, equipment) associated with the Project;
    - Estimated operating costs over the life of the Project, including breakdown of costs by category (e.g., labour, supplies and materials, administration); and
    - Estimated costs for decommissioning/closure/abandonment/reclamation.
- Employment estimates including:
    - Direct employment to be created, by job category by Project phase, in number of person year jobs for construction and decommissioning and full-time equivalent jobs for operations. Direct employment estimates will be broken down into full-time, part-time and seasonal job categories;
    - Average wages, by major job category, for the construction and operating periods;
    - Breakdown of jobs that will be filled from local, provincial, national or international labour markets;
    - Employment and training opportunities for Indigenous and non-Indigenous people;
    - Indirect and induced employment to be generated, by Project phase; and
    - Information about an employment strategy, if any.
- Contractor supply services estimates including:
    - List of the major types of businesses/contractors to be used, broken down at the local, provincial, and national level, by Project phase;
    - Value of supply of service contracts expected, by Project phase;
    - Information about a local purchasing strategy, if any;
- Annual government revenues, by type (e.g., income tax, license rent, property tax) and jurisdiction (e.g., local, provincial, federal), for the phases of the Project;
- Benefits the project may have on either environment, economic, social, health, or heritage components;
- Canadian dollar estimates will be provided in real dollars, with an explanation of how they are measured (e.g., discount rates); and
- Assumptions and references for the above information will be stated.

The Project Benefits assessment will address uncertainty in the above listed benefits estimated by:

- Identifying and considering the range of potential benefits, and establishing as much as possible the likelihood of these benefits;
- Sensitivity and/or scenario analysis as part of quantitative modeling;
- Reasoned argumentation to justify input parameters for quantitative modeling; and
- Consideration and discussion of factors that may affect (enhance or limit) potential benefits.

2.6. Project Design and/or Alternative Means of Carrying out the Project

The EEE/Application will include:

- An assessment of the alternative means of carrying out the Project that are technically and economically feasible;
- The rationale and criteria used to select the proposed means of undertaking the Project; and
- Specific alternatives already considered (e.g., components and activities that will be considered in the EEE/Application).
- Vopak has been, and will be evaluating a number of alternative designs and technologies (collectively referred to as the “alternative means”) for the proposed Project, including;
- Orientations for the onsite facilities;
- Jetty location and structure;
- Alternative energy sources; and
- Disposal of marine sediments.

Initial criteria used to evaluate these alternatives will include:

- Technical requirements to construct and operate the Project;
- Geotechnical and geophysical properties of the land and marine site including seismic data;
- Feedback received from Indigenous Groups, including feedback related to Aboriginal Interests;
- Economic feasibility of alternative technologies for construction and operation of the Project;
- Minimizing or avoiding impacts to human health as well as feedback received from local communities;
- Reducing adverse effects on environmental and heritage resources; and
- Industry safety standards and regulatory requirements.

2.7. Alternatives to the Project

The EEE/Application will include an assessment of the alternatives to the Project that were technically and economically feasible including, but not limited to, the alternatives identified in this TOR/AIR.

3. CONSULTATION AND ENGAGEMENT

The EEE/Application will summarize the consultation and engagement activities undertaken to date and/or planned by Vopak with the public, Indigenous groups, and government agencies regarding the Project's potential to cause adverse environmental effects.

3.1. Public Consultation

The scope of engagement with the public and stakeholders will be described in the EEE/Application, including a summary of public participation in the EEE/Application process, a list of the key issues raised, and the status of issue resolution (with cross-references, as appropriate, to other sections of the EEE/Application that deal further with consultation and issues raised).

3.2. Indigenous Consultation

The scope of engagement with Indigenous groups will be described, separately for each individual group, including a summary of their participation and a list of the key issues raised by each party and the status of issue resolution. A more in depth assessment of Indigenous consultation and effects on rights and interests is included in Section 8 of the TOR/AIR.

3.3. Regulatory Engagement

The scope of engagement with regulatory agencies will be described, including a summary of their participation and a list of the key issues raised by each party and the status of issue resolution.

4. METHODOLOGY

The EEE/Application will present additional details regarding the effects assessment methodology used. The approach used in this EEE/Application is consistent with the CEAA 2012 principle of ensuring that the primary effort and analysis of an EA is focused on the components of the Project most likely to yield residual adverse effects. The EEE/Application will also draw on principles that guide BC environmental assessments.

The methodology used in this EEE/Application is consistent with guidance from the CEA Agency (2014), "*Projects on Federal Lands: Making a determination under section 67 of the CEAA 2012*" and the EAO (2013), "*Guideline for the Selection of Valued Components and Assessment of Potential Effects,*" in addition to current best practices for EAs in BC and Canada and guidance listed in Section 1.4 of this TOR/AIR. This will include establishing the existing conditions of the study areas as the baseline, selection of final Valued Components (VCs), characterization of project effects and interactions, identification of effects associated with accidents and malfunctions, identifying effective and established mitigation measures, determining residual effects after applying mitigation, and assessment of cumulative effects.

Ridley Island and the area have been recently subject to several large-scale and detailed EAs conducted for nearby projects. The EEE/Application will incorporate available information from several key existing EAs, including but not limited to:

- Ridley Island Propane Export Terminal – Environmental Effects Document. 2016.
- Proposed Prince Rupert LNG Facility – Application Information Requirements for an Environmental Assessment Certificate. 2014.
- Summary of the Environmental Impact Statement and EA for Pacific Northwest LNG. 2014.
- Bulk Liquids Project. Worley Parsons for RTI. 2013 (EA not completed – studies used for reference herein).
- Marine Berth Expansion Project. Worley Parsons for RTI. 2013 (EA not completed – studies used for reference herein).
- Environmental Impact Statement and Technical Data Reports – Canpotex Potash Export Terminal and Ridley Island Road, Rail, and Utility Corridor. 2011.
- EA Document – Sulphur Forming, Handling and Storage Facility, Ridley Island, BC. 2007 C, February 2007.
- Phase II Environmental Site Assessment, Ridley Island, Prince Rupert, BC. Dillon Consulting Ltd for Transport Canada, March 31, 2004.
- Sulphur Export Terminal at Ridley Terminals, Ridley Island, Prince Rupert – Environmental Appraisal Document. Sulphur Corp of Canada, March 1999.
- Onshore Geotechnical Investigation, Ridley Island, BC, Canpotex Terminals Ltd., October 2009.

Vopak will incorporate, as appropriate (i.e., non-confidential information), information received from Indigenous groups through engagement. Traditional Knowledge and Current Use information will inform the effects assessment of all Project VCs, when available.

4.1. Selection of Valued Components

The EEE/Application will summarize the process and methodologies used to identify and select the VCs for assessment. The Application will also include the rationale for any differences in the list of VCs presented in the EEE/Application from those listed in the final TOR/AIR.

VCs are components of the biophysical and socio-economic environments that are considered by Vopak, the public, Indigenous groups, government agencies, and other stakeholders involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, or historical importance (CEA Agency 2014 and 2015; EAO 2013).

The assessment will describe the three-step process used to select the VCs:

1. Issues scoping (including: a literature review, public, Indigenous groups, and regulatory agency engagement);
2. Evaluation of candidate VCs; and
3. Selection of final VCs, including identification of indicators for assessment.

VCs will be selected to be **relevant** to the Project, **representative** of the important features of the natural and human environment likely to be affected by the Project, **responsive** (i.e., sensitive) to the potential effects of the project, **concise** (so the nature of the project-VC interaction can be understood, while avoiding overlapping or redundant analysis), and taken together, **complete** to enable a full understanding of the important potential environmental, economic, social, heritage, and health effects of the Project (EAO 2013).

A list of candidate VCs are summarized in Table 6 below. The table also includes candidate VCs that were scoped out of the assessment, including the rationale.

Table 6: List of Candidate Valued Components and Rationale for Selection

Valued Component	Subcomponent	Rationale
Air Quality	--	• Potential interaction of the Project including emissions of Criteria Air Contaminants (CACs).
Greenhouse Gas Emissions	--	• Project-related emissions of GHGs are relevant and of concern with respect to provincial and federal contributions to GHG targets.
Noise	--	• Potential disturbance to nearby sensitive receptors.
Visual Quality - including Ambient Light	Visual Quality	• Existing viewscape from marine side may be altered.
	Ambient Light	• Lighting related to the Project may increase sky glow. • Lighting related to the Project may disturb or interrupt wildlife and marine life along jetty.

Table 6 (Cont'd): List of Candidate Valued Components and Rationale for Selection

Valued Component	Subcomponent	Rationale
Marine Resources	Marine Habitat	• The Marine Resources VC was selected as an umbrella for several marine-related subcomponents commonly regarded in other EAs as important values for the public, Indigenous groups, federal and provincial regulators. • Several federal acts have provisions for the protection of resources related to the marine environment, including fauna and habitat. • Marine water and sediment quality selected due to potential contamination of nearby sediment.
	Marine Water Quality	
	Marine Sediment Quality	
	Marine Fish and Invertebrates	
	Marine Mammals	• Marine mammals selected to focus the VC assessment on Project-related effects on marine mammals and potential effects of underwater noise.
	Marine Birds (including migratory and species at risk)	• Several pieces of federal legislation provides protection for marine bird species (*Migratory Bird Convention Act, Species at Risk Act*). • Marine birds are considered to be of value for stakeholders and communities.
Terrestrial Resources	Wildlife and Wildlife Habitat, (including non-marine birds, migratory birds, and Species at Risk)	• Terrestrial Resources are considered to be of value for several stakeholders and communities because of mandated protection legislation, values placed on preservation of natural environments (e.g., wetland function), and recreation and hunting values. Certain species are considered to be of traditional or cultural importance for Indigenous groups. • Certain species are legally protected under legislation, i.e., species at risk, such as little brown myotis bat (*Myotis lucifugus*). • Wetlands are identified as important ecological communities and provide important ecosystem functions.
	Vegetation (including rare vascular plants, rare non-vascular plants, and rare lichens)	
	Wetlands and Wetland Function	
Soils and Terrain	Soils and Terrain	• The Soils and Terrain VC is proposed because potential changes to soil and terrain may have effects on other VCs (e.g., loss of permeability, habitat loss).
Freshwater Fish and Fish Habitat	Ground and Surface Water Quality	• Freshwater Fish and Fish Habitat was selected to represent several related components of freshwater aquatic habitat. The quality of surface and groundwater has the potential to affect habitat for receptors such as fish and other fauna. These subcomponents of freshwater resources support an understanding for the environmental setting of the Project.
	Freshwater Fish	

Table 6 (Cont'd): List of Candidate Valued Components and Rationale for Selection

Valued Component	Subcomponent	Rationale
Economic Conditions	--	• Project demands for labour and other inputs may have economic effects locally and regionally, such as competition for labour, goods, and services, with potential effects on existing employers and customers. • Project demand for housing and other local inputs may increase locals' cost of living, though Project economic effects may improve local income levels and overall financial well-being.
Marine Use and Navigation	--	• Project components have the potential to interfere with navigation and other commercial, recreational and traditional marine uses. Project-related effects will focus on: o Fishing, recreation and marine use and o Interference with navigation.
Community Infrastructure and Services, including Accommodations	--	• Workers associated with the construction, operations and decommissioning of the proposed facility may increase the demand on existing infrastructure health care services and local accommodation via an increase in local workforce and families (i.e., temporary and/or permanent human populations). The effects of the work camp will also be assessed here.
Community Well-being	--	• Concerns related to potential Project-related effects on social determinants of health.
Heritage and Archaeology	--	• Archaeological sites have been identified on Ridley Island; therefore, archaeology has been identified as a VC to be considered for this Project.
Human Health	--	• Air quality, noise, water and sediment quality, and lighting have been considered in other EAs as important to the health of nearby residents and workers; and • Results of the marine sediment assessment will provide the basis for assessing potential Project-related effects to human health from contaminated marine foods.
Excluded VC: Land and Resource Use		• Land Use on Ridley Island is captured within the Port of Prince Rupert 2020 Land Use Management Plan, which was subject to public consultation. The land is designated for industrial. • No current access to the land is permitted for public or Indigenous use.

4.2. Scope of the Assessment

VCs without subcomponents and VC subcomponents will be presented and assessed as per the following methodology. The term VC is used subsequently to capture both VCs and subcomponents.

For each identified VC the following information and methodology is summarized in this document:

- Scope of the assessment: including assessment boundaries, subcomponents of the VC and measurable indicators to be used to assess change;
- Regulatory guidelines and legislation relevant to the management of the VC;
- Existing information sources;
- Proposed field and desktop studies;
- Project interactions and potential effects summary;
- Mitigation measures;
- Residual effects characterization; and
- Cumulative effects assessment.

4.2.1. Assessment Boundaries

The EEE/Application will include a definition of the spatial and temporal boundaries, and where applicable the relevant administrative and technical boundaries, for the effects assessment for each VC.

4.2.1.1. Spatial Boundaries

Spatial boundaries defined for the scope of the assessment encompass the areas within which the Project is expected to have potential effects on each VC. For each VC a Local Study Area (LSA) and Regional Study Area (RSA) will be defined. The LSA comprises of an area within which the potential Project-related effects are expected to occur, often considered the Project's zone of influence where direct Project interactions with VCs are expected. The RSA is a study area that provides context to the VC at a regional level. The RSA boundary is used to define the scope of the cumulative effects assessment.

The EEE/Application will include a map figure and description of the spatial assessment area for each VC. The VC boundaries will be relevant to its respective VC assessment to sufficiently capture potential Project-related effects.

4.2.1.2. Temporal Boundaries

The potential effects specific to the Project are based on the three main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months- Decommissioning Phase (if required and appropriate).

4.2.2. Subcomponents and Indicators

The EEE/Application will introduce subcomponents of the VCs, the indicators to be used for the VC assessment, and other linked VCs that form part of the pathway of effects.

'Indicators' are metrics that will be used to measure and report on the condition of a VC in order to demonstrate change from current condition to expected condition with the Project. Indicators that will be used to measure change for each VC assessment are presented within each VC section in Section 5.

'Linked VCs' represent VC assessments that can be informed by, or inform the assessment of other VCs. For example, Project-related changes to marine water quality represents a pathway of effects to other VCs such as marine fish or marine mammals.

4.2.3. Regulatory Context

The EEE/Application will include the relevant guidelines and legislation, as listed in Section 5 for each VC, used in the regulation of each VC and to inform or guide the assessment.

4.3. Baseline Conditions

The EEE/Application will describe the existing conditions for each selected VC within the Project area. The following information will be included for each selected VC:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed. Whether the existing conditions of the particular VC at the site have been well documented by existing and proposed projects in the area, and the EEE/Application will reference those existing reports wherever possible. Additional studies conducted, when required, to define the existing conditions will be described.
- A description of baseline conditions within the study area in sufficient detail to enable potential Project-VC interactions to be identified, understood, and assessed.
- Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage, and health setting, irrespective of the changes that may occur as a result of the Project or other project and/or activities in the area.
- An explanation of whether and how other past and present projects and activities in the study area have affected or are affecting each VC.
- Description of what Traditional Ecological Knowledge (TEK), including Indigenous Traditional Knowledge, was used in the VC assessment.
- A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities.
- Where additional project and VC-specific field studies are conducted, the scope and methods to be used will follow published documents pertaining to data collection and analysis methods, where these are available. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the EEE/Application.
- The EEE/Application will contain the existing (or baseline) technical reports in the Appendices and will summarize key findings contained in these technical reports directly in the EEE/Application, in a manner that allows the reader to understand each VC's effects assessment.

4.4. Project Interactions and Potential Effects

The EEE/Application will identify Project effects on the existing conditions for each VC within the relevant Project study boundaries.

For each VC section, the EEE/Application will:

- Identify the potential interactions of the proposed Project and the considered and selected VCs;
- Identify and describe the potential adverse effects resulting from the proposed Project; and
- Demonstrate how feedback from Indigenous groups, the public, stakeholders and government agencies on VC selection and assessment was incorporated, as appropriate.

The EEE/Application will identify any project activity-VC interactions that were excluded from further assessment, including the methods and criteria used to justify the exclusion and input received from EAO, government agencies, Indigenous groups and the public regarding the exclusion.

A project interaction table will be developed for each VC. The table will identify the anticipated interactions between Project construction, operation, or decommissioning activities and each VC. Table 7 below identifies preliminary Project interactions with identified VCs. Potential effects related to the identified interactions will be described in the EEE/Application.

Interactions with potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application as per the requirements in Section 6 of this TOR/AIR.

Project interactions and potential effects on Aboriginal Interests will be identified and assessed in Section 8 of the EEE/Application as per the requirements of Section 8 of this TOR/AIR.

In any instances where federal and provincial spatial boundaries vary for a VC, the EEE/Application will include a summary of whether and how the environmental effects assessment would differ based on the federal spatial boundary.

Table 7: Preliminary Project Interactions Table

Project Activity and Physical Works	Valued Components													
	Air Quality	GHG Emissions	Noise	Visual Quality and Ambient Light	Terrestrial Resources	Marine Resources	Freshwater Fish and Fish Habitat	Soils and Terrain	Archaeology and Heritage Resources	Economic Conditions	Community Infrastructure and Services	Community Well-being	Marine Use and Navigation	Human Health
Construction														
Site clearing including, soil storage (approximately 30 hectares)	x	x	x	x	x	x	x	x	x	x	x	x		x
Construction road traffic	x	x			x					x	x	x		x
Site grading, including blasting, and fill	x	x	x	x	x	x	x	x	x	x	x	x		x
Construction of project facilities on land (civil, mechanical and electrical & instrumental work)	x	x	x	x	x		x	x		x	x	x		x
Construction of marine jetty and berths	x	x	x	x	x	x		x	x	x	x	x	x	x
Dredge and disposal of dredgeate	x	x	x			x			x	x	x	x	x	x
Reclamation and clean up			x		x	x		x	x	x	x	x		
Commissioning, systems testing, including hydrotesting						x	x			x	x	x		x
Potential accidents and malfunctions	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations														
Railway operations associated with inbound train unloading and outbound train staging	x	x	x	x	x					x	x	x		x
LPG cooling process	x	x	x		x					x	x	x		x
Product storage	x	x	x	x						x	x	x		x
Vessel berthing	x	x	x	x	x	x				x	x	x	x	x
Cargo loading	x	x	x		x	x				x	x	x		x
General terminal operations (24 hours, 365 days) (power, lighting, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	x	x	x	x	x	x	x			x	x	x		x
Routine maintenance and inspections	x	x	x		x					x	x	x		x
Associated off-site rail and shipping activities[2]	x	x	x	x	x	x				x	x	x	x	x
Potential accidents and malfunctions	x	x	x	x	x	x	x	x	x	x	x	x	x	x

[2] The section 11 Order defines associated off-site shipping and rail activities as: “The operation of vessels and other supporting marine traffic along the marine access route between the marine terminal and the pilot boarding location at or near Triple Island; and the operation of rail tracks used by the proposed Project within the Port of Prince Rupert.” The scope of the federal assessment includes rail loading and unloading activities within the administrative boundaries of the PRPA and shipping activities associated with the terminal operation within the administrative boundaries of the PRPA.

Table 7 (Cont'd): Preliminary Project Interactions Table

Project Activity and Physical Works	Valued Components													
	Air Quality	GHG Emissions	Noise	Visual Quality and Ambient Light	Terrestrial Resources	Marine Resources	Freshwater Fish and Fish Habitat	Soils and Terrain	Archaeology and Heritage Resources	Economic Conditions	Community Infrastructure and Services	Community Well-being	Marine Use and Navigation	Human Health
Decommissioning														
Cleaning of tanks and infrastructure					x			x		x	x	x		
Removal of tanks and infrastructure	x	x	x	x	x					x	x	x		x
Removal of buildings and utilities infrastructure	x	x	x	x	x					x	x	x		x
Removal of jetty topside	x	x	x	x	x	x				x	x	x	x	x
Soil sampling and soil remediation if required					x		x	x		x	x	x		x
Potential accidents and malfunctions	x	x	x	x	x	x	x	x	x	x	x	x	x	x

KEY:
x=Potential adverse effect requiring mitigation, carried forward to effects assessment.

4.5. Mitigation Measures

For the EEE/Application, mitigation measures will be developed as appropriate to address the potential effects identified above. *CEAA 2012* defines mitigation measure[s] as "measure for the elimination, reduction or control of adverse environmental effects". Under BCEAA, mitigation refers to "practical means of preventing or reducing to an acceptable level of any potential adverse effects of the project."

For each VC, the assessment will:

- Describe the approach to identify and analyze mitigation measures, including any management and compensation plans proposed by the Proponent, which will be implemented to address potential effects;
- Describe the mitigation measures incorporated into the project, including site and route selection, project scheduling, project design (e.g., equipment selection, placement, emissions abatement measures), and construction and operation procedures and practices;
- Describe any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices;
- Clearly indicate how the mitigation measures will mitigate the potential adverse effects on the VC;
- Provide the rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible, and the need for and scope of any proposed compensation or offset;
- Evaluate the anticipated success of each mitigation measure and describe rationale and analysis for these evaluations. If there is little relevant/applicable experience with a proposed mitigation measure and there may be some question as to its effectiveness, describe the potential risks and uncertainties associated with use of the mitigation;
- Include the time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility; and
- Summarize the mitigation measures for potential Project effects by project phase and identify any mitigation measures that are in management or compensation plans.

Mitigations will be summarized along with the potential Project-related effect in a Table format shown below in Table 8. Where the application of mitigation does not eliminate a Project effect, a residual effect will be identified with a Y (Yes) and carried forward to be characterized as presented in section 4.6.

Table 8: Table Format - Summary of Potential Project-related Effects and Mitigation

Potential Effect	Proposed Mitigation	Potential Residual Effect? (Y/N)
Construction		
Operations		
Decommissioning		

4.6. Residual Effects Characterization and Proponents Determination of Significance

4.6.1. Residual Effects Characterization

The potential residual effects identified in Table 8 will be characterized using the metrics summarized in Table 9 for each VC. Ultimately, the project-VC interactions identified with the potential for significant adverse effects will be clearly described in sufficient detail to enable a non-technical reviewer to understand the cause, type, and nature of the potential effects.

The EEE/Application will describe, in a table format, the residual effects using the residual effects criteria context, magnitude, extent, duration, reversibility, and frequency, as defined in EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects. Where feasible, these criteria will be described quantitatively in the EEE/Application for each VC. When residual effects cannot be characterized quantitatively, the Application will characterize these effects qualitatively. Definitions will be provided when qualitative terms are used.

The use of any qualitative terms (e.g., high, moderate, low, etc.) will be accompanied by distinct definitions for each of these rankings. An explanation will be included for the conclusion reached for each criterion used to characterize a residual effect.

When residual effects on a VC are determined and the VC is also considered a "pathway" for other potential effects on other VCs, the EEE/Application will identify the linkages between the VCs and the discipline-specific studies to which the information has been forwarded for further evaluation.

Table 9: Criteria for the Characterization of Residual Effects

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	Defined on a VC specific basis – see individual VC assessment sections for definition
Extent	Spatial scale over which the residual effect is expected to occur	Defined on a VC specific basis. • Site-specific; • Local; and • Regional.
Duration	Length of time over which the residual effect is expected to persist	Definitions vary by VC, taking into account VC-specific temporal cases: • short term; • long term; and • permanent.
Frequency	How often the residual effect is expected to occur	Definitions vary by VC, taking into account VC-specific temporal cases: • rare/once; • infrequent; • frequent; and • continuous.
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	• fully reversible; • partially reversible; and • irreversible.
Context	Sensitivity and resilience of the VC to Project-related change.	Defined on a VC specific basis and draws on the existing conditions

The characterization and assessment of potential residual Project effects will be based on professional judgement, discussion with the Project's Technical Working Group including, federal and provincial authorities, input gathered through consultation with potentially affected Indigenous groups, previously documented interactions of other projects, and will consider the likelihood of occurrence, the level of consequence, and the significance of the residual effect.

Proposed criteria and significance thresholds are defined for each VC in the individual VC sections of this document.

4.6.2. Likelihood

The EEE/Application will assess the likelihood for all residual adverse effects using appropriate quantitative or qualitative terms and sufficient description to understand how the conclusions were reached. Definitions of any qualitative terms, such as 'low', 'moderate', or 'high' probability will be provided for each VC assessment.

4.6.3. Proponent's Determination of Significance

The EEE/Application will present the process and methodology used to define and evaluate the significance of residual effects, including how the term "significance" has been used in relation to each VC using available quantitative and qualitative thresholds (CEA Agency 2015; EAO 2013).

For the EEE/Application, Vopak will make its own determination of the significance of the potential residual effect for each VC, including consideration of likelihood of the effect, confidence in the assessments prediction of the effect and the associated risk (i.e., likelihood x consequence) of the effect.

A conclusion of significance of residual adverse effects will be provided for each VC.

4.6.4. Confidence and Risk

The EEE/Application will summarize the process and methodology used to evaluate the levels of confidence associated with residual effects predictions and in particular, how any identified uncertainty may affect either the likelihood or the significance of the predicted residual effect. The EEE/Application will also describe any measures to reduce uncertainty through monitoring, adaptive management or other follow-up programs.

The EEE/Application will summarize the process and methodology used to determine if additional risk analysis is required. If additional risk analysis is required, the EEE/Application will summarize the process and methodology used for this analysis and the conclusions, including the range of likely, plausible and possible outcomes with respect to likelihood and significance.

For each identified residual effect, Vopak will summarize the characterization and determination of significance in a table as exampled below in Table 10.

Table 10: Table Format – Summary of Residual Effect Characterization Related to <identified residual effect X>

Criteria	Rating	Rationale
Magnitude		
Extent		
Duration		
Frequency		
Reversibility		
Proponents Determination of Significance		
Likelihood		
Significance		
Confidence		

4.7. Cumulative Effects Assessment

The EEE/Application will include a cumulative effects assessment. The EEE/Application will summarize the process and methodology used to conduct a cumulative effects assessment, including the identification of potential cumulative effects, identification of additional mitigation measures, and evaluation of (residual) cumulative effects and determination of significance using the same methodology described in the assessment for the residual effects in section 4.4 through 4.6 above. The cumulative effects assessment will be conducted in conformance with BC EAO and CEA Agency guidelines, including those listed in Section 1.4.1 of this document.

The EEE/Application will describe the methodology for identifying potential interactions between residual project effects and the effects of other developments, including a description of the following:

- The spatial boundaries for the cumulative effects assessment for each VC, including maps;
- The spatial and temporal boundaries of other developments; and
- The potential for interaction (spatial and temporal) and linkages (overlap) of VCs with other developments.

The EEE/Application will include:

- A table of all past, present and reasonably foreseeable developments that will be included in the cumulative effects assessment, should one be required for a particular VC;
- A general description of the information sources used to identify reasonably foreseeable developments and activities; and
- A map showing the location of the projects and activities.

The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities within the regional assessment boundaries as defined for each VC.

The following is a list of currently operating projects or activities near the Project area. These include the following:

- Fairview Container Terminal Phase I;
- Northland Cruise Terminal;
- Odin Seafood;
- Prince Rupert Ferry Terminal;
- Prince Rupert Grain Limited;
- Prince Rupert Industrial Park;
- Ridley Island Road, Rail and Utility Corridor
- Marine shipping activities (e.g., recreational, ferries, cruise, existing industries);
- Prince Rupert and Port Edward municipal development;
- Prince Rupert Airport;
- Ridley Island Log Sort;
- Atlin Terminal;
- Northland Cruise Terminal;
- Rio Tinto Alcan;
- Ridley Island Propane Export Terminal;
- Existing rail activities on CN track;
- CN rail expansion projects (i.e., Waterson Island Siding Project);
- Forestry activities including log sorts and dumps;
- Ridley Terminals Inc.; and
- Westview Wood Pellet Terminal.

Other certain or reasonably foreseeable projects and activities include:

- RTI Berth Expansion Project;
- Fairview Container Terminal Phase II;
- Pembina Prince Rupert LPG Export Terminal;
- Kitimat LNG;
- Coastal Gas Link Pipeline;
- LNG Canada;
- Wolverine Terminals – Prince Rupert Marine Fuels Service Project;
- Pacific Northern Gas Looping Project;
- Westcoast Connector Gas Transmission Project;
- Prince Rupert Gas Transmission;
- CN rail activity;
- Kaien-Ridley Connector Road Project and associated habitat compensation projects;
- Marine shipping activities (e.g., recreational, ferries, cruise, existing industries); and
- Expected activities including fishing, hunting, and recreation and tourism.

4.8. Follow-Up Strategy

Where an adverse effect and/or cumulative effect has been identified for a specific VC, the EEE/Application will include a description of a follow-up strategy, where appropriate, that:

- Identifies the measures to evaluate the accuracy of the original effects prediction;
- Identifies the measures to evaluate the effectiveness of proposed mitigation measures; and
- Proposes an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected. This includes reference to further mitigation, involvement of key stakeholders, Indigenous groups, government agencies and any other measures deemed necessary to manage the issue.

Part B:

5. ENVIRONMENTAL EFFECTS EVALUATION

The EEE/Application will include an assessment of identified VCs. The assessment will be conducted in accordance with the methodology specified in Section 4, Methodology.

5.1. Air Quality and Greenhouse Gas Emissions

The air quality and greenhouse gas (GHG) emissions effects evaluation is divided into two VCs:

- The Air Quality VC will assess criteria air contaminant (CAC) emissions and deposition, from Project construction and operation activities.
- The GHG Emissions VC will assess direct GHG emissions from Project activities and components within the Project site within a provincial and national GHG management context.

5.1.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 11 includes a description of the spatial assessment (both LSA and RSA) area for the VCs. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VCs. LSA and RSA boundaries are represented on maps found in Appendix A.

Table 11: Air Quality Local and Regional Study Boundaries and GHG Administrative Boundaries

VC	LSA	RSA	Administrative
Air Quality	Includes sensitive receptor sites that may be affected by Project-related activities. The LSA is a 10 km by 10 km area centred on the Project location as well as the shipping route to Triple Island, including a one-km buffer on either side of the shipping route, to account for potential interaction of ship emissions. This domain is chosen based on an expectation that model predictions at the LSA boundaries would be 1/10th or less than the ambient air quality objectives (as suggested in the BC dispersion modelling guidelines).	Includes broader areas to evaluate cumulative effects. The RSA is a 30 km by 30 km area centred on the Project location. The RSA is chosen for the purposes of evaluating other significant emission sources in the vicinity of the project, with an expectation that model predictions at the RSA boundaries would be 1/10th or less than the ambient air quality objectives.	NA

Table 11 (Cont'd): Air Quality Local and Regional Study Boundaries and GHG Administrative Boundaries

VC	LSA	RSA	Administrative
GHG Emissions	NA	NA	Administrative Boundaries for the GHG Emissions VC are relevant with respect to provincial and national GHG emissions management targets and objectives. The assessment boundaries for GHG emissions will be the Province of BC, to provide context as to the Project-related GHG emissions contribution to provincial targets as well as nationally, using federal GHG emissions targets.

The temporal boundaries of potential effects specific to the Project for these VCs include:

- Two years– Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.1.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VCs, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 12: Indicators of Air Quality and GHG Emissions assessment

VC	Indicators	Linked VCs
Air Quality	Ambient concentrations of CACs, including, but not limited to, suspended particulate matter (as Total Suspended Particles, Particulate Matter (PM_{10} and $PM_{2.5}$), hazardous air pollutant (HAPs), nitrogen oxides (NOx), sulfur dioxide (SO_2), volatile organic compounds (VOCs) and carbon monoxide (CO).	• Human Health; • Terrestrial Resources; • Visual Quality; • Soil and Terrain; • Freshwater Fish and Fish Habitat; and • Community Well-being.
GHG Emissions	Total Annual GHG Emissions.	• Human Health; • Terrestrial Resources; • Visual Quality; and • Community Well-being.

5.1.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VCs and to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Air Quality VC
Canadian Environmental Protection Act, 1999
British Columbia Ministry of Environment Air Quality Dispersion Modelling Guideline, 2015
British Columbia Ambient Air Quality Objectives, 2016
Canadian Council of Ministers of the Environment Canadian Ambient Air Quality Standards, 2014
Port Emissions Inventory Tool and User Guide
Environment and Climate Change Canada National Marine Emissions Inventory model (2015) and report
United States Environmental Protection Agency CALPUFF dispersion model User Guide
World Resources Institute's Greenhouse Gas Protocol (definitions of direct/indirect sources)
Environment and Climate Change Canada National Inventory Report 1990-2016
Health Canada, Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality
Greenhouse Gas VC
Greenhouse Gas Emission Reporting Regulation, 2016
Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act, 2008
National inventory report: greenhouse gas sources and sinks in Canada. Environment Canada, 2006

5.1.4. Baseline Assessment

For each selected VC, the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

Existing conditions will be identified by summarizing the existing ambient air quality monitoring in the region. Current and historical monitoring is conducted by the BC Ministry of Environment and Climate Change Strategy (BC ENV) and made available through a public data repository. In addition, ECCC develop climate norms for every region of the country. The air quality baseline will be developed through such data summaries, additionally identifying the major, existing emission sources within the airshed the Project is situated in.

Existing GHG emissions will be characterized by community-level emissions estimates developed by the BC Government through its Community Energy & Emissions Inventory initiative.

The baseline information that will support the assessment of the Air Quality and GHG Emissions VC is listed in the table below.

Existing Information/Data Sources

Data/Information
Envistaweb data repository for ambient air quality data in BC (envistaweb.env.bc.ca)
Canadian Climate Normals (climate.weather.gc.ca)
Community Energy & Emissions Inventory (BC) (www2.gov.bc.ca/gov/content/environment/climate-change/data/ceei)
Environment and Climate Change Canada National Inventory Report, 2017
Other EAs listed in Section 4 of this document, as relevant
Prince Rupert Airshed Study, September 2016, BC Ministry of Environment

Field and Desktop Studies

The EEE/Application will include a desktop assessment utilizing existing ambient air quality data for the Prince Rupert airshed.

Emissions Inventory

The Vopak air emissions inventory will be developed for the EEE/Application and will consider:

- The number of rail and marine movements each year associated with the terminal throughput;
- The terminal infrastructure with energy/emissions profile; and
- Rail, marine and mobile source equipment details and usage patterns from available literature and databases.

The inventory will be compared to the PRPA total inventory for relevance, which is compiled each year, and is inclusive of its tenant terminal operations.

The expected construction activities will be documented to the level of detail possible, identifying the expected total emissions (including fugitive emissions associated with land disturbance) to confirm that these activities would not cause adverse air quality beyond the LSA. Equipment and operation 'profiles' are expected to be used for the construction emissions assessment.

Guidance documents for the operations and construction emissions estimates would include two Canadian sources, notably the Port Emissions Inventory Tool (PEIT) and manual (developed and maintained for TC) and the ECCC National Marine Emissions Inventory model and report (2015 calendar year). PEIT leverages best practice emissions data and models supported by the US Environmental Protection Agency, including the Motor Vehicle Emission Simulator and Nonroad engines, equipment and vehicles emissions models.

Any assumptions required to select appropriate emission factors or related activity data (i.e., distance of travel, average vehicle speeds) will be identified with references.

Air Dispersion Model

The air dispersion model will use the US Environmental Protection Agency CALPUFF dispersion model, which is an accepted 'refined' model by BC ENV for complex terrain (including coastal settings).

The model will be configured for the Prince Rupert setting, using local meteorology, terrain and land use data, in a manner consistent with the BC ENV Dispersion Modelling Guidelines (2015). The modeling will be completed such that compliance with all applicable ambient objectives and standards can be demonstrated. GHG estimates will be organized in a manner which follows the World Resources Institute's GHG Protocol.

The dispersion modelling will also be used to identify potential deposition of contaminants to soil and water within the RSA. This will be done through display of isopleth maps as well as tabular identification of maximum deposition rates and locations. This information will be used to inform the assessment of Freshwater Fish and Fish Habitat and Soil and Terrain VCs.

5.1.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Air Quality and GHG Emissions VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for these VCs will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 13: Potential Project-related Effects Associated with Air Quality and GHG Emissions

Project Activity/Interaction	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Construction road traffic	Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Site grading, including blasting, and fill	Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Construction of project facilities on land (civil, mechanical and electrical & instrumental work)	Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Construction of marine jetty and berths	Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Dredge and disposal of dredgeate	Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Potential accidents and malfunctions	Potential effects on air quality and GHG emissions will be assessed in Section 6 of the EEE/Application.

Table 13 (Cont'd): Potential Project-related Effects Associated with Air Quality and GHG Emissions

Project Activity/Interaction	Potential Project-related Effect
Operations	
Railway operations associated with inbound train unloading and outbound train staging	Locomotives consume diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
LPG cooling process	Equipment usage consumes energy and fuel and will contribute to the Project CACs and GHG emissions.
Product storage	Product storage may release fugitive CACs and could adversely affect air quality conditions.
Vessel berthing	Vessels and tugs consume diesel fuel / fuel oil and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Cargo loading	Loading equipment will contribute to Project-related emissions of CACs and GHGs.
General terminal operations (24 hours, 365 days) (power, lighting, security, heating, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Equipment usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Routine maintenance and inspections	General maintenance may include use of equipment or venting of storage tanks that would release CACs and GHGs and could adversely affect air quality conditions.
Associated off-site rail and shipping activities	Transportation related emissions release CACs and GHGs and could adversely affect air quality conditions.
Potential accidents and malfunctions	Potential effects on air quality and GHG emissions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Removal of tanks and infrastructure	Equipment and vehicle usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Removal of buildings and utilities infrastructure	Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Removal of jetty topside	Equipment and vehicle usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Potential accidents and malfunctions	Potential effects on air quality and GHG emissions will be assessed in Section 6 of the EEE/Application.

5.1.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.1.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects for Air Quality

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** predicted off-project air quality concentrations due to project sources are within the normal variability experienced in the baseline. **Moderate:** predicted off-project air quality concentrations due to project sources are above the normal variability experienced in the baseline, without exceedances of government objectives in public areas. **High:** predicted off-project air quality concentrations due to project sources exceed government objectives in public areas.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: Effects are contained within the Project footprint. **Local:** Effects are contained within the LSA. **Regional**: Effects extend outside of the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** measureable for up to 1 month of the year. **Long term:** measurable for periods of 1 month within the lifetime of the project. **Permanent**: measurable for periods extending from 2 years up to the lifetime of the project.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** baseline conditions are immediately restored upon cessation of activity. **Partially reversible:** baseline conditions are restored within 1 year of cessation of activity. **Irreversible:** baseline conditions will not be restored.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low sensitivity:** Air Quality Health Index (AQHI) for the local communities is quantified as 'low' risk (value 1 to 3) 90% of the time or greater, with no 'high' or 'very high' risk periods (value 7 or higher), not including natural events such as forest fires. **Moderate sensitivity:** Air Quality Health Index is quantified as 'low' or 'moderate' risk (values up to 6) for 99% of the time or greater, not including natural events such as forest fires. **High sensitivity:** Air Quality Health Index is quantified as 'high' or 'very high' risk (value 7 or higher) more than 1% of the time (not including natural events such as forest fires).
Likelihood	Whether or not a residual effect is likely to occur	**Low:** The predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence) **Moderate:** The predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence) **High:** The predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

1 Criteria for the Characterization of Residual Effects for GHGs

Criteria	Description	Definitions
Magnitude	Expected size or severity of the residual effect	**Low:** negligible change in provincial and national GHG emissions. **Moderate:** measureable but relatively small change (<2%) in provincial or national GHG emissions estimates. **High:** a notable change (>2%) in provincial or national GHG emissions estimates.
Extent	Spatial scale over which the residual effect is expected to occur	**Provincial**: residual effect is within the provincial extent. **National:** residual effect is within the national extent. **Global**: residual effect is within the global extent.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to a two year time frame (e.g., during construction only). **Long term:** residual effect extends through lifetime of project. **Permanent**: residual effect extends beyond life of project and decommissioning.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** baseline conditions are immediately restored upon cessation of activity. **Partially reversible:** baseline conditions are restored within 1 year of cessation of activity. **Irreversible:** baseline conditions will not be restored.
Context	Sensitivity and resilience of the VC to Project-related change.	Not applicable to GHG emissions.
Likelihood of Residual Effect		
Likelihood	whether or not a residual effect is likely to occur	**Low:** The predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** The predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** The predicted residual effect is likely to occur or certain (80-100% chance of occurrence)**.**

2 Determination of Significance

VC	Threshold of Significance
Air quality	Predicted exceedances of relevant ambient objectives and standards due to project emissions sources in locations frequented by the public.
GHG	A notable change to provincial or national GHG totals (> 2%).

5.1.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities within the RSA.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.2. Noise

The Noise effects evaluation will be conducted to assess the potential effects of Project-related noise on sensitive human receptors and wildlife. Noise at Ridley Island is currently influenced by existing operations or construction at neighbouring facilities. Noise effects are of particular concern for sensitive receptors, which includes homes, First Nation Reserves and temporary use areas, hospitals, supported living facilities, and wildlife.

5.2.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 14 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 14: Noise Local and Regional Study Boundaries

VC	LSA	RSA
Noise	1.5 km from Project noise sources, based on BC Oil and Gas Commission Noise Control Best Practices Guideline	The RSA is set to 3 km from the Project noise sources, to add an additional 1.5 km buffer from the LSA based on BC Oil and Gas Commission Noise Control Best Practices Guideline, to consider cumulative effects.

The potential effects specific to the Project are based on the three main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.2.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 15: Indicators of Noise assessment

VC	Subcomponents	Indicators	Linked VCs
Noise	NA	Ambient sound levels Incremental change in noise level from construction of the project Incremental change in noise level from facility operations Percent highly annoyed (HA%) Low-Frequency Noise and Vibration	• Terrestrial Resources; • Economic Conditions; • Human Health; and • Marine Use and Navigation.

5.2.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
British Columbia Oil and Gas Commission Noise Control Best Practices Guideline
District of Port Edward Noise Control Bylaw No. 520
Health Canada's Useful Information for Environmental Assessments, Section 6

5.2.4. Baseline Assessment

For each selected VC, the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including: Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.

- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

The baseline information that will support the assessment of the Noise VC is listed in the table below.

Existing Information/Data Sources

Data/Information
Prince Rupert Port Authority Noise Monitoring Data
Other EAs listed in Section 4 of this document, as relevant

Field and Desktop Studies

The EEE/Application will include a desktop-based assessment utilizing available ambient noise data near the proposed Project.

The noise assessment will include a determination of existing baseline sound levels utilizing monitoring results from PRPA's noise monitoring program. The assessment will predict the noise effects of normal Project activities on receptors (dwellings, schools, hospitals, etc.) nearest to the proposed Project to determine appropriate mitigation measures during construction and operation.

Noise modelling will predict the sound levels from the facility at the nearest receptors and a comparison of those levels to standards from the BC Oil and Gas Commission Noise Control Best Practices Guideline and Health Canada's Guideline on Evaluation Human Health Impacts from Noise in Environmental Assessments, as well as the District of Port Edward Noise Control Bylaw No. 520.

5.2.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Noise VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 16: Potential Project-related Effects Associated with Noise

Project Activity/Interaction	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Construction equipment and activities may contribute to ambient noise levels.
Site grading, including blasting, and fill	Construction equipment and activities may contribute to ambient noise levels.
Construction of project facilities on land (civil, mechanical and electrical & instrumental work)	Construction equipment and activities may contribute to ambient noise levels.
Construction of marine jetty and berths	Construction equipment and activities may contribute to ambient noise levels.
Dredge and disposal of dredgeate	Construction equipment and activities may contribute to ambient noise levels.
Reclamation and clean up	Construction equipment and activities may contribute to ambient noise levels.
Potential accidents and malfunctions	Potential effects on ambient noise from potential accidents and malfunctions will be assessed in Section 6.

Table 16 (Cont'd): Potential Project-related Effects Associated with Noise

Project Activity/Interaction	Potential Project-related Effect
Operations	
Railway operations associated with inbound train unloading and outbound train staging	Transportation sources may contribute to ambient noise levels
LPG cooling process	Cooling equipment may contribute to ambient noise levels
Product storage	Storage activities may contribute to ambient noise levels.
Vessel berthing	Vessel activities may contribute to ambient noise levels
Cargo loading	Cargo loading equipment may contribute to ambient noise levels
General terminal operations (24 hours, 365 days) (power, lighting, heating, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Terminal operation equipment may contribute to ambient noise levels
Routine maintenance and inspections	Maintenance and inspections may have associated equipment use and/or activities that contribute to ambient noise levels
Associated off-site rail and shipping activities	Transportation sources may contribute to ambient noise levels
Potential accidents and malfunctions	Potential effects on ambient noise from potential accidents and malfunctions will be assessed in Section 6.
Decommissioning	
Removal of tanks and infrastructure	Construction equipment and activities may contribute to ambient noise levels.
Removal of buildings and utilities infrastructure	Construction equipment and activities may contribute to ambient noise levels.
Removal of jetty topside	Construction equipment and activities may contribute to ambient noise levels.
Potential accidents and malfunctions	Potential effects on ambient noise from potential accidents and malfunctions will be assessed in Section 6.

5.2.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.2.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects for Noise

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** predicted noise levels due to project sources are below health and annoyance levels identified in relevant municipal bylaws as well as provincial and national guidelines, at the nearest residential locations. **Moderate:** predicted noise levels due to project sources are moderately higher (>5%) than health and annoyance levels identified in relevant municipal bylaws as well as provincial and national guidelines, at the nearest residential locations. **High:** predicted noise levels due to project sources are notably higher (>5%) than health and annoyance levels identified in relevant municipal bylaws as well as provincial and national guidelines, at the nearest residential locations.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend outside of the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** persisting for a 12 month timeframe during any Project phase. **Long term:** persisting for more than 12 months during any phase of the project, such as an operations phase. **Permanent**: measurable during the entire project.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100%) of the time.
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** baseline conditions are immediately restored upon cessation of activity. **Partially reversible:** baseline conditions are restored within 1 year of cessation of activity. **Irreversible:** baseline conditions will not be restored.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low:** Zero to five historical noise complaints (logged against commercial or industrial operations) per year by residents of a local community over the previous five years. **Moderate:** greater than five but fewer than 10 noise complaints (logged against commercial or industrial operations) by residents of a local community over the previous five years. **High:** Ten or more noise complaints (logged against commercial or industrial operations) by residents of a local community over the previous five years.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

Determination of Significance

VC	Threshold criteria
Noise	**Significant:** Predicted noise levels are above health and annoyance levels identified in relevant municipal bylaws as well as provincial and national guidelines, at the nearest residential locations.

5.2.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.3. Visual Quality – including Ambient Light

The Visual Quality effects evaluation will include the potential Project-related effects of Project lighting and a change in viewscape on Ridley Island from various viewpoints related to Project land clearing and infrastructure.

5.3.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 17 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 17: Visual Quality Local and Regional Study Boundaries

VC	LSA	RSA
Visual Quality/ Ambient Light	The LSA will be an 8 km area surrounding the outside boundary of the Project, as well as a 4 km buffer along the shipping route to Triple Island. The 8 km distance is a standard applied to most projects in BC for the visual assessment of a project. It is generally accepted that at an 8 km distance the naked eye can determine detail. This threshold is based on Visual Quality Objectives set out in the *Forest and Range Practices Act* and on key design concepts and principles as set out in the Visual Landscape Design Training Manual (BC Ministry of Forests, 1994) and the Visual Impact Assessment Guidebook (BC Ministry of Forests 2001).	The RSA will be the distance viewing area up to 25 km from the Project location, as well as a 12 km buffer along the shipping lane to Triple Island. This will incorporate the viewshed and potential long distance view of the project site. This is a standard distance used in most projects in BC for the visual assessment of a project. The 25 km distance threshold represents the background distance where details on the landscape may not be visible but larger features, or alterations to landscape are visible (cleared trees, lighting at night, taller features).

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.3.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 18: Indicators of Visual Quality assessment

VC	Subcomponents	Indicators	Linked VCs
Visual Quality / Ambient Light	Visual Quality	Change in visual quality (i.e., modified viewscape as defined in guidance listed below), resulting from project activities and land development	• Community Well-being; • Air Quality; and • Human Health.
	Ambient Light	Change in levels of light trespass, glare, and sky glow (lux)	• Community Well-being; • Air Quality; • Terrestrial Resources; • Human Health; and • Marine Resources.

5.3.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Visual Impact Assessment guidebook, Second Edition, Province of British Columbia
Visual Landscape Inventory: Procedures and Standard Manual, Province of British Columbia
Protocol for Visual Quality Effectiveness Evaluation Procedures and Standards, Forest and Range Evaluation Program, British Columbia Ministry of Forest Range and British Columbia Environment & Climate Change.
Visual Quality Objectives, *Forest and Range Practices Act*
Visual Landscape Design Training Manual, British Columbia Ministry of Forests, Lands and Natural Resources
Visual Impact Assessment Guidebook, British Columbia Ministry of Forests, Lands and Natural Resources
Visual Resource Contrast Rating Manual, Bureau of Land Management, United States of America
The International Commission on Illumination (CIE)
Leadership in Energy and Environmental Design (LEED) Green Building Council Certification Program of Canada.

5.3.4. Baseline Assessment

For each selected VC, the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

A review of previous light assessments conducted in the Prince Rupert area will be completed to understand baseline ambient light conditions. Lights assessments were included in the EAs for Pacific NorthWest LNG Export Terminal (2014) and the Canpotex Potash Export Terminal (2011).

The baseline information that will support the assessment of the Visual Quality VC is listed in the table below.

Existing Information/Data Sources

Data/Information
AECOM. 2012. Prince Rupert Port Authority 2020 Land Use Management Plan. Prepared for PRPA.
AECOM. 2014. Prince Rupert LNG. Environmental Impact Statement Guidelines. Prepared for BG Group.
Stantec. 2016. Pacific NorthWest LNG Project. Environmental Impact Assessment and Technical Data Reports. Prepared for Pacific NorthWest LNG Limited Partnership.
DataBC. 2018. iMapBC Public Mapping Application. Available: http://ilmbwww.gov.bc.ca/content/e-services/geobc/imapbc.
SNC-Lavalin Inc. 2016. Ridley Island Propane Export Terminal. Environmental Effects Determination. Prepared for AltaGas Ltd.
Stantec. 2011. Canpotex Potash Export Terminal. Environmental Impact Statement and Technical Data Reports. Prepared for Canpotex Terminals Ltd.
Stantec. 2012. Fairview Terminal Expansion. Comprehensive Study Report and Technical Data Reports. Prepared for CN Rail.
Natural Resources Canada. 2016. Canadian Digital Elevation Model
Natural Resources Canada. 2016. Canadian Digital Surface Model
Additional spatial data from the City of Prince Rupert, Port Edward, Port of Prince Rupert, and North Coast Regional District may be used for the purposes of this assessment.

Field and Desktop Studies

For this VC, the effects of landscape change on visual quality will be determined using Canadian and American methods for assessing change. Using a combination of photographic analysis and geospatial analysis in a 3D environment the landscape change will be modeled and visualized. Guidelines available from the Bureau of Land Management and the Province of BC will be used to assess the extent of that change and quantify that change.

For Ambient Light, the analysis will be based on existing research and studies in the project area.

The effects assessment will include a combination of a field visit and desktop analysis. The first stage of the project involves a background review and spatial analysis to determine the viewshed of the project and existing visual landscape characteristics. Viewpoints will be identified from a combination of previously identified important viewpoints, Indigenous consultation, and visual landscape objectives. A field visit will be conducted to take photos from proposed viewpoints towards the project location.

The second phase will involve the analysis of those viewpoints and photos using a combination of 3D analysis in geographic information system (GIS) and photographic analysis and editing. The analysis will draw upon existing guidelines for visual quality assessment to quantify the change from project activities. Additionally, the assessment will look at cumulative change in visual landscape using historic aerial and 3D scene generation in GIS.

5.3.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 19: Potential Project-related Effects Associated with Visual Quality and Ambient Light

Project Activity/Interaction	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Visual quality may be changed by alteration of view scape. The extent and shape of these cleared areas as well as materials being added will need to be factored into visual quality modelling.
Site grading, including blasting, and fill	Changes to the site grading and filling may impact the visual landscape and will need to be assessed. Fill material will be incorporated into visual quality assessment.
Construction of Project facilities on land (civil, mechanical and electrical & instrumental work)	New buildings will change the visual landscape. These buildings and changes will be incorporated into a 3D model for visual assessment.
Construction of marine jetty and berths	New marine features may change the visual quality.
Potential accidents and malfunctions	The assessment of effects on visual quality and lighting from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operation	
Railway operations associated with inbound train unloading and outbound train staging	Railcar movement may impact visual quality.
Product storage	Project storage tanks may impact visual quality.
Vessel berthing	Vessel berthing could impact visual quality and add to ambient light.

Table 19 (Cont'd): Potential Project-related Effects Associated with Visual Quality and Ambient Light

Project Activity/Interaction	Potential Project-related Effect
Operation (Cont'd)	
General terminal operations (24 hours, 365 days) (power, lighting, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Additional lighting may contribute to ambient light.
Associated off-site rail and shipping activities	Marine vessel and rail car movement may impact visual quality and contribute to ambient light.
Potential accidents and malfunctions	The assessment of effects on visual quality and lighting from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Removal of tanks and infrastructure	Visual quality may be changed by removal of existing land based infrastructure.
Removal of buildings and utilities infrastructure	Visual quality may be changed by removal of existing land based infrastructure.
Removal of jetty topside	Visual quality may be changed by removal of existing infrastructure.
Potential accidents and malfunctions	The assessment of effects on visual quality and lighting from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

5.3.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.3.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects for Visual Quality

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no measureable change in the LSA's visual quality[3]. **Low:** a measurable change in the LSA's average visual quality from moderate and high importance viewpoints. LSA remains within the existing visual quality class, and visual quality objectives are met. **Moderate:** a measurable change in the LSA's average visual quality from moderate and high importance viewpoints. Change in the LSA's existing visual quality class. **High:** a measurable change in the LSA's average visual quality from moderate and high importance viewpoints. Change in the LSA's existing visual quality class and/or established visual quality objectives are exceeded.
Extent	Spatial scale over which the residual effect is expected to occur	**LSA:** residual effects extend into the LSA. **RSA:** residual effects extend into the RSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** measureable change that persists within a 2 year timeframe (e.g., construction phase length). **Medium term:** measureable change that persists longer than 2 years but does not persist throughout all Project phases. **Long term:** measurable change throughout all Project phases. **Permanent**: Effect unlikely to return to existing conditions.
Frequency	How often the residual effect is expected to occur	**Once:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** residual effect will return to existing condition after Project decommissioning. **Partially reversible:** residual effect will return in part to existing condition after Project decommissioning. **Irreversible:** residual effect is permanent.
Context	Sensitivity and resilience of the VC to Project-related change. Consideration of baseline level disturbance is assumed.	**Low:** low capacity for the VC to recover from a disturbance. **Moderate:** moderate capacity for the VC to recover from disturbance. **High:** high capacity for the VC to recover from a disturbance.
Likelihood of Residual Effects		
Likelihood	whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

[3] Visual quality as defined in Visual Landscape Inventory Procedures and Standards Manual, May 1997, Province of BC Ministry of Forests.

1 Criteria for the Characterization of Residual Effects – Ambient Light

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** effect is detectable but is reduced through design mitigation. **Moderate:** plant lighting is effectively controlled, but navigation, security and other required lighting have a measurable effect. **High:** the design is without regard to lighting design criteria.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short-term:** measurable for less than one month. **Medium-term:** measurable for more than one month but less than two years. **Long-term:** measurable through all phases of the Project. **Permanent:** measurable parameter unlikely to recover to baseline.
Frequency	How often the residual effect is expected to occur	**Once:** effect occurs once. **Infrequent:** effect occurs on multiple occasions at irregular intervals. **Frequent:** effect occurs on multiple occasions at regular intervals. **Continuous:** effect occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Reversible:** will recover after Project decommissioning. **Irreversible:** effect cannot be reversed.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** sensitive human receptors and wildlife accustomed to existing low levels of ambient lighting (e.g., rural development). **Moderate resilience:** sensitive human receptors and wildlife accustomed to moderate levels of existing lighting (e.g., street lights and occasional commercial development). **High resilience:** sensitive human receptors and wildlife accustomed to high levels of industrial and large-scale commercial development.
Likelihood of Residual Effects		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

Determination of Significance

Subcomponent	Threshold of Significance
Visual Quality	A residual effect will be considered significant if: The established visual quality objective is exceeded (identified in the visual landscape inventory), or The average visual condition within the LSA exceeds the partial retention visual quality condition where: • The average existing visual condition is preservation, retention, or partial retention. • The viewpoints from which the change is viewed are of moderate to high importance. Importance of viewpoints will be established through consultation and known important viewpoints. • Visual quality is a principal planning objective, in consideration of other applicable planning objectives, in the LSA and RSA. A residual effect will be considered significant if: • Viewings are highly probable with an average duration greater than four hours per day. • The average prominence of Project-related vessels in the LSA is moderate or high. • The viewpoints from which the change is viewed are of moderate to high importance. • Visual quality is a principal planning objective, in consideration of other applicable planning objectives, in the LSA or RSA.
Ambient Light	A significant adverse effect on ambient light is defined as an increase in project-related light emissions such that the guidelines for light spill and glare in a suburban environment are exceeded and the resulting conditions related to sky glow could be as much as an urban environment.

5.3.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.4. Marine Resources

The Marine Resources effects evaluation will be conducted to assess the Project-related effects on the following subcomponents:

- Marine habitat;
- Marine sediment quality;
- Marine water quality;
- Marine birds;
- Marine mammals; and
- Marine fish and invertebrates.

5.4.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 20 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 20: Marine Resources VC Local and Regional Study Boundaries

VC	LSA	RSA
Marine Resources (Marine Mammals subcomponent)	The LSA for the subcomponent marine mammals will include a 6.5 km diameter buffer extending outwards from the shoreline area of the Project to the Kinahan Islands, as well as the area of Porpoise Channel between Lelu Island and Ridley Island and a 6 km buffer on each side of the shipping route from the berths out to Triple Island. The buffer around the berths will include diverse habitats that encapsulate the behavior and range of inshore pinniped and local cetacean species inhabiting the area. The buffer around the shipping route will also include diverse habitats, including varied water depths, to cover all marine mammal species that could potential be affected.	The RSA will include all of PRPA jurisdiction in addition to the shipping route out to Triple Island with a 6 km buffer.
Marine Resources (Marine Habitats, Marine Sediment Quality)	The LSA for the subcomponents, including marine habitats and marine sediment quality will be defined as the Project water lot area and a 500 m buffer around the western portion of the water lot that has potential to be affected by berthing vessels, trestle and loading platform construction, and other activities associated with the construction and operation of the Project. This LSA boundary is ecologically relevant as the area includes habitat for both migratory fish and sessile fauna including those in marine sediments.	The RSA for the subcomponents, including marine habitats and marine sediment quality will be defined as the boundaries of the ecosystem contained within Pacific Fishery Management Area 4.
Marine Resources (Marine Fish and Invertebrates)	The LSA for the Marine Fish and Invertebrates subcomponent will be defined as the Project water lot area and a 500 m buffer around the western portion of the water lot that has potential to be affected by berthing vessels, trestle and loading platform construction, and other activities associated with the construction and operation of the Project. It also includes a 1 km buffer on either side of the shipping route to account for potential effects on fish behavior from transiting ship underwater noise.	The RSA for the subcomponent Marine Fish and Invertebrates will be defined as the boundaries of the ecosystem contained within Pacific Fishery Management Area 4.

Table 20 (Cont'd): Marine Resources VC Local and Regional Study Boundaries

VC	LSA	RSA
Marine Resources (Marine Water Quality)	The LSA/RSA for the marine water quality subcomponent will include marine water within 5km from the berth to incorporate up to eight PRPA marine water quality stations. The spatial distribution of the eight locations is appropriate to describe the baseline conditions across different seasonal conditions.	The RSA will be defined as the boundaries of the ecosystem contained within Pacific Fishery Management Area 4. This encompasses the whole PRPA area where baseline data is currently collected including the outer anchorage locations in Chatham Sound. The variance in the ecological indicators in water quality will be examined among locations to highlight locations that may be affected by project components or activities.
Marine Resources (Marine Birds)	The waters within the Vopak water lot area, 500 m on all sides of the water lot area, and 1 km on both sides of the proposed shipping route between the marine terminal and Triple Island.	The PRPA boundary and 10 km on all sides of the proposed shipping route between the marine terminal and Triple Island, to allow for the assessment to be conducted within the context of important marine bird areas and ecologically sensitive habitats nearby, including Lucy Island.

* The LSA and RSA spatial boundaries may be revised upon consultation with local authorities on disposal sites and related activities. Both on-land and marine disposal locations may be identified through this exercise.

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.4.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 21: Indicators of Marine Resources assessment

VC	Subcomponents	Indicators	Linked VCs
Marine Resources	Marine Habitats (including intertidal and nearshore (<20 m) and offshore (>20 m) subtidal)	Habitat quality – e.g., species richness and abundance Habitat quantity - Total area of marine habitat permanently altered or destroyed (m^2)	• Visual Quality (Light); • Terrestrial Resources; • Marine Water and Sediment Quality; • Freshwater Fish and Fish Habitat; and • Human Health.
	Marine Mammals, including Species at Risk	Marine mammal or species at risk presence/absence Habitat availability & quantity Ambient underwater noise levels	• Marine Habitats; • Marine Fish and Invertebrates; • Visual Quality (Light); and • Freshwater Fish and Fish Habitat.
	Marine Sediment Quality	Sediment properties (physical and chemical), including but not limited to: metals, moisture content, pH, particle size, total oxygen content, petroleum hydrocarbons) Slope stability Sediment transport	• Terrestrial Resources; • Freshwater Fish and Fish Habitat; and • Human Health.
Marine Resources (Cont'd)	Marine Water Quality	Water properties (physical and chemical)	• Terrestrial Resources; • Marine Sediment; • Freshwater Fish and Fish Habitat; and • Human Health.
	Marine Fish and Invertebrates	Fish and invertebrate species presence/absence and diversity/abundance Change in ambient underwater noise	• Visual Quality (Light); • Terrestrial Resources; • Marine Resources (Marine Habitats, Marine Sediment Quality, Marine Water Quality); • Freshwater Fish and Fish Habitat; and • Human Health.
	Marine Birds, (including migratory and species at risk)	Quantity and distribution of marine bird habitat and sensitive habitat features Quantity and distribution of identified critical habitat or residences for federal marine bird species at risk Relative abundance and distribution of marine birds (including waterfowl, waterbirds, and shorebirds) Mortality risk for marine birds (including waterfowl, waterbirds, and shorebirds)	• Air Quality; • Noise; • Ambient Light/Visual Quality; • Soils; • Freshwater Fish and Fish Habitat (surface water quality); • Marine Resources (marine sediment and water quality); and • Terrestrial Resources (wildlife and wildlife habitat);

5.4.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Fisheries Act
Species at Risk Act
Canadian Environmental Protection Act, 1999
Migratory Birds Convention Act, 1994
Migratory Birds Regulation
Sediment Management: A Proponent's Guide for the Prince Rupert Region, final – October 2016.
British Columbia Marine Conservation Analysis. 2009. Physical Representation - Benthic Classes. British Columbia Marine Conservation Analysis Atlas. Website:http://bcmca.ca/datafeatures/eco_physical_benthicclasses/.
British Columbia Ministry of Environment. 2017. British Columbia Approved Water Quality Guidelines, updated December 2017.
British Columbia Ministry of Forests, Lands and Natural Resource Operations. 2005. Repetitive Shore Type – Line, Shorezone (Theme). Coastal Resource Information System.
Clarke, C.L., and G.S. Jamieson. 2006. Identification of Ecologically and Biologically Significant Areas in the Pacific North Coast Integrated Management Area: Phase I – Identification of Important Areas. Canadian Technical Report of Fisheries and Aquatic Sciences 2678. vi + 89 pp.
Environment Canada. 2014. Interim Guidance for the Assessment of Risks from Dioxins and Furans in Sediments Proposed for Disposal at Sea in Pacific and Yukon Region. April, 2014.
Environment Canada. 1997. A marine ecological classification system for Canada. Environment Canada Lee E. Harding (Ed.). Marine Environment Quality Advisory Group.
Fisheries and Oceans Canada. 2007. *Interim Marine Habitat Information Requirements*.
Fisheries and Oceans Canada. 2004. Identification of Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006.
Fisheries and Oceans Canada. 2013. Fisheries protection policy statement. October 2013. DFO. 2013b. Science Advice to Support Development of a Fisheries Protection Policy for Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/063.
Fisheries and Oceans Canada. 2013. Science Advice to Support Development of a Fisheries Protection Policy for Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/063.
Fisheries and Oceans Canada. 2013. Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/017.
Fisheries and Oceans Canada. 2014. A Science-Based Framework for Assessing the Response of Fisheries Productivity to State of Species or Habitats. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/067
Fisheries and Oceans Canada. 2011. Pacific Region Integrated Fisheries Management Plan. Salmon, Northern BC, June 1, 2011 – May 31, 2012.
Fisheries and Oceans Canada. 2013. Evaluation of Proposed Ecologically and Biologically Significant Areas in Marine Waters of British Columbia. Canadian Science Advisory Secretariat Science Advisory Report 2012/75. February 2013.
Fisheries and Oceans Canada. 2013. Evaluation of proposed ecologically and biologically significant areas in marine waters of British Columbia. DFO Canadian Science Advisory Secretariat Research Document 2012/075.

Relevant Guidelines and Legislation (Cont'd)

Guidance and Legislation
Government of Canada. Species at Risk Act Permitting Policy [Proposed]. Species at Risk Act: Policies and Guidelines Series. Government of Canada, Ottawa. 12 pp + Annex. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/permits-agreements-exceptions/proposed-policy-2016.html.
Harper, J.R., B. Emmett, D.E. Howes and D. McCullough 1998. Seabed imaging and mapping system – seabed classification of substrate, epiflora and epifauna. In Proceedings of the1998 Canadian Hydrographic Conference, Victoria, BC, 13p.
Harper, J.R., B.D. Bornhold, P. Thuringer and D. McCullough 1999. Application of Underwater Video Imaging for Seabed Engineering and Habitat Assessment. In Proceedings of the 1999 Canadian Coastal Conference, Victoria, BC, 12p.
Howes, D., J. Harper and E. Owens. 1994. Physical Shore-Zone Mapping System for British Columbia.
Howes, D.E., M.A. Zacharias and J.R. Harper. 1997. British Columbia Marine Ecological Classification: Marine Ecosections and Ecounits. Prepared for The Resource Inventory Committee Coastal Task Force. Website: http://ilmbwww.gov.bc.ca/cis/coastal/mris/mec.htm.
Permits, Agreements and Exceptions for Species at Risk Act. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/permits-agreements-exceptions.html.
Puget Sound Action Team (1997) Recommended Quality Assurance and Quality Control Guidelines for the Collection of Environmental Data in Puget Sound. Prepared for U.S. Environmental Protection Agency Region 10, Seattle, WA and Puget Sound Water Quality Authority, Olympia, WA by King County Environmental Lab, Seattle, WA. 108 pp.
Searing, G.F. and H.R. Frith. 1997. British Columbia Biological Shore-Zone Mapping System. Resource Information Standards Committee, Province of British Columbia. Website: http://www.ilmb.gov.bc.ca/risc/pubs/coastal/bioshore/index.htm. Accessed: May 2013.
Williams, G.L. 1993. Coastal/estuarine Fish Habitat Description and Assessment Manual, Part II, Habitat Description Procedures H. M. D. Department of Fisheries and Oceans, Pacific Region. Nanaimo, BC.
Zacharias, M.A., Howes, D.E., Harper, J.R., Wainwright, P. 1998. The British Columbia marine ecosystem classification: rationale, development, and verification. Coastal Management 26, 105-124.
Fisheries and Oceans Canada. 2013. Fisheries Protection Policy Statement. 24 pp.
Fisheries and Oceans Canada. 2013. Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting. 21 pp.
Canadian Council of Ministers of the Environment. 2016. CCME Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. Volume 1 Guidance Manual. pp. 343
British Columbia Ministry of Environment. 2018. British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Updated March 2018.
Canadian Council of Ministers of the Environment. 2017. British Columbia Sediment Quality Guidelines for the Protection of Aquatic Life, Updated June 2017.

5.4.4. Baseline Assessment

For each selected VC, the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed; and
- Additional studies conducted, when required, to define the existing conditions.

1 Existing Information and Data Sources

2 The baseline information that will support the assessment of the Marine Resources VC is listed in the
3 table below.

4 **Existing Information/Data Sources**

Data/Information
Det Norske Veritas (DNV). 2013. Prince Rupert Marine Risk Assessment. Navigational Risk Assessment Report produced for Prince Rupert Port Authority. Report No./DNV Reg. No.: / 13JIMVK-8 Rev 3, 2012-02-29.
DFO. 2007. Ecosystem Overview: Pacific North Coast Integrated Management Area (PNCIMA). Canadian Technical Report of Fisheries and Aquatic Sciences 2667.
Government of Canada. 2016. Species at Risk Public Registry.
AECOM. 2012. Prince Rupert Port Authority 2020 Land Use Management Plan. Prepared for PRPA.
AECOM. 2014. Prince Rupert LNG. Environmental Impact Statement Guidelines. Prepared for BG Group.
CEA Agency. 2016. Pacific NorthWest LNG Project. Environmental Assessment Report.
Altagas Ltd. 2018. RIPET Project Updates. Available: https://www.altagas.ca/infrastructure/projects/ridley
Ambach, M. and J. Casey. 2011. Final Report: Identification and mapping of fish habitat within and around Prince Rupert Harbour. February 2011. WWF
BC Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria, B.C.
Campbell, R. W., N. K. Dawe, I. McTaggert-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. E. McNall. 1990. The birds of British Columbia volume 1: introduction and loons through waterfowl. UBC Press in cooperation with Environment Canada, BC Ministry of Environment, Lands and Parks, and the Royal BC Museum, Victoria, BC.
McCrodan, A. and Hannay, D. 2013. Modelling of Underwater Noise for Pacific NorthWest LNG Marine Construction and Shipping Scenarios Marine Construction and Shipping Scenarios. JASCO Document 00669, Version 2.14. Technical report by JASCO Applied Sciences.
PRPA. 2018. Prince Rupert Port Authority website. Existing Operations and Marine Mammal Program.
SNC-Lavalin Inc. 2016. Ridley Island Propane Export Terminal. Environmental Effects Determination. Prepared for AltaGas Ltd.
Stantec. 2011. Canpotex Potash Export Terminal. Environmental Impact Statement and Technical Data Reports. Prepared for Canpotex Terminals Ltd.
Stantec. 2012. Fairview Terminal Expansion. Comprehensive Study Report and Technical Data Reports. Prepared for CN Rail.
Stantec. 2016. Pacific NorthWest LNG Project. Environmental Impact Statement and Technical Data Reports. Prepared for Pacific NorthWest LNG Limited Partnership.
Stantec. 2016a. Aurora LNG. Environmental Assessment Certificate Application and Technical Data Reports. Prepared for Nexen Energy.
WorleyParsons. 2012. Ridley Terminals Expansion. Parcel A and Energy Bulk Export Terminal Pre-Feasibility Study and Parcel A: An Archaeological Impact Assessment.
Archipelago Marine Research Ltd. 2014. Westcoast Connector Gas Transmission Project: Marine Environmental Technical Data Report. Prepared for TERA Environmental Consultants on behalf of Westcoast Connector Gas Transmission Ltd.

Field and Desktop Studies

There are currently five primary marine baseline and field programs identified that will inform the current status of Marine Resources VC and subcomponents. Marine habitat quality will be informed by indicators of environmental quality and will include both physical abiotic and biological assessments. The abiotic assessments will characterize the water, sediment, underwater noise, and physical nature of the habitat that support the biological communities potentially affected by the Project. The proposed programs are identified below.

Marine Water Quality Program

The EEE/Application will utilize the existing data set to undertake the assessment of the VC. Marine water quality monitoring in PRPA waters has been ongoing since 2013. As part of the marine water quality program, oceanographic properties are recorded at depth, whereas heavy metals, polycyclic aromatic hydrocarbons (PAHs), and bacteriological components (fecal coliform and enterococcus) are collected from both surface and at depth. Water sampling sites (identified in the Marine Water Quality LSA/RSA figure in Appendix A) are established in Chatham Sound along Ridley Island, while four sites are located in Porpoise Harbour. Quarterly water quality data is available from the last five years (2013-2017).

Vopak is in the process of identifying options for disposal sites of dredgeate, which will likely include at-sea location(s). Once identified, these sites will be assessed in accordance with the information requirements for the DAS Permit application[4].

Marine Sediment Quality and Benthic Invertebrates Program

Marine Sediment Quality

Existing baseline data includes those collected from 2008 to 2013 for the Canpotex proposed dredge area (i.e., a similar area to that which Vopak is proposing). Canpotex conducted a seabed surface and core sampling program to support their disposal at sea (DAS) application. Sediment was characterized by measuring physical parameters (i.e., total organic carbon (TOC) and particle size), heavy metals, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), and dioxins and furans (PCDD/Fs). This existing data will be supplemented with new data collection as follows.

The marine sediment quality program will focus on the collection of sediment samples from 10 sites within the proposed marine development area. Sediment samples will be sent to an accredited laboratory and analyzed for the following parameters including but not limited to:

- Metals (full suite of CCME listed metals);
- PAHs;
- Moisture content;
- Total Organic Carbon;
- Petroleum hydrocarbons;
- PCBs;
- Particle size; and
- Dioxins and Furans.

[4] https://www.canada.ca/en/environment-climate-change/services/disposal-at-sea/permit-applicant-guide/guide-dredged-material.html

Results will be compared to Canadian Council of Ministers of Environment guidelines for the protection of aquatic life, both the Interim Sediment Quality Guidelines and Probable Effects Levels.

These samples will be used to support the assessment of potential effects on the Marine Habitats, Marine Water and Sediment Quality. Another, more comprehensive, sampling program guided by ECCC will be focused on the collection of surface and core samples will be used to inform the Disposal at Sea permitting process.

Marine Habitat and Marine Fish and Invertebrates Program

Intertidal Ground Survey

The intertidal ground survey will support the "Marine Habitat" and the "Marine Fish and Invertebrates" subcomponents of the Marine Resources VC. Data collected from the intertidal ground survey will support the following indicators:

- Habitat quality – such as species richness and abundance; and
- Habitat quantity – total area (m2) of marine habitat permanently altered or destroyed.

Subtidal Towed Video Survey

The subtidal towed video survey will support the "Marine Habitat" and the "Marine Fish and Invertebrates" subcomponents of the Marine Resources VC. Data collected from the subtidal towed video survey will support the following indicators:

- Habitat quality and habitat quantity ("Marine Habitats" subcomponent) – such as species richness and abundance and total area (m2) of marine habitat permanently altered or destroyed; and
- Benthic invertebrate diversity/abundance ("Marine Fish and Invertebrates" subcomponent).

The proposed survey design will serve to update the information collected in the area of the Project footprint during the subtidal towed video survey that was conducted in 2009 for the proposed Canpotex Potash Export Terminal (Stantec 2011). The 2009 survey data may be used to supplement the representative information collected in the remaining LSA (i.e., outside the Project footprint).

Nearshore Juvenile Salmon Survey.

The nearshore juvenile salmon surveys will provide supplemental data to inform the "Marine Fish and Invertebrates" subcomponent of the Marine Resources VC. Data collected from the nearshore juvenile salmon surveys will support the following indicators:

- Fish species presence/absence.

The nearshore juvenile salmon surveys will provide specific baseline data on juvenile salmon presence/absence and relative abundance from either side of the proposed causeway footprint for comparison post-construction. In addition, it is proposed that data is also collected from the existing Ridley Island Terminal causeway located north of the Project area as a comparative reference[5]. The Ridley Island Terminal site is selected to determine if a nearby existing causeway is acting as a barrier to nearshore juvenile salmon movement.

[5] If ongoing port operations permit access to the site.

Benthic Fish and Invertebrates Trawl Study

Benthic fish and invertebrate trawl survey will support the "Marine Fish and Invertebrates" subcomponents of the Marine Resources VC. Data collected from the trawl survey will support the following indicators:

- Fish species presence/absence and benthic invertebrate diversity and abundance.

Fish species presence/absence and abundance data was limited to towed video survey observations in the Canpotex Potash Export Terminal study (Stantec 2011a) therefore this proposed trawl survey serves to provide a more comprehensive and recent data set.

Marine Biota Tissue Sampling

The marine biota tissue sampling program, which involves the collection and analysis of clam and crab tissue, will support the Human Health VC assessment. Clams from the intertidal zone and Dungeness crabs (Metacarcinus magister) have been selected for evaluation in support of the Human Health VC assessment, as they are benthic-dwelling organisms (i.e., live in or in close association with sediments), have the potential to be harvested and consumed by locals, and also have the potential to spend a significant portion of their life span within the LSA.

Marine biota tissue samples will be sent to an accredited laboratory and analyzed for the contaminants that have been previously identified in sediments in the area:

- Metals;
- PAHs; and
- Dioxins and furans.

Marine Mammals Program

The EEE/Application and assessment of the marine mammals subcomponent will incorporate publicly available scientific research on the northern coast of BC, management plans and risk assessments completed for other industrial projects in the region, Committee on the Status of Endangered Wildlife in Canada (COSEWIC) species assessment reports, SARA species status reports, SARA recovery planning documents, wildlife tourism general information, work conducted by the Port of Prince Rupert, as well as engagement/consultation documentation from past development proposals. Local sightings data will be reviewed from marine mammal databases, such as the British Columbia Cetacean Sightings Network. Existing hydrophone networks, such as that overseen by Oceans Network Canada will be utilized, if made available, would also be incorporated into the EEE/Application.

An underwater noise assessment will be completed using existing data to assess the potential noise effects on marine mammals and fish associated with the construction of the marine infrastructure of the Project. It is anticipated that current acoustic data can be obtained from existing data sources including existing hydrophone networks such as Oceans Network Canada. In addition, project specific data will be collected.

Marine Bird Surveys

Marine birds, shorebirds and waterfowl (e.g., ducks, geese, swans, grebes, gulls, murres, murrelets, phalaropes, plovers, sandpipers, and cormorants) are important components of the biodiversity of the coast around Prince Rupert. Shore-based stationary point counts and fixed-width boat transects will be used to assess bird use of the shoreline and near-shore waters in proximity to the Project, based on methods described in Resources Inventory Committee (1997). The marine birds survey will collect data regarding presence and location of marine bird species at risk, and marine birds protected by legislation.

5.4.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Marine Resources VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 22: Potential Project-related Effects Associated with Marine Resources

Project Activity/Interaction	Potential Project-related Effect Marine Resources
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Change in marine water quality; Alteration of habitat for marine birds; and Disturbance and displacement of marine birds.
Site grading, including blasting, and fill	Discharge from surface water or storm water may impact water quality in the marine environment; Potential for impacts on marine habitat from reduced freshwater discharge to intertidal habitat; Alteration of habitat for marine birds; and Disturbance and displacement of marine birds.
Construction of marine jetty and berths	Change in marine water quality, alteration and loss of subtidal and intertidal fish habitat; Harm or change in behaviour to fish and marine mammals from underwater noise; Increased marine traffic; Potential for injury or direct mortality of fish, invertebrates, and disturbance or injury to marine mammals; Alteration of habitat for marine birds; and Disturbance and displacement of marine birds.
Dredge and disposal of dredgeate	Change in marine water quality; Deposit of potentially deleterious materials and alteration of fish habitat; Direct mortality of fish, invertebrates, and disturbance or injury to marine mammals; Disturbance in behaviour from underwater noise; and Increased marine traffic; Alteration of habitat for marine birds; and Disturbance and displacement of marine birds.
Reclamation and clean up	Potential for change in marine water quality; Alteration of habitat for marine birds; and Disturbance and displacement of marine birds.
Commissioning, systems testing, including hydrotesting	Interaction with marine water, potential change in marine water quality related to discharge of hydrotest sea water (if sea water is used).
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

Table 22 (Cont'd): Potential Project-related Effects Associated with Marine Resources

Project Activity/Interaction	Potential Project-related Effect Marine Resources
Operations	
Vessel berthing	Alteration of subtidal fish habitat (shade effects); Potential for temporary increase in underwater noise; Increased marine traffic resulting in vessel strike risk for marine mammals; Change in water quality; and Disturbance and displacement of marine birds.
Cargo loading	Potential for deleterious materials to be deposited; and Disturbance and displacement of marine birds.
General terminal operations (24 hours, 365 days) (power, lighting, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Discharge from surface water or storm water may affect water quality in the marine environment; Potential disruption to alongshore juvenile salmon movement; Shading of benthic habitats; and Lighting effects on fish.
Associated off-site rail and shipping activities	Increased marine traffic resulting in potential for vessel strike risk for marine mammals; Disturbance in behaviour from underwater noise; and Disturbance and displacement of marine birds.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Removal of jetty topside	Construction related marine traffic; Alteration of habitat for marine birds; and Disturbance and displacement of marine birds.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

5.4.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.4.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

1 Criteria for the Characterization of Residual Effects for Marine Habitats

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below environmental regulatory thresholds and does not affect the ongoing viability of Marine Habitats. **Moderate:** a measurable change from existing baseline conditions that is below but approaching environmental regulatory thresholds but does not affect the ongoing viability of Marine Habitats. **High:** a measurable change from existing baseline conditions that is above population or ecosystem and/or regulatory thresholds and adversely affects the ongoing viability of Marine Habitats.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (or a similar period of time during operations) and is predicted to return to existing baseline conditions within two years with no lasting effect. **Long term:** residual effect continues for more than two years before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs as a single event. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Short term**: effect will recover to existing baseline in less than one year. **Medium term**: effect will recover to existing baseline between one and five years. **Long term**: effect will recover to existing baseline in more than five years. **Irreversible**: effect is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low Sensitivity:** the VC has little or no unique attributes and/or has a high capacity to recover from a perturbation resulting from Project effects. **Moderate Sensitivity:** the VC has some unique attributes and/or has a moderate capacity to recover from a perturbation resulting from Project effects. **High Sensitivity:** the VC has unique attributes and/or has a low capacity to recover from a perturbation resulting from Project effects.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

Criteria for the Characterization of Residual Effects for Marine Mammals, including Species at Risk

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below environmental and/or regulatory thresholds and does not affect the ongoing viability of Marine Mammals, including Species at Risk **Moderate:** a measurable change from existing baseline conditions that is approaching environmental and/or regulatory thresholds but does not affect the ongoing viability of Marine Mammals, including Species at Risk. **High:** a measurable change from existing baseline conditions that is above environmental and/or regulatory thresholds and adversely affects the ongoing viability of Marine Mammals, including Species at Risk.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (i.e., less than 2 years) or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** residual effect continues for more than two years before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** effect will recover to existing baseline conditions after decommissioning phase or sooner. **Partially reversible:** effect will partially recover to existing baseline conditions after decommissioning phase or sooner. **Irreversible:** effect is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for the VC to recover from a perturbation, with a consideration of the baseline disturbance. **Moderate resilience:** moderate capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance. **High resilience:** high capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence) **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence) **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)

1 Criteria for the Characterization of Residual Effects for Marine Sediment Quality

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below environmental and/or regulatory thresholds (i.e., CCME). **Moderate**: a measurable change from existing baseline conditions that is below but approaching environmental and/or regulatory thresholds (i.e., CCME). **High**: a measurable change from existing baseline conditions that is above environmental and/or regulatory thresholds (i.e., CCME).
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (i.e., less than 2 years), or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** residual effect continues for more than two years after the Project construction phase, or continues during Project operation and decommissioning phases, before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** effect will recover to existing baseline conditions after decommissioning phase or sooner. **Partially reversible:** effect will partially recover to existing baseline conditions after decommissioning phase or sooner **Irreversible:** effect is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for the VC to recover from a perturbation, with a consideration of the baseline disturbance. **Moderate resilience:** moderate capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance. **High resilience:** high capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence) **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence) **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)

1 Criteria for the Characterization of Residual Effects for Marine Water Quality

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below environmental and/or regulatory thresholds (i.e., CCME). **Moderate:** a measurable change from existing baseline conditions that is below but approaching environmental and/or regulatory thresholds (i.e., CCME). **High:** a measurable change from existing baseline conditions that is above environmental and/or regulatory thresholds (i.e., CCME).
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects are contained within the RSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (i.e., less than 2 years) or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** residual effect continues for more than two years after the Project construction phase, or continues during Project operation and decommissioning phases, before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** effect will recover to existing baseline conditions after decommissioning phase or sooner. **Partially reversible:** effect will partially recover to existing baseline conditions after decommissioning phase or sooner **Irreversible:** effect is permanent
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for the VC to recover from a perturbation, with a consideration of the baseline disturbance **Moderate resilience:** moderate capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance. **High resilience:** high capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence) **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence) **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)

1 Criteria for the Characterization of Residual Effects for Marine Fish and Invertebrates

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below environmental and/or regulatory thresholds and does not affect the ongoing viability of Marine Fish and Invertebrates. **Moderate:** a measurable change from existing baseline conditions that is below but approaching environmental and/or regulatory thresholds but does not affect the ongoing viability of Marine Fish and Invertebrates**.** **High:** a measurable change from existing baseline conditions that is above environmental and/or regulatory thresholds and adversely affects the ongoing viability of Marine Fish and Invertebrates.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (i.e., less than two years) or a similar period of time during operations, and is predicted to return to existing baseline conditions within two years with no lasting effect. **Long term:** residual effect continues for more than two years after the Project construction and/or decommissioning phases, before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously.
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Low:** the VC has little or no unique attributes and/or has a high capacity to recover from a perturbation resulting from Project effects. **Moderate:** the VC has some unique attributes and/or has a moderate capacity to recover from a perturbation resulting from Project effects. **High:** the VC has unique attributes and/or has a low capacity to recover from a perturbation resulting from Project effects.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low sensitivity:** the VC has little or no unique attributes and/or has a high capacity to recover from a perturbation resulting from Project effects. **Moderate sensitivity:** the VC has some unique attributes and/or has a moderate capacity to recover from a perturbation resulting from Project effects. **High sensitivity:** the VC has unique attributes and/or has a low capacity to recover from a perturbation resulting from Project effects.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence) **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence) **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)

1 Criteria for the Characterization of Residual Effects for Marine Birds

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no measurable change within the LSA. **Low:** the incremental change to marine birds and their habitat will be minor, remaining below a level of effect that would pose a threat to the sustainability of these resources in the LSA. **Moderate:** the incremental change to marine birds and their habitat will result in a clearly defined change, but remain below a level of effect that could pose a threat to the sustainability of these resources in the LSA. **High:** the incremental change to marine birds and their habitat will result in a clearly defined change that could pose a threat to the sustainability of these resources in the LSA.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects extend beyond the Project footprint but are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** the effect is expected to last up to 2 years/breeding seasons. **Medium term:** the effect is expected to last more than 2 years/breeding seasons but not more than 5 years/breeding seasons. **Long term:** the effect is expected to last more than 5 years/breeding seasons but not more than 50 years/breeding seasons (i.e., following Project closure). **Permanent:** the effect is expected to last beyond Project closure and for the foreseeable future.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** marine birds will fully recover following decommissioning. **Partially reversible:** marine birds will partially recover following decommissioning. **Irreversible:** effect to marine birds is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **Moderate resilience:** moderate capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **High resilience:** high capacity to resist being changed and/or recover from that change after being subjected to a disturbance.
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

Determination of Significance

Subcomponent	Threshold of Significance
Marine Habitats (including foreshore and shallow subtidal)	**Significant:** A high probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot be technically mitigated.
Marine Mammals, including Species at Risk	**Significant:** any residual effect with a high likelihood of causing harm to species including Species at Risk included under Schedule 1 of SARA, or those with relevant risks identified by COSEWIC. An adverse residual effect on the acoustic environment to Marine Mammals is considered significant if there is an increase in the overall underwater noise levels during facility construction and operation such that levels exceed the accepted underwater levels for injury or disturbance to marine mammals.
Marine Sediment Quality	**Significant:** Any residual effect with a high likelihood of a long term exceedance of established CCME thresholds from baseline.
Marine Water Quality	**Significant:** any residual effect with a high likelihood of a long term exceedance of established CCME thresholds from baseline.
Marine Fish and Invertebrates	**Significant:** A high probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot be technically mitigated.
Marine Birds	**Significant:** Residual effects are considered significant if they are predicted to exceed the resilience and adaptability limits of a marine bird population and result in a population within the RSA that is not self-sustaining.

5.4.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures, and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.5. Soils and Terrain

The Soils and Terrain effects evaluation will be conducted to assess the Project-related effects on the following subcomponents:

- Soils, including potential effects on soil quality; and
- Terrain, including potential effects related to terrain stability.

5.5.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 23 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 23: Soil and Terrain Local and Regional Study Boundaries

VC	LSA	RSA
Soil and Terrain	The LSA will be defined as the Vopak landside Project footprint in order to capture all areas disturbed by the project. This LSA supports the quantification of the spatial extent of terrain/soil loss.	The RSA will be defined as all of Ridley Island.

The potential effects specific to the Project are based on the main phases of the Project:

- Two years– Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

Potential effects on soils during the phases of the Project from potential accidental spills or leaks will be assessed in the Accidents and Malfunctions section of the EEE/Application.

5.5.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 24: Indicators of VC assessments

VC	Subcomponents	Indicators	Linked VCs
Soil and Terrain	Soil Quality	Soil contaminants	• Terrestrial Resources; and • Air Quality.
	Terrain	Terrain stability Spatial extent of Project footprint	• Terrestrial Resources.

5.5.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment, Winnipeg Manitoba, including updates to 2015
Canadian Soil Quality Guidelines
Canada Wide Standards for Petroleum Hydrocarbons in Soil, Canadian Council of Ministers of the Environment, Winnipeg, Manitoba, January 1, 2008
British Columbia Contaminated Sites Regulation, B.C. Reg. 375/96, including amendments up to B.C. Reg. 253/2016, November 1, 2017 British Columbia Contaminated Sites Regulation Commercial Land standards are considered applicable for the majority of municipal landfills in BC and may be applicable for the Project during handling and management of excess soils generated during construction work.

5.5.4. Baseline Assessment

For each selected VC, the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

The baseline information that will support the assessment of Soils and Terrain VC is listed in the table below.

Existing Information/Data Sources

Data/Information
iMapBC (DataBC 2018)
Golder Associates. 2009. Onshore Geophysical Investigation, Ridley Island, British Columbia. Prepared for Canpotex Terminals Limited.
Trow Associates. 2009. Geotechnical Investigation for Proposed Transportation Corridor, Ridley Island, BC. Prepared for PRPA
Geological Survey of Canada, GEOSCAN Database, mapsheet 1557a
Geological Survey of Canada, GEOSCAN Database, mapsheet 1472a
Stantec. 20111. Environmental Impact Statement, Canpotex Potash Export Terminal and Ridley Island Road, Rail and Utility Corridor, Ridley Island, Prince Rupert, B.C. 555p.
SNC-Lavalin. 2015. Limited Phase II Environmental Site Assessment, Ridley Terminal Inc. Coal and Petroleum Coke Storage/Transfer Facility, Ridley Island, Prince Rupert, BC – DRAFT.
SNC-Lavalin. 2016. Limited Phase I Environmental Site Assessment, Ridley Terminal Inc. Coal and Petroleum Coke Storage / Transfer Facility, Ridley Island, Prince Rupert, BC – DRAFT.

Field and Desktop Studies

The EEE/Application will incorporate findings of past studies listed above, as well as results from geotechnical investigations planned for the landside footprint in 2018. The geotechnical investigation will profile the chemistry of the soil, subsurface stratigraphy, including bedrock depth in the location of the tank farm/facility footprint.

5.5.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Soils and Terrain VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 25: Potential Project-related Effects Associated with Soils and Terrain

Project Activity/Interaction	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Reduced permeability or loss of permeability as a result of soil removal. Disturbance of potentially contaminated soil within the site clearing boundaries.
Site grading, including blasting, and fill	Soil compression resulting in reduced permeability or complete loss of permeability. Accidental introduction of contaminated fill for site grading.
Construction of Project facilities on land (civil, mechanical and electrical & instrumental work)	Soil compression resulting in reduced permeability or complete loss of permeability.
Construction of marine jetty and berths	Potential for the introduction of untreated contaminated sediment to the on-site disposal area at Ridley Island, unless the dredge material is disposed of at sea.
Reclamation and clean up	Potential effects on soil quality from construction equipment.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
General terminal operations	Assessment of effects related to potential deposition of Project emissions as determined in Air Quality assessment.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Cleaning of tanks and infrastructure	Potential effects on soil quality.
Soil sampling and soil remediation if required	Potential effects on soil quality.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

5.5.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.5.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects for Soil Quality

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** differs from the average value for baseline conditions but remains within the range of natural variation and below a guideline or threshold value. **Moderate:** differs substantially from the average value for baseline conditions and approaches the limits of natural variation, but equal to, or slightly above, a guideline or threshold value. **High:** differs substantially from baseline conditions and is beyond a guideline or threshold value, resulting in a detectable change beyond the range of natural variation.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** restricted to construction and/or decommissioning phases (i.e., less than 2 years) or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** continues for more than two years before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** baseline conditions are fully re-established after decommissioning phase or sooner. **Partially reversible:** baseline conditions are partially re-established after decommissioning phase or sooner**.** **Irreversible:** change is permanent.

Criteria for the Characterization of Residual Effects for Soil Quality (Cont'd)

Criteria	Description	Definitions
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for the soil quality to recover from change, with a consideration of the baseline disturbance. **Moderate resilience:** moderate capacity for the soil quality to recover from change, with a consideration of the baseline disturbance. **High resilience:** high capacity for the soil quality to recover from change, with a consideration of the baseline disturbance.
Likelihood of Residual Effect		
Likelihood	whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence) **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence) **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)

Criteria for the Characterization of Residual Effects for Terrain

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** differs from the average value for baseline conditions but remains within the range of natural variation and below a guideline or threshold value. **Moderate:** differs substantially from the average value for baseline conditions and approaches the limits of natural variation, but equal to, or slightly above, a guideline or threshold value. **High:** differs substantially from baseline conditions and is beyond a guideline or threshold value, resulting in a detectable change beyond the range of natural variation.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** restricted to construction and/or decommissioning phases (i.e., less than 2 years) or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** continues for more than two years before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** baseline conditions are fully re-established after decommissioning phase or sooner. **Partially reversible:** baseline conditions are partially re-established after decommissioning phase or sooner**.** **Irreversible:** change is permanent.

Criteria for the Characterization of Residual Effects for Terrain (Cont'd)

Criteria	Description	Definitions
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for terrain stability to be maintained, with a consideration of the baseline condition. **Moderate resilience:** moderate capacity for terrain stability to be maintained, with a consideration of the baseline condition. **High resilience:** high capacity for terrain stability to be maintained, with a consideration of the baseline condition.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)**.**

Determination of Significance

Subcomponent	Threshold of Significance
Soil	Residual effects have high magnitude; regional geographic extent; and could occur at any frequency. Effect is irreversible or its duration extends beyond the life of the Project, and the receiving environment has low resilience to imposed stress. Residual effects on VCs are consequential (i.e., structural and functional changes in populations, communities, and ecosystems are predicted) and are irreversible. The ability to meet land resource management plan objectives is impaired.
Terrain	

5.5.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.6. Terrestrial Resources

The Terrestrial Resources effects evaluation will include an assessment of Project-related effects on the following subcomponents:

- Wildlife and wildlife habitat;
- Vegetation; and
- Wetland function.

5.6.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 26 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 26: Terrestrial Resources Local and Regional Study Boundaries

VC	LSA	RSA
Terrestrial Resources	The lands within the Vopak land lot area, and 500 m on all sides of the land lot area.	The extent of the Kaien Landscape Unit. The landscape unit is a spatially identified area for resource management. It can be related back to landscape-level objectives and information on wildlife and ecosystems, and follows ecologically-relevant boundaries such as watersheds.

The LSA boundary was chosen because the Project LSA buffered by 500 m is sufficient to capture local Project-related effects for the majority of terrestrial resources, based upon the existing habitat, the type of proposed development, and the terrestrial resources that will be affected by the Project (Wilson 2016). Most of the area more than 500 m to the north of the proposed LSA is already developed industrial land. Baseline information indicates that there is little to no use of Ridley Island by wide-ranging wildlife (e.g., grizzly bear) due to the current level of human disturbance. The RSA boundary was chosen as it is the planning area under a single jurisdiction, in which the Project is located.

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.6.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 27: Indicators of Terrestrial Resources assessment

Valued Component	Subcomponents	Indicators	Linked VCs
Terrestrial Resources	Wildlife and Wildlife Habitat (including non-marine birds, migratory birds, and species at risk)	• Quantity and distribution of suitable habitat and sensitive habitat features. • Quantity and distribution of identified critical habitat or residences for federal species at risk. • Relative abundance and distribution of wildlife, including birds protected under MBCA Mortality risk.	• Air Quality; • Noise; • Ambient Light/Visual Quality; • Soils; • Freshwater Fish and Fish Habitat (surface water quality); and • Marine Resources.
	Vegetation (including rare vascular plants, rare non-vascular plants, and rare lichens)	• Quantity and distribution of terrestrial ecosystems. • Quantity and distribution of terrestrial ecosystems at risk. • Presence and distribution of vegetation species at risk.	• Air Quality; • Soils; and • Freshwater Fish and Fish Habitat (Surface Water Quality)
	Wetlands and Wetland Function	• Quantity and distribution of wetland ecosystems (by class). • Hydrological and biogeochemical functions of wetland ecosystems. • Habitat functions of wetland ecosystems, including relative abundance and distribution of migratory birds and species at risk in wetland ecosystems.	• Freshwater Fish and Fish Habitat • Marine Resource (Marine Habitat, Marine Birds) • Terrestrial Resources (Vegetation, Wildlife) • Air Quality

5.6.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Species at Risk Act
Migratory Birds Convention Act, 1994
Migratory Birds Regulation
Best Management Practices for Bats in British Columbia - 2016
Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia
Government of Canada. 1991. Federal Policy on Wetland Conservation
Government of Canada. Species at Risk Act Permitting Policy [Proposed]. Species at Risk Act: Policies and Guidelines Series. Government of Canada, Ottawa. 12 pp + Annex. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/permits-agreements-exceptions/proposed-policy-2016.html.

Relevant Guidelines and Legislation (Cont'd)

Guidance and Legislation
Guidelines for Amphibian and Reptile Conservation During Urban and Rural Development in British Columbia - 2014
Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia - 2013
National Wetlands Working Group, 1997. The Canadian Wetland Classification System. Second Edition. Wetlands Research Centre, University of Waterloo, Waterloo, Ontario.
Permits, Agreements and Exceptions for Species at Risk Act. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/permits-agreements-exceptions.html.
Reducing risk to migratory birds (Environment and Climate Change Canada)
Wetland Ecological Functions Assessment: An Overview of Approaches. 2008.
A Framework for the Scientific Assessment of Potential Project Impacts on Birds – Technical Report Series Number 508. Canadian Wildlife Service 2009.

5.6.4. Baseline Assessment

For each selected VC the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

The baseline information that will support the assessment of the Terrestrial Resources VC is listed in the table below.

Existing Information/Data Sources

Data/Information
AECOM. 2012. Prince Rupert Port Authority 2020 Land Use Management Plan. Prepared for PRPA.
AECOM. 2014. Prince Rupert LNG. Environmental Impact Statement Guidelines. Prepared for BG Group.
CEA Agency. 2016. Pacific NorthWest LNG Project. Environmental Assessment Report.
BC Conservation Data Centre. 2018. BC Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria, BC. Available: http://a100.gov.bc.ca/pub/eswp/
BC Conservation Data Centre (CDC): Conservation Data Centre Mapping Service [web application]. 2008. Victoria, British Columbia, Canada. Available: http://maps.gov.bc.ca/ess/sv/cdc/
BC Species Inventory Web Explorer (WSI database portal) http://a100.gov.bc.ca/pub/siwe/search_reset.do
Campbell, R. W., N. K. Dawe, I. McTaggert-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. E. McNall. 1990. The birds of British Columbia volume 2: nonpasserines, diurnal birds of prey through woodpeckers. UBC Press in cooperation with Environment Canada, BC Ministry of Environment, Lands and Parks, and the Royal BC Museum, Victoria, BC.
Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1997. The birds of British Columbia. Vol. 3 – Flycatchers through vireos. Royal BC Museum, Victoria and Canadian Wildlife Service, Delta, BC.

Existing Information/Data Sources (Cont'd)

Data/Information
Campbell, R.W., N.K. Dawe, I.M. Cowan, J. Cooper, G. Kaiser, A.C. Stewart, and M. McNall. 2001. The Birds of British Columbia. Volume 4. Passerines. Royal British Columbia Museum, Victoria, BC.
DataBC. 2018. iMapBC Public Mapping Application. Available: http://ilmbwww.gov.bc.ca/content/e-services/geobc/imapbc.
Ecora Resource Group Ltd. 2013. North Coast Level R Terrestrial Ecosystem Mapping – Landscape Units: Kaien, Quotoon, Scotia, Brown, Kumealon, Hevenor. Available at: https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=40877.
Jacques Whitford AXYS Ltd. 2008. Ridley Island Western Toad Survey. September 2008. Memo report to PRPA.
SNC-Lavalin Inc. 2016. Ridley Island Propane Export Terminal. Environmental Effects Determination. Prepared for AltaGas Ltd.
Stantec. 2011. Canpotex Potash Export Terminal. Environmental Impact Statement and Technical Data Reports. Prepared for Canpotex Terminals Ltd.
Stantec. 2012. Fairview Terminal Expansion. Comprehensive Study Report and Technical Data Reports. Prepared for CN Rail.
Stantec. 2014. Prince Rupert Gas Transmission Project. Application for an Environmental Assessment Certificate.
Stantec. 2016. Pacific NorthWest LNG Project. Environmental Impact Assessment and Technical Data Reports. Prepared for Pacific NorthWest LNG Limited Partnership.
Stantec. 2016a. Aurora LNG. Environmental Assessment Certificate Application and Technical Data Reports. Prepared for Nexen Energy.

Field and Desktop Studies

Additional information will be required to form the baseline and the following field programs will be used to augment the existing data.

Bat Surveys

Bat acoustic surveys will be carried out using battery-operated remote acoustic detectors to identify the presence and areas of activity for the SARA-listed little brown myotis (*Myotis lucifugus*) and other bat species in the LSA. The detectors will be deployed in a combination of foraging habitat and forested habitat. Recorded bat calls will be identified to species or species group to produce a species list of bats present on Ridley Island. In addition to acoustic data collection, targeted ground truthing for habitat features related to the suitability of the habitat for little brown myotis roosting will be conducted as described in the Terrestrial Ecosystem Mapping and Wetland Function section below.

No telemetry work to identify residences for little brown myotis (*Myotis lucifugus*) is planned at this time. Little brown myotis often day-roost in anthropogenic structures, and tree roosts usually are located in relatively large-diameter older trees with cavities, peeling bark, broken tops and other defects, in mature and overmature forest (COSEWIC 2013). The majority of the area currently proposed for Project component construction consists of coastal treed bogs dominated by small-diameter cedars, pine and young alders, which is typically poor roosting habitat for cavity-roosting bats such as little brown myotis (Van den Driessche et al. 2000; Kalcounis-Ruppell et al. 2005; Bunnell 2013; COSEWIC 2013; Broders and Forbes 2004, Jung et al. 2004, and Fabianek et al. 2015, all cited in ECCC 2018). Pacific Northwest LNG (2016) reported the results of bat surveys in the area using multiple methods, stating that the interior of Ridley Island has characteristics suggesting infrequent use by bats for roosting and foraging; no bats radio-tagged during the study were tracked back to forested habitat on Ridley Island. In addition, the use of telemetry to

identify roosts within a relatively small area is challenging, given the distance bats can travel from forage locations (often used for capture sites) to roost sites; Pacific Northwest LNG (2016) recorded little brown myotis traveling about a kilometre between capture and roost sites, but some studies have indicated daily movements of 6 km or more (COSEWIC 2013; Rainey 2018).

Western Toad Survey

Western toads (*Anaxyrus boreas*) are federally of Special Concern on *SARA's* Schedule 1. EAs of previous projects on Ridley Island have included collection of field data on toads, but additional development affecting the island's wetlands has occurred since those surveys. Western toad juvenile migration surveys will be conducted according to methods described in Resources Inventory Committee (1998b) to identify potential migration corridors of importance to toads.

Songbird Surveys

Migratory birds are protected by the *Migratory Birds Convention Act* and *Regulations*, the *BC Wildlife Act*, and some species are listed on Schedule 1 of SARA. ECCC also identifies migratory bird use of wetlands as an important component for wetland function. Variable Radius Point Count surveys spaced at 200 m intervals along stratified transects will be conducted to assess songbird diversity and relative abundance, following methods described in Resources Inventory Committee (1999).

Common Nighthawk Survey

The Common Nighthawk (*Chordeiles minor*) is a *SARA*-listed bird species that often nests in areas with limited overhead vegetation cover (e.g., anthropogenic sites, fields, wetlands). Targeted surveys for nighthawks will be used to assess presence and distribution in the LSA. Nighthawk surveys will be carried out using methods described in Knight (2018), using a two-person crew to conduct unlimited radius point count surveys.

Swift and Swallow Surveys

Surveys for swifts and swallows will be conducted following relative abundance methods described in RIC (1998). Surveys will involve a crew of two persons conducting unlimited radius point-counts, recording all swifts and swallows observed during a three-minute time period at each point.

Western Screech-owl Survey

Call-playback surveys will be conducted for Western Screech-owls to assess their occupancy status in the LSA. Surveys will follow call-playback methods described in Hausleitner (2006) and will be completed by a crew of two persons conducting call playback stations separated by 400 m. The objective of Western Screech-owl call-playback surveys are to provide baseline information on occupancy of the LSA by this species, consistent with provincial inventory standards (Hausleitner 2006). As per discussions with ECCC, surveys will occur during a period consistent with the peak calling period of April 9 to May 8 identified by Kissling and Lewis (2009). Follow-up surveys to confirm nesting status will not be conducted due to potential for disturbance of nesting individuals.

Terrestrial Ecosystem Mapping and Wetland Function

Terrestrial Ecosystem Mapping (TEM) was prepared for the surrounding North Coast Timber Sales Area in 2013 at a scale of 1:20,000. For the EEE/Application, the 2013 TEM will be utilized and updated based on recent changes to ecosystems and land use in the Project area. The updates will be completed using recent aerial and satellite imagery to edit polygon line work and TEM database attributes, followed by field plots to confirm the accuracy of the changes. Field data collection will follow provincially developed methodology (BC Ministry of Forests and Range and BC Ministry of Environment 2010). Incidental wildlife observations

will also be recorded. The updated TEM will be used to quantify vegetation communities, ecosystems and wildlife habitat that will be affected by the Project.

TEM fieldwork will also include data collection to refine information on wetland classification and function within the Project area. The Federal Policy on Wetland Conservation (Government of Canada 1991) includes the objective of no net loss of wetland functions on all federal lands and waters. Information on wetland classification and function will assist with addressing their concerns and for determining appropriate mitigation and compensation, if required.

Wildlife Habitat Suitability Mapping

Habitat suitability is "the ability of the habitat in its current condition to provide the life requisites of a species" (RIC 1999). Wildlife habitat suitability mapping will be completed following methods outlined in RIC (1999). Based on existing knowledge of habitat preferences, ratings will be applied to ecosystem units within the TEM to produce a ratings table that indicates the relative potential for each unit (in its current state) to support the species. Ratings will be assigned using either a four-class or six-class suitability scheme, reflecting the amount of knowledge available for assessing each species' habitat requirements (Table 28).

Table 28: Rating schemes used to rate habitat suitability for the Project

% of Best Habitat in Province	Rating	6-Class Code	4-Class Code
100 – 76	High	1	H
75 – 51	Moderately High	2	M
50 – 26	Moderate	3	
25 – 6	Low	4	L
5 – 1	Very Low	5	
0	Nil	6	N

Wildlife habitat suitability mapping will be completed for six species to support the assessment of Project effects to Terrestrial Resources:

- Common Nighthawk (Chordeiles minor);
- Little brown myotis (Myotis lucifugus);
- Marbled Murrelet (Brachyramphus marmoratus);
- Olive-sided Flycatcher (Contopus cooperi);
- Western Screech-owl (Megascops kennicottii ssp. kennicottii); and
- Western toad (Anaxyrus boreas).

Rare Plant Survey

Surveys for rare plants were previously done on Ridley Island; however most of the detailed data for these surveys are not anticipated to be available. In addition, at-risk status of vegetation has changed in the interim from previous baseline data collection to the present, introducing new species to the at-risk list that were not searched for during past assessments. Surveys for rare plants (including rare vascular plants, rare non-vascular plants, and rare lichens) are planned to be undertaken to identify rare plant species that may be affected by the Project and to assist with designing mitigation. The EEE/Application will include the

results from systematic transect surveys throughout the LSA. Rare plants observed will be recorded, and voucher specimens will be collected as needed to identify the plants in the office.

5.6.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Terrestrial Resources VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 29: Potential Project-related Effects Associated with Terrestrial Resources

Project Activity/Interaction	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Loss of habitat for wildlife and vegetation; loss of wetland function; mortality of wildlife, disturbance and displacement of wildlife.
Construction road traffic	Mortality of wildlife due to collisions, disturbance and displacement of wildlife from traffic noise and light.
Site grading, including blasting, and fill	Mortality of wildlife, disturbance and displacement of wildlife due to noise and human presence.
Construction of Project facilities on land (civil, mechanical and electrical & instrumental work)	Mortality of wildlife, disturbance and displacement of wildlife due to noise and human presence.
Construction of marine jetty and berths	Mortality of wildlife, disturbance and displacement of wildlife due to noise.
Reclamation and clean up	Mortality of wildlife, disturbance and displacement of wildlife due to noise.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
Railway operations associated with inbound train unloading and outbound train staging	Mortality of wildlife due to train collisions, disturbance and displacement of wildlife due to noise, vibration and artificial light
LPG cooling process	Disturbance and displacement of wildlife due to noise. Effects of Project-related emissions on wildlife and vegetation.
Vessel berthing	Disturbance and displacement of wildlife due to vessel movement, noise and artificial light
Cargo loading	Disturbance and displacement of wildlife due to human presence, noise and artificial light
General terminal operations (24 hours, 365 days) (power, lighting, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Mortality of wildlife due to vehicle collisions, disturbance and displacement of wildlife due to human presence, noise and artificial light. Potential mortality or health effects from heat/emissions to birds and bats flying over the stack during the flaring activity. Effects of Project-related emissions on wildlife and vegetation.

Table 29 (Cont'd): Potential Project-related Effects Associated with Terrestrial Resources

Project Activity/Interaction	Potential Project-related Effect
Operations	
Routine maintenance and inspections	Mortality of wildlife, disturbance and displacement of wildlife due to noise and human presence
Associated off-site rail and shipping activities	Mortality of wildlife, disturbance and displacement of wildlife, introduction of invasive species
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Cleaning of tanks and infrastructure	Disturbance and displacement of wildlife due to human presence, noise and artificial light
Removal of tanks and infrastructure	Disturbance and displacement of wildlife due to noise and human presence.
Removal of buildings and utilities infrastructure	Disturbance and displacement of wildlife due to noise and human presence, introduction of invasive species.
Removal of jetty topside	Disturbance and displacement of wildlife due to noise and human presence, introduction of invasive species.
Soil sampling and soil remediation if required	Mortality of wildlife, disturbance and displacement of wildlife, introduction of invasive species.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

5.6.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.6.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

1 Criteria for the Characterization of Residual Effects for Wildlife and Wildlife Habitat

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no measurable change within the LSA. **Low:** the incremental change to wildlife and wildlife habitat will be minor, remaining below a level of effect that would pose a threat to the sustainability of these resources in the LSA. **Moderate:** the incremental change to wildlife and wildlife habitat will result in a clearly defined change, but remain below a level of effect that could pose a threat to the sustainability of these resources in the LSA. **High:** the incremental change to wildlife and wildlife habitat will result in a clearly defined change that could pose a threat to the sustainability of these resources in the LSA.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects extend beyond the Project footprint but are contained within the terrestrial LSA. **Regional**: effects extend beyond the terrestrial LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** the effect is expected to last up to 2 years/breeding seasons. **Medium term:** the effect is expected to last more than 2 years/breeding seasons but not more than 5 years/breeding seasons. **Long term:** the effect is expected to last more than 5 years/breeding seasons but not more than 50 years/breeding seasons (i.e., following Project decommissioning)**.** **Permanent**: the effect is expected to last beyond Project decommissioning and for the foreseeable future.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once or very few times during the life of the Project. **Infrequent:** occurs at multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. r **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** wildlife and wildlife habitat will fully recover following decommissioning. **Partially reversible:** wildlife and wildlife habitat will partially recover following decommissioning. **Irreversible:** effect to wildlife and wildlife habitat is permanent
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **Moderate resilience:** moderate capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **High resilience:** high capacity to resist being changed and/or recover from that change after being subjected to a disturbance.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

1 Criteria for the Characterization of Residual Effects for Vegetation

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no measurable change within the LSA. **Low:** the incremental change to terrestrial ecosystems, ecological communities at risk or vegetation species at risk will be minor, remaining below a level of effect that would pose a threat to the sustainability of these resources in the LSA. **Moderate:** the incremental change to terrestrial ecosystems, ecological communities at risk or vegetation species at risk will result in a clearly defined change, but remain below a level of effect that could pose a threat to the sustainability of these resources in the LSA. **High:** the incremental change to terrestrial ecosystems, ecological communities at risk or vegetation species at risk will result in a clearly defined change that could pose a threat to the sustainability of these resources in the LSA.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects extend beyond the Project footprint but are contained within the terrestrial LSA. **Regional**: effects extend beyond the terrestrial LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** the effect is expected to last up to 2 years. **Medium term:** the effect is expected to last more than 2 years but not more than 5 years. **Long term:** the effect is expected to last more than 5 years but not more than 50 years (i.e., following Project closure)**.** **Permanent**: the effect is expected to last beyond Project closure and for the foreseeable future.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions and irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** vegetation resources will fully recover following decommissioning. **Partially reversible:** vegetation resources will partially recover following decommissioning. **Irreversible:** effect to vegetation resources is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **Moderate resilience:** moderate capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **High resilience:** high capacity to resist being changed and/or recover from that change after being subjected to a disturbance.
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

1 Criteria for the Characterization of Residual Effects for Wetlands and Wetland Function

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no measurable change within the LSA. **Low:** the incremental change to wetlands and wetland function will be minor, remaining below a level of effect that would pose a threat to the sustainability of wetlands and wetland functions in the LSA. **Moderate:** the incremental change to wetlands and wetland function will result in a clearly defined change, but remain below a level of effect that could pose a threat to the sustainability of wetlands and wetland functions in the LSA. **High:** the incremental change to wetlands and wetland function will result in a clearly defined change that could pose a threat to the sustainability of wetlands and wetland functions in the LSA.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects extend beyond the Project footprint but are contained within the terrestrial LSA. **Regional**: effects extend beyond the terrestrial LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** the effect is expected to last up to 2 years. **Medium term:** the effect is expected to last more than 2 years but not more than 5 years. **Long term:** the effect is expected to last more than 5 years but not more than 50 years (i.e., following Project closure)**.** **Permanent**: the effect is expected to last beyond Project closure and for the foreseeable future.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions and irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** wetlands and wetland functions will fully recover following decommissioning. **Partially reversible:** wetlands and wetland functions will partially recover following decommissioning. **Irreversible:** effect to wetlands and wetland function is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **Moderate resilience:** moderate capacity to resist being changed and/or recover from that change after being subjected to a disturbance. **High resilience:** high capacity to resist being changed and/or recover from that change after being subjected to a disturbance.
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence), **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

Determination of Significance

Subcomponent	Threshold criteria
Wildlife and Wildlife Habitat	Residual effects are considered significant if they are predicted to exceed the resilience and adaptability limits of a wildlife population and result in a population within the RSA that is not self-sustaining.
Vegetation	Residual effects to vegetation are considered significant if a terrestrial ecosystem, ecological community at risk or vegetation species at risk is predicted to no longer be self-sustaining in the RSA.
Wetlands and Wetland Function	Residual effects to wetlands and wetland function are significant if they result in an unmitigated net-loss of wetland area or wetland functions for ecologically important wetlands.

5.6.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.7. Freshwater Fish and Fish Habitat

The Freshwater Fish and Fish Habitat effects evaluation will assess the potential Project-related effects on freshwater fish and fish habitat including ground and surface water quality.

5.7.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 30 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 30: Freshwater Fish and Fish Habitat Local and Regional Study Boundaries

VC	LSA	RSA
Freshwater Fish and Fish Habitat	The LSA will include the Vopak Land Lot area and include the path of surface watercourses flowing out of the project lot area. This LSA was selected as waters on Ridley Island were classified as non-fish bearing by DFO and only waters directly flowing to and from the Project would be relevant to the assessment of effects on freshwater quality.	Freshwater bodies on Ridley Island to demonstrate representative change in availability of freshwater habitat. The RSA captures potential Project-related changes to freshwater habitat quality and quantity in relation to total similar habitat on Ridley Island.

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.7.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 31: Indicators of Freshwater Fish and Fish Habitat assessment

VC	Subcomponents	Indicators	Linked VCs
Freshwater Fish and Fish Habitat	Ground and Surface Water Quality	Ground and surface water quality parameters (such as metals, nutrients, contaminants, and in-situ measurements, e.g., pH, temperature, dissolved oxygen, turbidity)	• Marine Resources; • Terrestrial Resources (i.e., Wetland function); • Soils and Terrain; • Human Health; and • Air Quality.
	Freshwater Fish and Fish Habitat	Fish presence/absence Habitat quality & quantity	

5.7.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Resources Inventory Standards Committee. 2001. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Manual.
Johnston and Slaney. 1996.Level 1 Fish Habitat Assessment Procedure
BC Ministry of Environment, Lands and Parks. 1997. Fish Collection Methods and Standards, Aquatic Ecosystems Task Force.
BC Ministry of Environment, Lands and Parks. 1999a. Overview Fish and Fish Habitat Inventory Methodology.
BC Ministry of Environment, Lands and Parks. 1999b. Freshwater Biological Sampling Manual.
Resources Inventory Standards Committee, Ministry of Environment Science and Information Branch. Manual of British Columbia Hydrometric Standards.
Fisheries Act
Canadian Environmental Protection Act, 1999
Species at Risk Act
Migratory Birds Convention Act, 1994

5.7.4. Baseline Assessment

For each selected VC, the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed; and
- Additional studies conducted, when required, to define the existing conditions.

Information Sources

The baseline information that will support the assessment of Freshwater Resources VC are listed in the table below.

Existing Information/Data Sources

Data/Information
Golder Associates. 2009. Onshore Geophysical Investigation, Ridley Island, British Columbia. Prepared for Canpotex Terminals Limited.
Trow Associates. 2009. Geotechnical Investigation for Proposed Transportation Corridor, Ridley Island, BC. Prepared for PRPA.
AECOM. 2012. Prince Rupert LNG. Environmental Impact Statement Guidelines. Prepared for BG Group.
CEA Agency. 2016. Pacific NorthWest LNG Project. Environmental Assessment Report.
Ambach, M. and J. Casey. 2011. Final Report: Identification and mapping of fish habitat within and around Prince Rupert Harbour. February 2011. WWF-Canada North Coast Program.
SNC-Lavalin Inc. 2016. Ridley Island Propane Export Terminal. Project Description. Prepared for AltaGas Ltd.

Existing Information/Data Sources (Cont'd)

Data/Information
Stantec. 2011. Canpotex Potash Export Terminal. Environmental Impact Statement and Technical Data Reports. Prepared for Canpotex Terminals Ltd.
Stantec. 2016. Pacific NorthWest LNG Project. Environmental Impact Statement and Technical Data Reports. Prepared for Pacific NorthWest LNG Limited Partnership.
Stantec. 2016b. Aurora LNG. Environmental Assessment Certificate Application and Technical Data Reports. Prepared for Nexen Energy.
WorleyParsons. 2012. Ridley Terminals Expansion. Parcel A and Energy Bulk Export Terminal Pre-Feasibility Study.

Field and Desktop Studies

The EEE/Application will incorporate information from existing reports relevant to the VC and subcomponents. Existing information is being used to inform baseline conditions as well as identify need for additional information. Additional information needs identified will be fulfilled with field based surveys. A fish and fish habitat survey will characterize potential fish and fish habitat for the EEE/Application. The abundance, distribution and species life-history phases using different habitat types will be assessed using standard provincial fish sampling and habitat assessment techniques i.e., RISC 2001.

The survey will verify and confirm the fish bearing status of watercourses (i.e., presence/absence) on the Vopak Project Land Lot Area. Both in-situ water quality measurements and chemistry grab samples will be collected.

Water quality will be compared to BC and CCME WQGs for protection of freshwater aquatic life (MOE 2015, 2016, 20-17).

Additionally, the known stream to the southwest of the Vopak Project will also be investigated for the presence of spring spawners (i.e., sea-run cutthroat trout) as the stream may be subject to direct or indirect effects from the Project.

5.7.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Freshwater Fish and Fish Habitat VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 32: Potential Project-related Effects Associated with Freshwater Fish and Fish Habitat

Project Activity/Interaction	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Change in water quality, surface water drainage, Increased sediment and erosion risk
Site grading, including blasting, and fill	Change in water quality, surface water drainage, Increased sediment and erosion risk
Construction of Project facilities on land (civil, mechanical and electrical & instrumental work)	Change in water quality, surface water drainage, Increased sediment and erosion risk
Commissioning, systems testing, including hydrotesting	Interaction with freshwater, potential change in freshwater quality related to discharge of hydrotest freshwater (if freshwater is used).
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
General terminal operations (24 hours, 365 days) (power, lighting, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Potential change in water quality Assessment of effects related to potential deposition of Project emissions as determined in Air Quality assessment
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Soil sampling and soil remediation if required	Potential change in water quality, surface water drainage
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

5.7.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.7.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects for Ground and Surface Water Quality

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below CCME guidelines. **Moderate:** a measurable change from existing baseline conditions that is below but approaching CCME guidelines.**High**: a measurable change from existing baseline conditions that is above CCME guidelines.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (i.e. less than 2 years) or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** residual effect continues for more than two years before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** effect will recover to existing baseline conditions after decommissioning phase or sooner. **Partially reversible:** effect will partially recover to existing baseline conditions after decommissioning phase or sooner. **Irreversible:** effect is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for the VC to recover from a perturbation, with a consideration of the baseline disturbance. **Moderate resilience:** moderate capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance. **High resilience:** high capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)**.**

1 Criteria for the Characterization of Residual Effects for Freshwater Fish

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low**: a measurable change from existing baseline conditions but is below environmental and/or regulatory thresholds and does not affect the ongoing viability of Freshwater Fish. **Moderate:** a measurable change from existing baseline conditions that is below but approaching environmental and/or regulatory thresholds but does not affect the ongoing viability of Freshwater Fish. **High**: a measurable change from existing baseline conditions that is above environmental and/or regulatory thresholds and adversely affects the ongoing viability of Freshwater Fish.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained within the Project footprint. **Local:** effects are contained within the LSA. **Regional**: effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** residual effect restricted to Project construction and/or decommissioning phases (i.e., less than 2 years) or a similar period of time during operations, and is predicted to return to existing baseline conditions with no lasting effect. **Long term:** residual effect continues for more than two years before returning to existing baseline conditions. **Permanent**: residual effect is unlikely to return to existing baseline conditions.
Frequency	How often the residual effect is expected to occur	**Rare:** occurs once. **Infrequent:** occurs on multiple occasions at irregular intervals. **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** effect will recover to existing baseline conditions after decommissioning phase or sooner. **Partially reversible:** effect will partially recover to existing baseline conditions after decommissioning phase or sooner. **Irreversible:** effect is permanent.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** low capacity for the VC to recover from a perturbation, with a consideration of the baseline disturbance **Moderate resilience:** moderate capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance. **High resilience:** high capacity for the VC to recover from a perturbation, with consideration of the baseline level of disturbance.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur.	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)**.**

Determination of Significance

Subcomponent	Threshold criteria
Ground and Surface Water Quality	Any residual effect with a high likelihood of a long term exceedance of established CCME thresholds from baseline.
Freshwater Fish	Significant: Any residual effect with a high likelihood of a long term exceedance of established CCME thresholds from baseline effecting the viability of freshwater fish.

5.7.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.8. Economic Conditions

The EEE/Application will include the assessment of economic conditions. Economic conditions have been considered as important values to be assessed in the EEE/Application. The effects evaluation will assess Project-related effects on the following VC:

- Economic Conditions, scope of the VC focused on:
  - Business and local customer base;
  - Labour force competition; and
  - Financial wellbeing.

5.8.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 33 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 33: Economic Conditions VC Local and Regional Study Boundaries

VC	LSA	RSA
Economic Conditions	The LSA consists of the communities within the mainland portion of the North Coast Regional District and Kitimat-Stikine Regional District (the latter with a focus on Terrace and communities with close economic ties to the Prince Rupert area).	Same as LSA

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase;
- 12 months – Decommissioning Phase, as relevant.

5.8.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in Table 34 along with the other linked VC assessment that represent a pathway of effects.

Table 34: Indicators of the Economic Conditions VC Assessment

Valued Component	Indicators	Linked VCs
Economic Conditions	Labour market conditions (e.g., unemployment rates, wages, skills and education). Demand and supply of local goods and services (e.g., local business activity, number of local businesses registered with chamber of commerce, availability of goods and services to customer base). Financial well-being (e.g., income level, prevalence of poverty, income equality).	• Marine Resources; • Noise; and • Visual Quality.

5.8.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment.

Relevant Guidelines and Legislation

Guidance and Legislation
Guidelines for Socio-Economic and Environmental Assessment (SEEA) - Land Use Planning and Resource Management Planning, BC Ministry of Agriculture and Lands, 2007.

5.8.4. Baseline Assessment

For this VC the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

The baseline information that will support the assessment of Economic Condition VC is listed in the table below.

Existing Information/Data Sources

Data/Information
SNC-Lavalin Inc. 2016. Ridley Island Propane Export Terminal. Project Description. Prepared for AltaGas Ltd.
Stantec. 2016. Pacific NorthWest LNG Project. Environmental Impact Assessment and Technical Data Reports. Prepared for Pacific NorthWest LNG Limited Partnership
Stantec. 2016b. Aurora LNG. Environmental Assessment Certificate Application and Technical Data Reports. Prepared for Nexen Energy.
Compass Resource Management. 2014. Impact Assessment of LNG and Other Development on the Metlakatla First Nation Final Report.
Compass Resource Management. 2014. Impact Screening of the Pacific Northwest LNG Project on the Gitga'at First Nation Final Report.
Compass Resource Management. 2015. Impact Screening of the Prince Rupert LNG Project on the Gitga'at First Nation Final Report.
Canada Starts Here: The BC Jobs Plan (2011)
BC Jobs Plan 5-year Update (2017)
B.C.'s Skills for Jobs Blueprint (2014)
Northwest Regional Workforce Table Regional Skills Training Plan 2013 - 2015 (2013)
Northwest Regional Skills Training Plan: 2013-2018
City of Prince Rupert Preparing for Growth – KPMG Report (KPMG 2015)

Field and Desktop Studies

The Economic Conditions VC will form baseline information using the following methods:

The description of baseline conditions will be based on information gathered from previous EA reports, reports of government and non-profit organizations, peer-reviewed academic literature, interviews with key community stakeholders and service providers, and government statistics. The description of the baseline will disaggregate conditions for the Indigenous population from conditions for the general population to the extent that data are available.

5.8.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Economic Conditions VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 35: Potential Project-related Effects Associated with Economic Conditions

Project Activity	Potential Project-related Effect
Construction	
All Construction Activities for Project	Demand on construction labour, with potential pressure on wages with consequent effects on other employers. Demand on local businesses, with potential effects on existing and other customers. Labour income may affect (both positively and negatively) locals' financial well-being.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
All Operations Activities for Project	Demand on labour, with potential pressure on wages with consequent effects on other employers. Demand on local businesses, with potential effects on available supply for existing customers. Labour income may affect (both positively and negatively) locals' financial well-being.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
All decommissioning activities	Demand on labour, with potential pressure on wages with consequent effects on other employers. Demand on local businesses, with potential effects on available supply for existing customers. Labour income may affect (both positively and negatively) locals' financial well-being.

5.8.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.8.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects – Economic Conditions

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** Negligible change, or change in key indicator(s) within the normal range of variability (Non-low change will be described using the specific units of the indicators).
Extent	Spatial scale over which the residual effect is expected to occur	**Local:** effects are contained within the LSA. **Regional**: effects are contained within the RSA. **Extra-regional:** effects extend beyond the RSA**.**
Duration	Length of time over which the residual effect is expected to persist	**Short term:** duration of effect restricted to duration of the construction phase (i.e., less than two years) or a similar period of time during other Project phases. **Medium-term:** duration of effect extends beyond two years but less than life of the Project. **Long-term:** duration of effect extends to life of the Project or longer but is not permanent. **Permanent**: the effect is permanent.
Frequency	How often the residual effect is expected to occur	**Once:** Effect occurs once. **Infrequent:** effect occurs on multiple occasions at irregular intervals. **Frequent:** effect occurs on multiple occasions at regular intervals. **Continuous:** effect occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible**: effect can be fully reversed after cessation. **Partially reversible**: effect can be partially reversed after cessation. **Permanent**: effect is permanent and non-reversible.
Context	Sensitivity and resilience of the VC to Project-related change.	No specific terms identified for this VC. Context will be discussed based upon evidence gathered.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur	**Exceptionally unlikely:** 0 to 1% probability of occurrence. **Very unlikely:** 0 to 10% probability of occurrence. **Unlikely:** 0 to 33% probability of occurrence. **As likely as not:** 33 to 66% probability of occurrence. **Likely:** 66 to 100% probability of occurrence. **Very likely:** 90 to 100% probability of occurrence. **Virtually certain:** 99 to 100% probability of occurrence**.** **Undetermined:** inadequate evidence to make a judgement of the probability of occurrence.

Determination of Significance Criteria

VC	Threshold criteria
Economic Conditions	Balance of evidence that economic conditions are unacceptable, with particular weight given to the following benchmarks and reference points: • Regional construction wage levels relative to national and provincial levels • Viability of local businesses • Acceptable availability and cost of goods and services to local customer base • Low income prevalence relative to provincial and national rates

5.8.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.9. Social Assessment

The EEE/Application will include the assessment of social conditions. Social and community conditions have been considered as important values to be assessed in the EEE/Application. The effects evaluation will assess Project-related effects on the following VCs: Marine Use and Navigation, with the scope of the VC focused on:

- Fishing, recreation and marine use; and
- Interference on navigation.

Community Services and Infrastructure, with the scope of the VC focused on:

- Local community services and infrastructure;
- Housing; and
- Traffic.

Community Well-being, with the scope of the VC focused on:

- Social determinants of health (e.g., housing quality and low income prevalence).

Note that the assessment of Community Well-being and Community Services and Infrastructure will include consideration of any effect of temporary workers and the work camp planned to house these workers.

5.9.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 36 includes a description of the spatial assessment (both LSA and RSA) area for the VCs. All boundaries are relevant to the VC assessments to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VCs. Study boundaries are represented on maps found in Appendix A.

Table 36: Social VCs Local and Regional Study Boundaries

Valued Component	LSA	RSA
Marine Use and Navigation	The LSA includes a 5 km buffer, on either side of the centre-line of the shipping route to Triple Island to account for the two-way passing of carriers travelling along the shipping lane.	The RSA is the LSA and the area defined by the Pacific Fishery Management Area 4.
Community Services and Infrastructure	The LSA consists of the communities of Port Edward and Prince Rupert (Including Prince Rupert Airport). Highway 16 up to and including the Northwest Regional Airport Terrace Kitimat (YXT) and Mills Memorial Hospital (Terrace). The boundary is intended to capture communities in which the project will have direct interactions with the services and infrastructure provided.	The RSA is the area inclusive of the North Coast Regional District (NCRD), the Kitimat-Stikine Regional District, and the Prince Rupert Local Health Area.
Community Well-being	The LSA consists of the communities within the mainland portion of the NCRD and Kitimat-Stikine Regional District (the latter with a focus on Terrace and communities with closer economic ties to the Prince Rupert area).	Same as LSA

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.9.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 37: Indicators of Social VCs Assessment

Valued Component	Indicators	Linked VCs
Marine Use and Navigation	Shipping traffic in Prince Rupert harbour (ships per year) Marine vessel types Data on marine uses along shipping channel (i.e., fishing, CRA fisheries, aquaculture). Data on other uses (e.g., recreational boating routes, marine park locations, visitor frequency, and access) Visitor frequency, and access. Extent and area (in square metres) of the navigable channel and/or safety zone that is affected by the Project.	• Marine Resources; • Visual Quality; and • Human Health
Community Infrastructure and Services	Population and demographics Demand and supply of infrastructure and services (e.g., health care usage rates, government investment). Core Housing Need indicators - (e.g., affordability, adequacy, suitability, vacancy rates) Traffic (e.g., volume by type, accident rates)	• Community Well-being; • Economic Conditions; and • Human Health.
Community Well-being	Indicators for the Community Well-being VC will be based on those used in linked VCs. Community wellbeing is a function of peoples' physical and mental health as well as their social, economic, and environmental health. The Community Well-being VC will rely on indicators used in the other VCs.	• All other VCs are linked to the Community Well-being VC.

5.9.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VCs and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Valued Component	Guidance and Legislation
Marine Use and Navigation	*Navigation Protection Act*
	Canada Shipping Act
	Canadian Ballast Water Control and Management Regulations
	Canada Marine Act
	Marine Transportation Security Act and Regulations
	Transportation of Dangerous Goods Act and Regulations
	Canadian Ballast Water Control and Management Regulations
	Pilotage Act

Relevant Guidelines and Legislation (Cont'd)

Valued Component	Guidance and Legislation
Community Infrastructure and Services	City of Prince Rupert Official Community Plan (2007)
	District of Port Edward Official Community Plan (2013)
	BC *Residential Tenancy Act*
	BC Reg 427/83 Industrial Camp Regulations; BC Reg 411/85 Sewage Disposal Regulations; BC Reg 230/92 Safe Drinking Water Regulations
	BC *Commercial Transport Act*
	BC *Container Trucking Act*
	BC *Motor Vehicle Act*
	BC *Transportation Act*
	BC *Public Works Agreement Act*
	Standard Working Group Comments and Recommendations for Provincial Environmental Assessments in Northern British Columbia, Northern Health, April 2015.
	Northern Health: Health and Medical Services Plan Best Management Guide For Industrial Camps
	Communicable Disease Control Plan Best Management Guide for Industrial Camps
	Health and Safety During the Opioid Overdose Emergency: Northern Health's Recommendations for Industrial Camps
Community Well-being	*BC Public Health Act*
	Also as for Community Infrastructure and Services V*C*
	The social determinants of health impacts of resource extraction and development in rural and northern communities: A summary of impacts and promising practices for assessment and monitoring, Melissa Aalhus for Northern Health and the Provincial Health Services Authority, January 2018

5.9.4. Baseline Assessment

For each selected VC the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

The baseline information that will support the assessment of Social VCs is listed in the table below.

Existing Information/Data Sources

Data/Information
SNC-Lavalin Inc. 2016. Ridley Island Propane Export Terminal. Project Description. Prepared for AltaGas Ltd.
Stantec. 2016. Pacific NorthWest LNG Project. Environmental Impact Assessment and Technical Data Reports. Prepared for Pacific NorthWest LNG Limited Partnership
Stantec. 2016b. Aurora LNG. Environmental Assessment Certificate Application and Technical Data Reports. Prepared for Nexen Energy.
Compass Resource Management. 2014. Impact Assessment of LNG and Other Development on the Metlakatla First Nation Final Report.
Compass Resource Management. 2014. Impact Screening of the Pacific Northwest LNG Project on the Gitga'at First Nation Final Report.
Compass Resource Management. 2015. Impact Screening of the Prince Rupert LNG Project on the Gitga'at First Nation Final Report.
Canada Starts Here: The BC Jobs Plan (2011)
BC Jobs Plan 5-year Update (2017)
B.C.'s Skills for Jobs Blueprint (2014)
Northwest Regional Workforce Table Regional Skills Training Plan 2013 - 2015 (2013)
Northwest Regional Skills Training Plan: 2013-2018
City of Prince Rupert Preparing for Growth – KPMG Report (KPMG 2015)
Prince Rupert Interim Land Use Policy Framework (2016)
Prince Rupert Housing Action Plan (Northern Development Initiative Trust [NDIT] 2015a)
Port Edward Housing Action Plan (NDIT 2015b)
Homes for B.C. A 30-Point Plan for Housing Affordability in British Columbia (2018)
BC Housing 2018/19-2020/21 Service Plan (2018)
Dodge Cove Official Community Plan (SQCRD 1990)
Northwest Regional Airport Master Plan (AirBiz 2014)
BC on the Move (2015)
Highway 16 Transportation Action Plan
BC Ministry of Health 2018/19-2020/21 Service Plan (2018)

Field and Desktop Studies

The Social VCs will form baseline information using the following methods:

Marine Use and Navigation

A desktop study of relevant information including maps and spatial information marine use, tenure documentation and legal designations, government reports and statistics, academic and primary literature, and technical reports.

Literature sources may include DFO's Integrated Fishery Management Plans and statistical reports, other EAs relevant to the region, strategic north coast marine planning resources and multiple (land management and strategic planning) publications authored by the PRPA, quantitative data (e.g., landings, value, and licencing information) for commercial, recreational, and Indigenous fisheries. Spatial data for marine fisheries are available from the British Columbia Marine Conservation Analysis (BCMCA) online database. Spatial data for marine recreation and tourism activities (e.g., boating routes, marine accessible parks, and anchorages) can also be obtained from the BCMCA database.

Infrastructure and Services

The description of baseline conditions will be based on information gathered from previous EA reports, reports of government and non-profit organizations, peer-reviewed academic literature, interviews with key community stakeholders and service providers, and government statistics. The description of the baseline will disaggregate conditions for the Indigenous population from conditions for the general population to the extent that data are available.

Community Well-being

The description of baseline conditions will be based largely on a synthesis of information gathered in the course of developing baselines for the many other VCs that are linked to the Community Well-being VC. As such, the baseline will be based on information gathered from previous EA reports, reports of government and non-profit organizations, peer-reviewed academic literature, interviews with key community stakeholders and service providers, and government statistics. The description of the baseline will disaggregate conditions for the Indigenous population from conditions for the general population to the extent that data are available.

5.9.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Social VCs, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized below. The results of the effects assessment for these VCs will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 38: Potential Project-related Effects Associated with the Social VCs Marine Use and Navigation

Project Activity	Potential Project-related Effect
Construction	
Construction of marine jetty and berths	Construction and operation activities will bring additional vessels to the marine environment. The increase in vessel traffic will have the potential to affect navigation, fishing, public recreation and marine use. Increase in recreational users from workforce may affect CRA fisheries. Potential effects of permanent physical structures that may interact with navigation.
Dredge and dredgeate	Vessel traffic will increase in the LSA during construction of the facility, the jetty and supporting infrastructure. Support vessels (e.g., cranes, tug boats, drill rig, excavators and dredgers) will be required during construction for pile driving, dredging and disposal of dredge material. This increased traffic with operational safety buffers will mean less space for navigation of existing marine traffic, including fishers, boaters, and recreationalists such as kayakers.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

Table 38 (Cont'd): Potential Project-related Effects Associated with the Social VCs Marine Use and Navigation

Project Activity	Potential Project-related Effect
Operations	
Vessel berthing	A safety zone that might preclude fishing activities in close proximity to the marine structures may be applied.
Associated off-site rail and shipping activities	Increased shipping and related safety zones may have effects (navigation and wake) on recreation and fishing in the area.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Decommissioning	
Removal of jetty topside	Persistent marine structure may have effects on navigation and marine use.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

Community Infrastructure and Services

Project Activity	Potential Project-related Effect
Construction	
All construction activities for Project	Short-term requirement for accommodations for non-local construction workers, with potential effects on local housing rental market and existing households. Non-local construction workers may put pressure on local infrastructure and services, such as health care facilities.
Construction road traffic	Potential increase in traffic on roads to and from the Project site associated with workers commuting and movement of construction materials may cause congestion, accidents, and increased wear and tear on roads.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
All operation activities for Project	Requirement for accommodations for in-migrating workers and their families, with potential effects on local housing market. Any in-migrating operations workers and their families may put pressure on local infrastructure and services, such as health care facilities, absent proportional investment. Potential increase in traffic on roads to and from the Project site from workers commuting and movement of materials may cause congestion, accidents, and increased wear and tear on roads.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

1 Community Infrastructure and Services (Cont'd)

Project Activity	Potential Project-related Effect
Decommissioning	
All decommissioning activities for Project	Requirement for accommodations for in-migrating workers and their families, with potential effects on local housing market. Any in-migrating construction workers and their families may put pressure on local infrastructure and services, such as health care facilities, absent proportional investment. Potential increase in traffic on roads to and from the Project site from workers commuting and movement of materials may cause congestion, accidents, and increased wear and tear on roads.

2 Community Well-being

Project Activity	Potential Project-related Effect
Construction	
All Construction Activities for Project	In-migration of workers may disrupt social environment. Short-term requirement for accommodations for non-local construction workers, with potential effects on local housing rental market and existing households. Non-local construction workers may put pressure on local infrastructure and services, such as health care facilities. Labour income may improve locals' financial well-being, but potentially also serve to exacerbate income inequality. Impact on enjoyment and access to recreational activities (e.g., harvesting, fishing, boating etc.). Changes in environment may affect physical and mental health.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
All Operations Activities for Project	In-migration of workers and their families may disrupt social environment. Requirement for accommodations for in-migrating workers and their families, with potential effects on local housing market. Any in-migrating operations workers and their families may put pressure on local infrastructure and services, such as health care facilities, absent proportional investment. Labour income may improve locals' financial well-being, but potentially also serve to exacerbate income inequality. Impact on enjoyment and access to recreational activities (e.g., harvesting, fishing, boating etc.). Changes in environment may affect physical and mental health.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

3

Community Well-being (Cont'd)

Project Activity	Potential Project-related Effect
Decommissioning	
All decommissioning activities for Project	In-migration of workers and their families may disrupt social cohesion. Requirement for accommodations for in-migrating workers and their families, with potential effects on local housing market. Any in-migrating operations workers and their families may put pressure on local infrastructure and services, such as health care facilities, absent proportional investment. Labour income may improve locals' financial well-being, but potentially also serve to exacerbate income inequality. Impact on enjoyment and access to recreational activities (e.g., harvesting, fishing, boating etc). Changes in environment may affect physical and mental health.

5.9.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.9.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects for Marine Use and Navigation

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no appreciable change given background conditions; character of the VC remains unchanged. **Low:** small change relative to background conditions; A measureable change from existing conditions but marine uses are able to continue at current levels; and only relatively small areas of navigable waters are affected **Moderate**: moderate change relative to background conditions; but marine uses are able to continue, though at lower activity level and/or displaced. Moderate areas of navigable waters are affected. **High**: large change relative to the background conditions such that marine uses cannot continue or are completely displaced. Large areas of navigable waters are affected.

1 Criteria for the Characterization of Residual Effects for Marine Use and Navigation (Cont'd)

Criteria	Description	Definitions
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: residual effects are restricted to the marine terminal and waters immediately surrounding the facility. **Local:** residual effects are contained within the LSA. **Regional:** residual effects extend beyond the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short-term:** duration of effect restricted to duration of the construction phase (i.e., less than two years) or a similar period of time during other Project phases. **Medium-term:** duration of effect extends beyond two years but less than life of the Project. **Long-term:** duration of effect extends to life of the Project or longer but is not permanent. **Permanent**: the effect is permanent.
Frequency	How often the residual effect is expected to occur	**Rare**: occurs once. **Infrequent**: occurs on multiple occasions at irregular intervals. . **Frequent:** occurs on multiple occasions at regular intervals. **Continuous**: occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** residual effects can be reversed. **Irreversible:** residual effects cannot be reversed.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** occurs when marine use and navigation have limited ability to accommodate a disturbance without adverse effects. **Moderate resilience:** occurs when marine use and navigation can accommodate a moderate level of disturbance without adverse effects **High resilience:** occurs when marine use and navigation can accommodate a high level of disturbance without adverse effects.
Likelihood of Residual Effect		
Likelihood	whether or not a residual effect is likely to occur	**Low**: low likelihood of the residual effect occurring based on the potential Project interactions, mechanisms, and mitigation measures. **Moderate**: medium likelihood of the residual effect occurring based on the potential Project interactions, mechanisms, and mitigation measures. **High**: high likelihood of the residual effect occurring based on the potential Project interactions, mechanisms, and mitigation measures.

1 Criteria for the Characterization of Residual Effects for Community Infrastructure and Services

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** negligible change, or change in key indicator(s) within the normal range of variability (non-low change will be described using the specific units of the indicators).
Extent	Spatial scale over which the residual effect is expected to occur	**Local:** effects are contained within the LSA. **Regional**: effects are contained within the RSA. **Extra-regional:** effects extend beyond the RSA**.**
Duration	Length of time over which the residual effect is expected to persist	**Short-term:** duration of effect restricted to duration of the construction phase (i.e., less than two years) or a similar period of time during other Project phases. **Medium-term:** duration of effect extends beyond two years but less than life of the Project. **Long-term:** duration of effect extends to life of the Project or longer but is not permanent. **Permanent**: the effect is permanent.
Frequency	How often the residual effect is expected to occur	**Rare:** effect occurs once. **Infrequent:** effect occurs on multiple occasions at irregular intervals. **Frequent:** effect occurs on multiple occasions at regular intervals. **Continuous:** effect occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible**: effect can be fully reversed after cessation. **Partially reversible**: effect can be partially reversed after cessation. **Permanent**: effect is permanent and non-reversible.
Context	Sensitivity and resilience of the VC to Project-related change.	No specific terms identified for this VC. Context will be discussed based upon evidence gathered.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur	**Exceptionally unlikely:** 0 to 1% probability of occurrence. **Very unlikely:** 0 to 10% probability of occurrence. **Unlikely:** 0 to 33% probability of occurrence. **As likely as not:** 33 to 66% probability of occurrence. **Likely:** 66 to 100% probability of occurrence. **Very likely:** 90 to 100% probability of occurrence. **Virtually certain:** 99 to 100% probability of occurrence**.** **Undetermined:** inadequate evidence to make a judgement of the probability of occurrence.

1 Criteria for the Characterization of Residual Effects for Community Well-being

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** negligible change, or change in key indicator(s) within the normal range of variability. (Non-low change will be described using the specific units of the indicator).
Extent	Spatial scale over which the residual effect is expected to occur	**Local:** effects are contained within the LSA. **Regional**: effects are contained within the RSA. **Extra-regional:** effects extend beyond the RSA**.**
Duration	Length of time over which the residual effect is expected to persist	**Short-term:** duration of effect restricted to duration of the construction phase (i.e., less than two years) or a similar period of time during other Project phases. **Medium-term:** duration of effect extends beyond two years but less than life of the Project. **Long-term:** duration of effect extends to life of the Project or longer but is not permanent. **Permanent**: the effect is permanent.
Frequency	How often the residual effect is expected to occur	**Rare:** effect occurs once. **Infrequent:** effect occurs on multiple occasions at irregular intervals. **Frequent:** effect occurs on multiple occasions at regular intervals. **Continuous:** effect occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible**: effect can be fully reversed after cessation. **Partially reversible**: effect can be partially reversed after cessation. **Permanent**: effect is permanent and non-reversible.
Context	Sensitivity and resilience of the VC to Project-related change.	No specific terms identified for this VC. Context will be discussed based upon evidence gathered.
Likelihood of Residual Effect		
Likelihood	Whether or not a residual effect is likely to occur	**Exceptionally unlikely:** 0 to 1% probability of occurrence. **Very unlikely:** 0 to 10% probability of occurrence. **Unlikely:** 0 to 33% probability of occurrence. **As likely as not:** 33 to 66% probability of occurrence. **Likely:** 66 to 100% probability of occurrence. **Very likely:** 90 to 100% probability of occurrence. **Virtually certain:** 99 to 100% probability of occurrence**.** **Undetermined:** inadequate evidence to make a judgement of the probability of occurrence.

Determination of Significance Criteria

VC	Threshold criteria
Marine Use and Navigation	A determination of significant residual effects for marine use and navigable waters is one where the proposed Project activities are not compatible with established marine use plans or policies, or where the Project will create a change or disruption that widely restricts or degrades present marine uses to a point where the activities cannot continue at current levels and for which this change cannot be mitigated.
Community Infrastructure and Services	Balance of evidence that community infrastructure and services are unacceptable, with particular weight given to the following benchmarks and reference points: • Local quality of health care as indicated by ASCS (ambulatory care sensitive conditions) and AID (acute in-patient days) rates relative to provincial and national rates and other indicators as needed.. • Proportion of tenants in Prince Rupert in 'core housing need' relative to provincial and national proportions. • Per capita Prince Rupert automobile accident rates relative to provincial and national rates.
Community Well-being	Balance of evidence that community well-being conditions are unacceptable, based upon the significance thresholds of key indicators used in the assessment of other linked VCs. For example the following benchmarks and reference points may be used: • Local quality of health care relative to provincial and national rates. • Proportion of tenants in Prince Rupert in 'core housing need' relative to provincial and national proportions. • Low income prevalence relative to provincial and national rates.

5.9.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in sections 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.10. Heritage and Archaeology

The EEE/Application will include an effects evaluation of potential Project-related effects on the VC.

5.10.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 39 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 39: Archaeology and Heritage Resources Local and Regional Study Boundaries

VC	LSA	RSA
Archaeology	A 62 hectare area of the northern part of the Project land lot (includes Project footprint, rail racks, and laydown areas), as well as the marine footprint including the dredge pocket. A 30 metre buffer is applied to potential areas of disturbance.	Ridley Island and the Project water lot area.

The potential effects specific to the Project are based on:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.10.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 40: Indicators of Archaeology and Heritage Resources assessment

VC	Subcomponents	Indicators	Linked VCs
Archaeology and Heritage Resources	NA	Number of affected sites (e.g., CMTs, subsurface materials); Locations of recorded and unrecorded archaeological sites and areas of Archaeological potential	• Terrestrial Resources (Wetland and Wetland Function); and • Marine Resources.

5.10.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Relevant Guidelines and Legislation

Guidance and Legislation
Canadian Environmental Assessment Agency. 1996. The *Canadian Environmental Assessment Act* reference guide on physical and cultural heritage resources. Ministry of Supply and Services Canada, Ottawa, ON.
British Columbia Archaeological Impact Assessment Guidelines (British Columbia Archaeology Branch 1998).
Archaeology Branch. 2001. Culturally modified trees of British Columbia: A handbook for the identification and recording of culturally modified trees. Ministry of Forests, Lands and Natural Resources Operations, Victoria, British Columbia.

5.10.4. Baseline Assessment

For each selected VC the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed; and
- Additional studies conducted, when required, to define the existing conditions.

Existing Information and Data Sources

The EEE/Application will summarize existing conditions utilizing the following:

- Available Traditional Use Studies and Traditional Knowledge;
- Map of archaeological and heritage resources;
- Where available, background review of archaeological site forms to determine regional site type(s), artifact assemblages, and condition of previously recorded archaeological sites within the LSA; and
- Stakeholder and expert input into relative importance of affected resources.

Existing Information/Data Sources

Data/Information
Millennia Research Limited, 2008, *Archaeological Overview Assessment, Ridley Island, BC*, prepared for the Prince Rupert Port Authority.
Millennia Research Limited, 2010, *Ridley Terminals Inc. Archaeological Impact Assessment*, prepared for Ridley Terminals Inc.
Environmental Impact Statement: Canpotex Potash Export Terminal and Ridley Island Road, Rail and Utility Corridor, 2012.

Field and Desktop Studies

An Archaeological Overview Assessment (AOA) by a qualified archaeologist will be conducted to inform the archaeological potential of the project area and determine the areas to be surveyed during the subsequent Archaeological Impact Assessment (AIA) field study.

In addition to the terrestrial AOA and AIA, Vopak will complete a marine overview assessment (MOA) that will rely primarily on existing studies, sub-tidal video footage, existing bathymetric and multi-beam sonar data, along with geotechnical core logs, and the shipwrecks casualty list to determine whether further marine archaeological field studies will be required.

5.10.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Archaeology VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in the table below. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal Interests in Section 8.

Table 41: Potential Project-related Effects Associated with Archaeology and Heritage Resources

Project Activity/Interaction	Potential Project-related Effect
Site clearing including, soil storage (approximately 30 hectares)	Potential disturbance to archaeology and heritage sites within Project footprint associated with construction of both terrestrial and marine components.
Site grading, including blasting, and fill	
Construction of marine jetty and berths	
Dredge and disposal of dredgeate	
Reclamation and clean up	
Potential accidents and malfunctions for all phases	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

No interactions were identified with the operations or decommissioning phase activities. Potential disturbance to archaeological or heritage sites would occur during construction.

5.10.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.10.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects - Archaeology and Heritage Resources

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Negligible:** no measurable change. **Low:** a measurable change limited to small portions of archaeological sites or previously disturbed sites. **Moderate:** a measurable change to moderate portions of archaeological sites. **High:** a measurable change to substantial portions of one or more sites.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: effects are contained to the specific archaeological or heritage site or area. **Local:** effects are contained within the LSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** effects associated with project construction. **Long term:** indirect effects persisting beyond the construction phase (i.e., erosion, windfall etc.). **Permanent**: effect is permanent.

1 Criteria for the Characterization of Residual Effects - Archaeology and Heritage Resources (Cont'd)

Criteria	Description	Definitions
Frequency	How often the residual effect is expected to occur	**Rare:** effect occurs once. **Infrequent:** effect occurs on multiple occasions at irregular intervals. **Frequent:** effect occurs on multiple occasions at regular intervals. **Continuous**: effect occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** n/a **Partially reversible:** n/a **Irreversible:** all effects on archaeological resources are irreversible.
Context	Sensitivity and resilience of the VC to Project-related change.	**Low resilience:** sensitive archaeological site/resource, such as CMTs, burials, or preserved organic materials. **Moderate resilience:** archaeological sites/resource that are preserved moderately well. **High resilience:** resilient archaeological site/resource that may be preserved.
Likelihood of Residual Effects		
Likelihood	Whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence)**.**

2 Determination of Significance Threshold

Effect on Archaeological Resources/Site	Threshold Criteria
Damage or removal of CMTs	Damage or removal of CMTs that results in a loss of the ability to complete detailed CMT data collection as per the CMT handbook (Archaeology Branch 2001), including stemround sampling, is archaeologically significant because of permanence and irreversibility. All CMT sites pre-dating AD 1846 are protected by provincial legislation and require some degree of mitigation when they cannot be avoided.
Potential disturbance to archaeology and heritage sites within Project footprint associated with construction of both terrestrial and marine components.	Alteration or removal of a terrestrial or intertidal archaeological site that results in a loss of the ability to complete an appropriate level of systematic data recovery is archaeologically significant because of permanence and irreversibility. All cultural and heritage resources pre-dating AD 1846 regardless of the assessed cultural or scientific value of each, require some degree of mitigation when they cannot be avoided. In addition, ship and plane wrecks older than 2 years[6] will be considered significant. Systematic data recovery commonly consists of systematic excavation and recovery of some or all portions of resources to be affected and or archaeological monitoring.

[6] The Project is located on federal lands and does not require an HCA Permit. The HCA guidance is being followed for this assessment, however, to ensure a satisfactory level of assessment as the provincial guidelines are industry best practice, in the absence of federal guidelines.

5.10.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

5.11. Human Health

The EEE/Application will include an assessment of Human Health. The Human Health VC has been proposed because of potential Project-related effects on noise, air, light, soil, sediment, water, and country foods with the potential to have indirect effects on human health.

The Human Health VC will be informed by the assessments completed in:

- Section 5.1 Air Quality and GHG Emissions;
- Section 5.2 Ambient Noise;
- Section 5.3 Visual Quality and Light;
- Section 5.4 Marine Resources (Marine Fish and Invertebrates, Water and Sediment Quality);
- Section 5.5 Soils and Terrain;
- Section 5.6 Terrestrial Resources (Vegetation); and
- Section 5.7 Freshwater Fish and Fish Habitat.

5.11.1. Assessment Boundaries

The EEE/Application will include:

- A description of the spatial, temporal, administrative and technical study area boundaries, as applicable for the VC, including maps.

Table 42 includes a description of the spatial assessment (both LSA and RSA) area for the VC. All boundaries are relevant to the VC assessment to sufficiently capture potential Project-related effects within the regional assessment boundaries as defined for the VC. Study boundaries are represented on maps found in Appendix A.

Table 42: Human Health Local and Regional Study Boundaries

s	LSA	RSA
Human Health	The LSA will be the combined LSA boundaries of Air Quality, Noise, Visual, Marine Resources (Marine Fish and Invertebrates, Marine Sediment Quality), Soils and Terrain, and Terrestrial Resources (Vegetation).	The RSA will be the combined RSA boundaries of Air Quality, Noise, Visual, Marine Resources (Marine Fish and Invertebrates, Marine Sediment Quality), Soils and Terrain, and Terrestrial Resources (Vegetation).

The potential effects specific to the Project are based on the main phases of the Project:

- Two years – Construction Phase;
- Minimum of 50 years – Operations Phase; and
- 12 months – Decommissioning Phase, as relevant.

5.11.2. Subcomponents and Indicators

The indicators to be used for the VC assessment are presented in the table below along with relevant subcomponents for the VC, where relevant, and the other linked VC assessments that represent a pathway of effects.

Table 43: Indicators of Human Health assessment

VC	Subcomponents	Indicators	Linked VCs
Human Health	NA	Indicators that may be used to reflect a change in human health as listed in the Air Quality, Noise, Visual (Light) and Marine Resources (marine fish and marine sediments), Soils and Terrain, Freshwater and Freshwater Fish, and Terrestrial Resources (Vegetation) VCs.	• Air Quality; • Noise; • Visual (Light); • Marine Resources (Marine Fish and Invertebrates and Marine Sediment Quality); • Freshwater Fish and Fish Habitat; • Community and Infrastructure; • Soils and Terrain; and • Terrestrial Resources (Vegetation).

5.11.3. Regulatory Context

Relevant guidelines and legislation used in the regulation of the VC and relevant to inform or guide the assessment are listed below.

Human health effects assessments are governed by the methodologies and guidelines for the conduct of human health risk assessment in Canada and BC, including:

Relevant Guidelines and Legislation

Guidance and Legislation
Canadian Council of Ministers of Environment Guidelines for Canadian Drinking Water Quality (Health Canada).
British Columbia Approved and Working Water Quality Guidelines (Criteria) Reports for drinking water, irrigation, and recreation and aesthetics.
Useful Information for Environmental Assessments (Health Canada 2010).
The noise limits described in the District of Port Edward Noise Control Bylaw No. 520, Prince Rupert Port Authority Noise Program, and British Columbia Oil and Gas Commission Noise Control Best Practices Guideline.
Canadian Environmental Protection Act, 1999.
British Columbia Ministry of Environment Air Quality Dispersion Modelling Guideline, 2015.
British Columbia Ambient Air Quality Objectives, 2016.
Canadian Council of Ministers of Environment Canadian Ambient Air Quality Standards, 2014.
Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise.
Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Drinking and Recreational Water Quality.
Guidance for Evaluating Human Health Impacts in Environmental Assessments: Air Quality, Noise & Drinking and Recreational Water Quality.
Guidance on Human Health Preliminary Quantitative Risk Assessment.
Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals.
Supplemental Guidance on Human Health Risk Assessment for Country Foods.
Human Health Risk Assessment for Ambient Nitrogen Dioxide.
Guidance as captured in other linked VC Sections 5.1-5.8

5.11.4. Baseline Assessment

For each selected VC the EEE/Application will describe the existing conditions within the Project area. The following sections outline the baseline information that will be used to inform the EEE/Application for each VC, including:

- Documentation of the methods and data sources used to compile information on existing conditions, including standards or guidelines followed.
- Additional studies conducted, when required, to define the existing conditions.

The EEE/Application will include a description of baseline conditions through the following methods:

- Review of available information and reports of the linked VCs pertinent to human health and, where available, measurable changes in concentrations of relevant environmental media.
- Guidance published by federal agencies, and Health Canada's guidance on human health risk assessment.
- Review of available Traditional Knowledge and Traditional Use studies.
- Human Health will rely on findings from the assessment of linked VCs identified in Table 43. The results of the preliminary HHRA and assessment of Project-related effects will inform the rationale to complete a Detailed Quantitative Risk Assessment.
- Consideration of country foods of importance to Indigenous groups' communities in the area.

The description of the baseline will disaggregate conditions for the Indigenous population from conditions for the general population to the extent that data are available.

5.11.5. Project Interactions and Potential Effects

The EEE/Application will assess potential Project-related effects for each VC using the methodology described in Section 4 of this document.

Potential Project interactions with the Human Health VC, as identified in Table 7, in section 4.4, may result in potential Project-related effects as summarized in Table 44. The results of the effects assessment for this VC will be used to inform the assessment of effects on Aboriginal interests in Section 8.

Table 44: Potential Project-related Effects Associated with Human Health

Project Activity	Potential Project-related Effect
Construction	
Site clearing including, soil storage (approximately 30 hectares)	Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Construction equipment and activities may contribute to ambient noise levels.
Construction road traffic	Construction equipment and activities may cause high ambient noise levels. Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Site grading, including blasting, and fill	Construction equipment and activities may contribute to ambient noise levels. Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Construction of Project facilities on land (civil, mechanical and electrical & instrumental work)	Construction equipment and activities may contribute to ambient noise levels. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
Construction of marine jetty and berths	Construction equipment and activities may contribute to ambient noise levels. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Construction of the marine components may re-suspend potentially contaminated marine sediment with the potential to effect marine country foods.
Dredge and disposal of dredgeate	Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Potential for contaminated sediment resuspension may affect marine country foods. Construction equipment and activities may contribute to ambient noise levels.

Table 44 (Cont'd): Potential Project-related Effects Associated with Human Health

Project Activity	Potential Project-related Effect
Construction (Cont'd)	
Commissioning, systems testing, including hydrotesting	Construction equipment and activities may contribute to ambient noise levels. Interaction with marine water, potential change in marine water quality related to discharge of hydrotest sea water (if sea water is used).
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.
Operations	
Railway operations associated with inbound train unloading and outbound train staging	Project transportation sources may contribute to increased ambient sound levels. Locomotives consume diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions.
LPG cooling process	Cooling equipment may contribute ambient sound levels. Equipment usage consumes energy and fuel and will contribute to the Project CACs and GHG emissions.
Product storage	Product storage may release fugitive CACs and could adversely affect air quality conditions.
Vessel berthing	Vessel activities may contribute to ambient sound levels. Vessels and tugs consume diesel fuel or fuel oil and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Vessel berthing could add to ambient light. Deposit of potentially deleterious materials or re-suspension of potentially contaminated marine sediment with the potential to affect marine country foods.
Cargo loading	Cargo loading equipment may contribute to ambient sound levels.
General terminal operations (24 hours, 365 days) (power, lighting, security, ancillary building operations, staffing, water requirements during operations, storm water management, flaring for maintenance and emergency purposes)	Terminal operation equipment may contribute to ambient sound levels. Equipment usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Additional lighting may contribute to ambient light.
Routine maintenance and inspections	Maintenance and inspections may have associated equipment use and/or activities that contribute to ambient sound levels. General maintenance may include use of equipment or venting of storage tanks that would release CACs and GHGs and could adversely affect air quality conditions.
Associated off-site rail and shipping activities	Transportation related emissions release CACs and GHGs and could adversely affect air quality conditions. Transportation sources may contribute to ambient noise levels. Marine vessel and rail car movement may contribute to ambient light.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

Table 44 (Cont'd): Potential Project-related Effects Associated with Human Health

Project Activity	Potential Project-related Effect
Decommissioning	
Cleaning of tanks and infrastructure	Equipment and vehicle usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Construction equipment and activities may contribute to ambient noise levels.
Removal of tanks and infrastructure	Equipment and vehicle usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Construction equipment and activities may contribute to ambient noise levels.
Removal of buildings and utilities infrastructure	Potential for dust generation, affecting ambient particulate matter concentrations. Equipment usage consumes diesel fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Construction equipment and activities may contribute to ambient noise levels.
Removal of jetty topside (jetty structure itself will remain)	Equipment and vehicle usage consumes fuel and will contribute to Project-related emissions of CACs and GHGs and could adversely affect air quality conditions. Construction equipment and activities may contribute to ambient noise levels.
Potential accidents and malfunctions	The assessment of effects from potential accidents and malfunctions will be assessed in Section 6 of the EEE/Application.

A Detailed Quantitative Risk Assessment will be conducted if Project-related effects establish marine sediment contamination and potential for resuspension are present.

5.11.6. Mitigation Measures

The EEE/Application will identify measures to avoid, manage or mitigate potential adverse effects to the selected VC consistent with section 4.5 (Mitigation Measures). Management and/or monitoring plans for relevant Project phases will be referenced.

5.11.7. Residual Effects Characterization and Determination of Significance

Where identified, the EEE/Application will characterize an adverse residual effect to support a detailed assessment of the VC. The adverse residual effect will be presented in a manner which sufficiently describes the context of the VC, magnitude, extent, duration, reversibility and frequency as consistent with section 4.6 (Residual Effects Characterization and Determination of Significance).

The following preliminary criteria definitions have been identified to characterize residual effects and determine significance.

Criteria for the Characterization of Residual Effects – Human Health

Criteria	Description	Definitions
Magnitude	Expected size or severity of the effect	**Low:** Measurable change(s) from baseline conditions identified, but are below human-health specific regulatory thresholds and thus do not represent unacceptable risks to human health. **Moderate:** Measurable change(s) from baseline above human-health specific regulatory thresholds are identified, but do not represent unacceptable risks to human health. **High:** Measurable change(s) from baseline above human-health specific regulatory thresholds are identified and represent potentially unacceptable risks to human health.
Extent	Spatial scale over which the residual effect is expected to occur	**Site-specific**: Effects are contained within the Project footprint. **Local:** Effects are contained within the LSA. **Regional**: Effects are contained within the RSA.
Duration	Length of time over which the residual effect is expected to persist	**Short term:** Residual effect restricted to duration of the construction phase (i.e., less than two years) or a similar period of time during other Project phases. **Long term:** Residual effect continues for the entire life of the Project, before returning to baseline conditions after decommissioning. **Permanent**: Permanent residual effect unlikely to return to baseline conditions even after Project decommissioning.
Frequency	How often the residual effect is expected to occur	**Rare:** Residual effect occurs once. **Infrequent:** Residual effect occurs on multiple occasions at irregular intervals. **Frequent:** Residual effect occurs on multiple occasions at regular intervals. **Continuous**: Residual effect occurs continuously (100% of the time).
Reversibility	Whether or not the residual effect can be reversed once the physical work or activity causing the effect ceases	**Fully reversible:** Predicted human health risks will return to baseline conditions following the completion of Project construction, operation or decommissioning phase activities. **Partially reversible:** Predicted human health risks are expected to return to baseline conditions following the completion of Project construction, operation or decommissioning phase activities, but exposures result in some lingering but non-permanent effects to human health. **Irreversible:** Even if predicted human health risks return to baseline conditions following completion of Project activities, changes to human health are irreversible and will persist even if exposure ceases (e.g., carcinogenic effects).

1 Criteria for the Characterization of Residual Effects – Human Health (Cont'd)

Criteria	Description	Definitions
Context	Sensitivity and resilience of the VC to Project-related change.	**Low sensitivity:** Effects are predicted for sensitive receptors and/or the level of baseline exposure could be a contributing factor to changes in human health risk. The impacted area is subject to extensive human activity. **Moderate sensitivity:** Baseline exposures not likely to contribute to human health risk and receptors are not sensitive by nature. The impacted area is subject to moderate human activity. **High sensitivity:** Baseline exposure does not contribute to changes in human risk, and receptors are not sensitive by nature. The impacted area is relatively undisturbed or unaffected by human activity.
Likelihood of Residual Effect		
Likelihood	whether or not a residual effect is likely to occur	**Low:** the predicted residual effect has a low likelihood of occurrence (0-20% chance of occurrence). **Moderate:** the predicted residual effect has a moderate likelihood of occurrence (20-80% chance of occurrence). **High:** the predicted residual effect is likely to occur or certain (80-100% chance of occurrence).

2 Determination of Significance

VC	Threshold criteria
Human Health	**Significant:** **For the evaluation of chemical changes to environmental media:** **Hazard quotients (HQs)** – characterize non-carcinogenic risks to human receptors. If the baseline HQ for human health risk is less than 0.2, the significance threshold is reached when: - Predicted HQ is greater than 0.2 **Incremental Lifetime Cancer Risk estimates (ILCRs)** – characterize carcinogenic (i.e., cancer) risks to human receptors. An ILCR indicating a risk greater than 1 in 100,000 indicates l potential for carcinogenic risks, or: - Predicted ILCR is greater than 1×10^{-5} In addition to the interpretation of quantitative estimates of risk described above, the significance of any increased risk to receptors will be determined with consideration of additional factors, including the relative contribution of the Project to exposure and risk, the uncertainty associated with these modeled estimates and the criteria for the characterization of residual effects, described in the table above. **For the evaluation of changes to noise levels:** A predicted increase in noise levels exceeds applicable noise thresholds, is not short-term in nature, and/or is likely to result in annoyance to human receptors. **For the evaluation of changes to light levels:** A predicted increase in light levels exceeds applicable light thresholds, is not short-term in nature, and/or has the potential to result in a nuisance to human receptors.

3

Determination of Significance (Cont'd)

VC	Threshold criteria
Human Health (Cont'd)	**Not-Significant:** **<u>For the evaluation of chemical changes to environmental media:</u>** **Hazard quotients (HQs)** – characterize non-carcinogenic risks to human receptors. If the baseline HQ for human health risk is less than 0.2, Project-related effects are not considered to be significant when: • Predicted HQ is less than 0.2 If the baseline HQ for human health risk is greater than or equal to 0.2, Project-related effects are not considered to be significant when: • Predicted HQ is less than the baseline HQ + 0.2 **Incremental Lifetime Cancer Risk estimates (ILCRs)** – characterize carcinogenic (i.e., cancer) risks to human receptors. An ILCR indicating a risk less than 1 in 100,000 indicates low potential for carcinogenic risks, or: • Predicted ILCR is less than 1×10^{-5} **<u>For the evaluation of changes to noise levels:</u>** Any predicted increases in noise levels do not exceed applicable noise thresholds, are short-term in nature, or are unlikely to result in annoyance to human receptors. **<u>For the evaluation of changes to light levels:</u>** Any predicted increases in light levels do not exceed applicable thresholds, are short-term in nature, or are unlikely to result in a nuisance to human receptors.

5.11.8. Cumulative Effects Assessment

The EEE/Application will assess the adverse residual effects of the selected VC using similar methodology described in section 4.4 to 4.6 of the TOR/AIR. The cumulative effects assessment identifies those residual effects from this Project that are considered likely to interact with similar effects in the same timeframe with those of past, existing, or foreseeable physical activities in the vicinity of the regional assessment boundaries as defined for the VC.

The EEE/Application will include the following:

- Identification of potential cumulative effects, i.e., cumulative interactions between residual effects of the Project and the potential residual effects of other foreseeable developments or currently operating facilities;
- Identification of additional mitigation measures; and
- Description and evaluation of (residual) cumulative effects of the selected VC.

6. ASSESSMENT OF POTENTIAL ACCIDENTS AND MALFUNCTIONS

The EEE/Application will describe potential accident and equipment malfunctions which may occur at each phase of the Project. Some accident and malfunctions may include, but are not limited to:

- Accidents at the Project facility (within the scope of the assessment):
  - Accidents involving workers and their vehicles or equipment;
  - Integrity Failure or Loss of Containment of Project infrastructure (i.e., onshore leaks or spills of deleterious material, atmospheric tanks, pressure tanks, underground piping, above ground piping, valves, pumps, transfer equipment);
  - Rail movement accident resulting in integrity failure of rail tank cars resulting in cargo spill; and
  - Project-related fire or explosions.
- Marine based incident within the marine study area:
  - Marine ship incident involving either collision, drift grounding, or powered grounding;
  - Structural failure resulting in loss of cargo; and
  - Fire and explosion.

The EEE/Application will include:

- The overall methodology for assessing the potential risk of an event (likelihood and consequence);
- Definitions of each category of likelihood;
- Definitions for each category of consequence;
- An assessment of the likelihood of the event occurring, based on historical trends and predictive models;
- Identification of proposed measures to reduce the likelihood of the event;
- Assessment of consequence of the event, in a manner consistent with the direct effects assessment;
- Identification of measures to mitigate the consequences to valued components; and
- Conclusions on the potential risk (likelihood multiplied by consequence) of the accident or malfunction.

7. EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The EEE/Application will include:

- The environmental factors deemed to have possible consequences on the proposed project, including, but not necessarily limited to, consideration of natural hazards such as:
    - Extreme weather (Heavy rains, snowfall, wind);
    - Seismic event;
    - Forest Fire; and
    - Climate change.
- A description of changes or effects on the proposed Project that may be caused by the above-mentioned environmental factors;
- Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of the effects of the environment on the proposed Project; and
- A conclusion about the potential risk of an effect of the environment on the proposed Project and to relevant VCs.

Part C

Section 8 Indigenous Consultation

8. INDIGENOUS CONSULTATION

8.1. Background

The Indigenous groups discussed in this section of the EEE/Application are those identified in the Project's section 11 Order, as follows:

- Lax Kw'alaams;
- Metlakatla;
- Kitselas;
- Kitsumkalum;
- Gitxaala; and
- Gitga'at

This section will:

- Provide available background information, the description will include background information on ethnography, language, governance, economy and reserves; and
- A map that identifies Indian Reserves and Indigenous communities, for the Indigenous Groups and the project location.

8.2. Consultation Activities

This section of the EEE/Application will include:

- A summary of past and planned consultation activities;
- A summary of proposed changes to the Indigenous Consultation Plan resulting from the Indigenous Groups' feedback, or experience from consultation to date, including any such changes which have been implemented;
- A summary of the key issues and concerns raised by Indigenous Groups relevant to the environmental assessment, the Proponent's responses to those issues and concerns, and the status of resolution;

8.3. Aboriginal Interests

The section 11 Order defines Aboriginal Interests as "asserted or determined aboriginal rights, including title and treaty rights".

The EEE/Application will include, in individual sections for each Indigenous Group:

- Traditional Ecological Knowledge and Traditional Land Use information, as available, with a description of how Traditional Ecological Knowledge (TEK) and Traditional Land Use Studies (TLUS)information was gathered and incorporated into the assessment of impacts of the proposed Project on Aboriginal Interests;
- A description of the Aboriginal Interests of each group identified through secondary research techniques or provided directly through consultation activities;
- A description of potential adverse effects of the proposed Project on Aboriginal Interests;

- A description or summary of mitigation measures to avoid or reduce potential adverse effects on Aboriginal Interests consistent with section 4.5 Mitigation Measures of this AIR template;
- A characterization of the residual adverse effects on Aboriginal Interests after mitigation using the methodology described in sections 4.6.1 Residual Effects Characterization, 4.6.2 Likelihood, and 4.6.4 Confidence and Risk of this AIR template and incorporating the findings of the VC chapters in the Application that are relevant to Aboriginal interests;
- A summary of any outstanding Aboriginal Interests issues identified by Indigenous groups; and
- A summary of publically available arrangements or agreements reached between the proponent and Indigenous Groups.

8.4. Statutory Requirements Under CEAA 2012 Section 5(1)(c)

Section 5(1)(c) of CEAA 2012 requires, with respect to Indigenous groups, an assessment of effects occurring in Canada of any change that may be caused to the environment on:

- Health and socio-economic conditions;
- Physical and cultural heritage;
- The current use of lands and resources for traditional purposes; or
- Any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.

For each Indigenous group, this section of the EEE/Application will:

- A description of potential paragraph 5(1)(c) environmental effects that may occur as a result of changes to the environment caused by the Project;
- A description of mitigation measures to avoid or reduce potential adverse paragraph 5(1)(c) environmental effects consistent with section 4.5 Mitigation Measures of the TOR/AIR;
- A characterization of the residual paragraph 5(1)(c) environmental effects after mitigation has been applied, using the methodology described in sections 4.6.1 Residual Effects Characterization, 4.6.2 Likelihood and 4.6.4 Confidence and Risk of the TOR/AIR and incorporating the findings of the VC assessments in Part B, Section 5 in the EEE/Application, that are relevant to paragraph 5(1)(c) environmental effects;
- A conclusion by the Proponent as to the significance of the identified residual paragraph 5(1)(c) environmental effects after mitigation has been applied; and,
- A summary of any outstanding issues in relation to paragraph 5(1)(c) environmental effects identified by Indigenous groups.

8.5. Other Matters of Concern to Indigenous Groups

The EEE/Application will include:

- A list of other matters of concern raised by Indigenous Groups with respect to potential environmental, economic, social, heritage and health effects of the proposed Project, which have not already been considered in the discussion about Aboriginal Interests or in the statutory requirements under CEAA 2012 where applicable;
- A description (or summary if described elsewhere in the Application) of the mitigation measures to address potential effects on other matters of concern to Indigenous Groups;

- A characterization of the residual adverse effects after mitigation, in a manner consistent with assessment methodology in this AIR template; and
- A description of how these matters of concern have been addressed from the perspective of the Indigenous Groups and the Proponent.

8.6. Issue Summary Table

The EEE/Application will include:

- A Summary Table (see example below) that identifies Aboriginal Interests or other matters of concern to Indigenous Groups that may be impacted by the proposed Project, and the measures to avoid, mitigate or otherwise manage the effects; and
- An Appendix, the Indigenous Consultation Report, which contains comments received from Indigenous Groups regarding this section of the Application.

Table 45: Summary Table of the Results of Indigenous Consultation related to Aboriginal Interests/Other Matters of Concern to Indigenous Groups

Indigenous Group	Consultation Stage / Information Source	Issue – Aboriginal Interest	Issue – Other Matters of Concern	Analysis of Potential Effect	Proposed Measures to Avoid, Mitigate or Otherwise Manage Effects	Status of Issue *(e.g., resolved, ongoing resolution, referred to agency, etc.)*

Part D

Section 9 Public Consultation

9. PUBLIC CONSULTATION

The EEE/Application will include a report on the results of implementation of the approved Public Consultation Plan including:

- Background information:
  - Identification of local governments, residents, property owners, and other rights holders who are potentially impacted by the proposed Project;
  - Maps of local government boundaries, private land, tenures/authorizations, or residences with respect to the proposed Project; and
  - Background information about each potentially affected municipality and/or stakeholder group.
- Public Consultation:
  - A summary of the past and planned consultation activities;
  - A summary of proposed changes to the approved Public Consultation Plan as a result of feedback from local governments, stakeholders or individuals, or experience from consultation to date; and
  - A description of the key issues raised by the public that are relevant to the EA, the responses to those issues, and the status of their resolution.
- Summary Table:
  - Identification of concerns raised by the public and the measures to avoid, reduce or mitigate those impacts. This information will be provided in the form of a table.

Part E

Section 10 Management Plans

Section 11 Monitoring and Follow Up Programs

10. MANAGEMENT PLANS

The EEE/Application will include:

- A preliminary list of Management Plans for the phases of the proposed Project including, but not limited to:
    - Construction Environmental Management Plan, including subcomponent plans such as:
        - Sediment and Erosion Control Plan;
        - Spill Prevention and Emergency Response Plan;
        - Water Management Plan;
        - Construction Waste Management Plan;
        - Air Quality, Noxious Weed Control, and Dust Control Plan;
        - Health And Safety Plan;
        - Archaeological Management Plan;
        - Wildlife Management Plan;
        - Riparian and Sensitive Sites Management Plan (inclusive of Wetland Habitat Compensation Plan);
        - Fish and Fish Habitat Offsetting Plan;
        - Environmental Monitoring Plan; and
        - Site Restoration Plan.
    - Operational Environmental Management Plan.
- A comprehensive description of the contents of each Management Plan, including:
    - A summary table of the identified mitigation measures described in previous sections, and the management plans they are included in, and
    - the relevant authority responsible for monitoring, compliance and enforcement.

11. MONITORING AND FOLLOW-UP PROGRAMS

The EEE/Application will include:

- A description of the monitoring and follow-up programs the Proponent will implement, including their activities, objectives and reporting; and
- Reporting structure as identified within the environmental management plans, monitoring plans and EA Certificate Conditions.

Part F

Section 12 Conclusions

12. CONCLUSIONS

The EEE/Application will:

- Provide the Proponent's conclusions regarding the potential for significant adverse effects on VCs from the Project; and
- Request an EA Certificate for the proposed Project.

12.1. Summary of Residual Effects

The Application will summarize all potential residual effects, including cumulative residual effects, in a table format that depicts the potential effect, project phases, project activity or physical work linked to the effect, proposed mitigation and significance of effect on VCs.

12.2. Summary of Mitigation Measures

The Application will include a table that identifies the proposed measures to mitigate potential impacts to VCs as shown in Table 46. This information provides the foundation for the development of a Table of Conditions for the proposed Project, which would be appended to an EA Certificate, should one be issued.

Table 46: Summary of Proposed Mitigation Measures

No.	VC and Effect	Proposed Mitigation Measure	Timing	Legal Requirement	Responsible Agency
Environmental					
1.1					
1.2					
Social					
2.1					

13. REFERENCES

The EEE/Application will include all references cited in the document.

TOR/AIR Reference List

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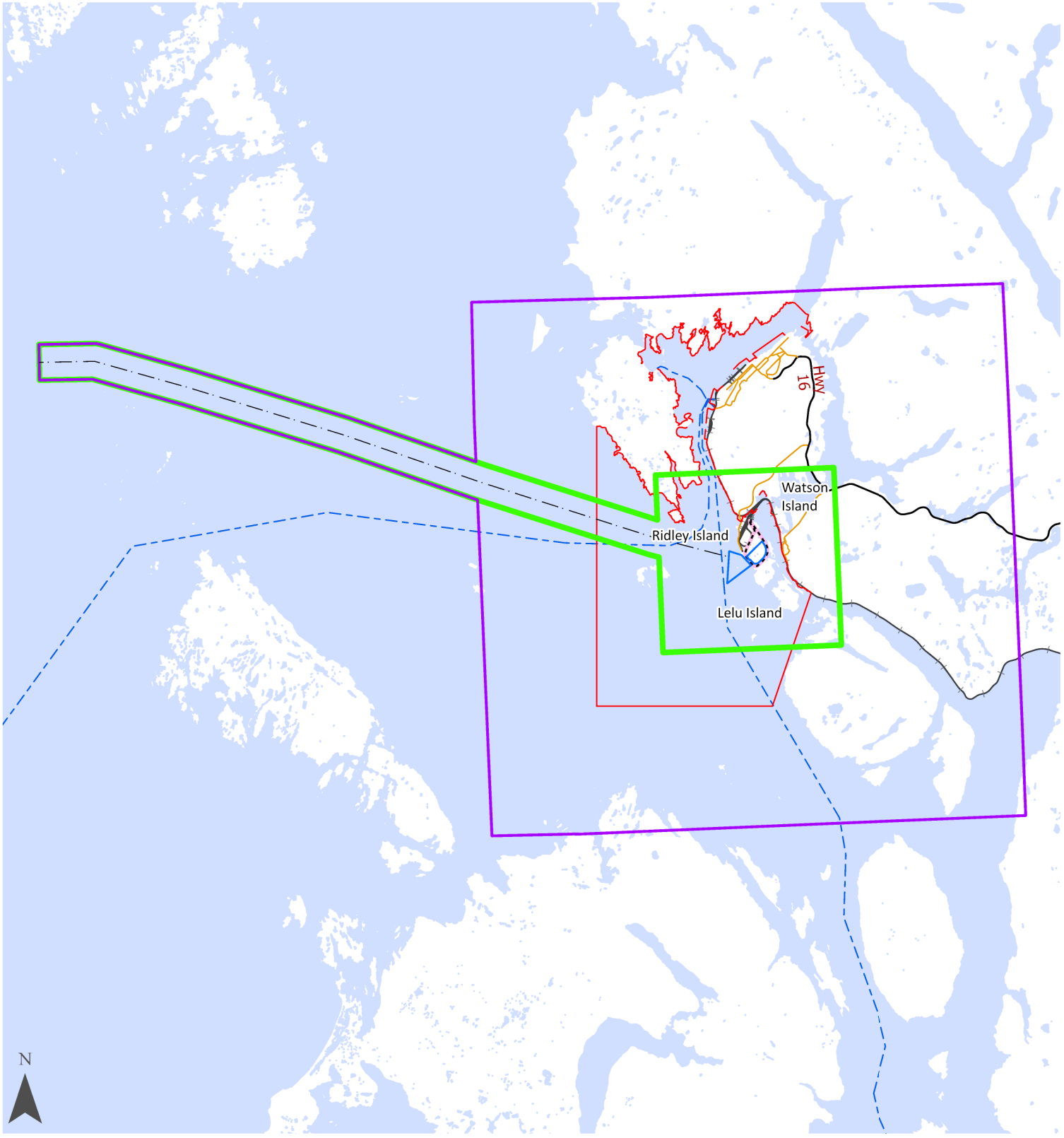
Appendices

The EEE/Application will include appendices, including those appendices referenced in the EEE/Application as well as information prepared by professionals and provided under their professional seal will be identified in the EEE/Application and the related sealed studies will be included in an Appendix.

APPENDIX

VC Assessment Spatial Boundary Maps



PRPA Jurisdiction
PRPA Road, Rail, Utility Corridor (RRUC)
Highways
Major Streets
Ferry/Water Routes
Railway
Air Quality Regional Study Area
Air Quality Local Study Area
Area of Interest
Ocean
Marine Access Route

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Air Quality Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/05/21
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:300,000	Reference No: 656431-MD-4

0 3,000 6,000 12,000 18,000 24,000 Meters

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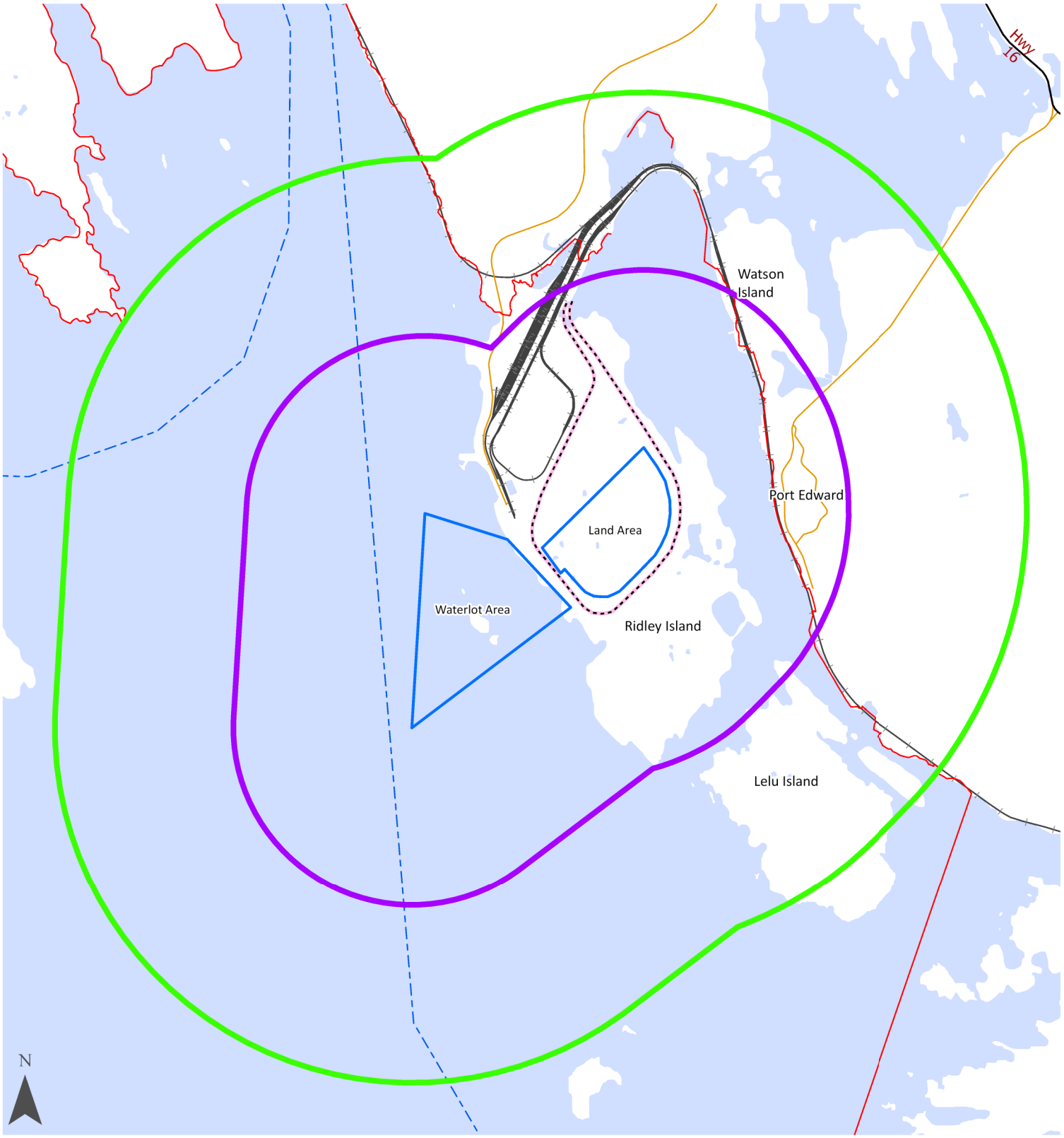

PRPA Jurisdiction
PRPA Road, Rail, Utility Corridor (RRUC)
Highways
Major Streets
Ferry/Water Routes
Railway
Noise Local Study Area
Noise Regional Study Area
Area of Interest
Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Noise Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/06
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:45,000	Reference No: 655902-MD-8

0 500 1,000 2,000 3,000 4,000 Meters

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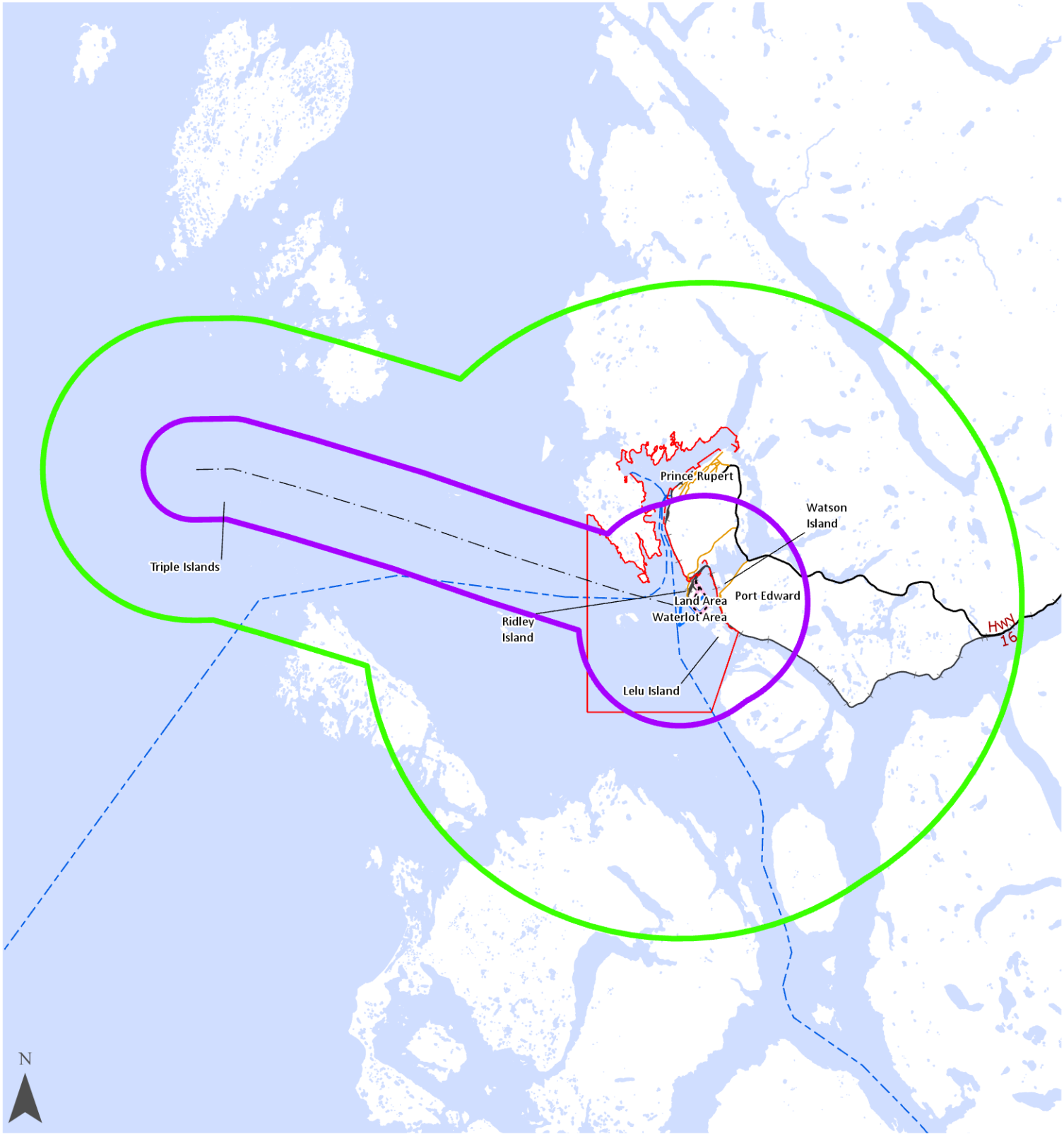

PRPA Jurisdiction

PRPA Road, Rail, Utility Corridor (RRUC)

Marine Access Route

Highways

Major Streets

Ferry/Water Routes

Railway

Ambient Light/ Visual Quality LSA

Ambient Light/ Visual Quality RSA

Area of Interest

Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Ambient Light/Visual Quality Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/07/12
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:425,000	Reference No: 655902-MD-5

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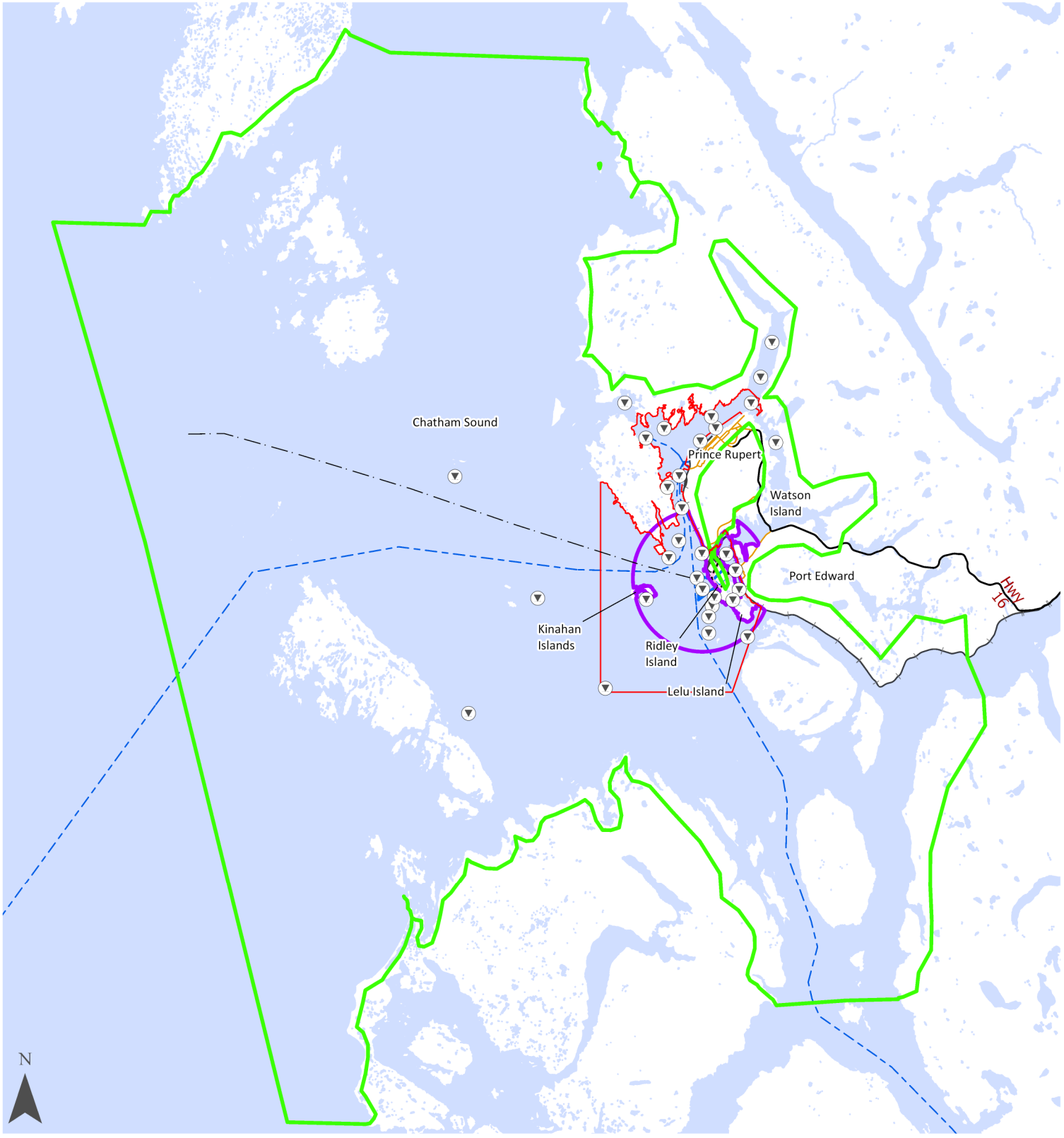

Water Quality Station

Marine Access Route

PRPA Jurisdiction

PRPA Road, Rail, Utility Corridor (RRUC)

Highways

Major Streets

Ferry/Water Routes

Railway

Marine Resources (Marine Water Quality) Local Study Area

Marine Resources (Marine Water Quality) Regional Study Area

Area of Interest

Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Marine Resources Marine Water Quality Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/13
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:400,000	Reference No: 655902-MD-18

0 4,500 9,000 18,000 27,000 36,000 Meters

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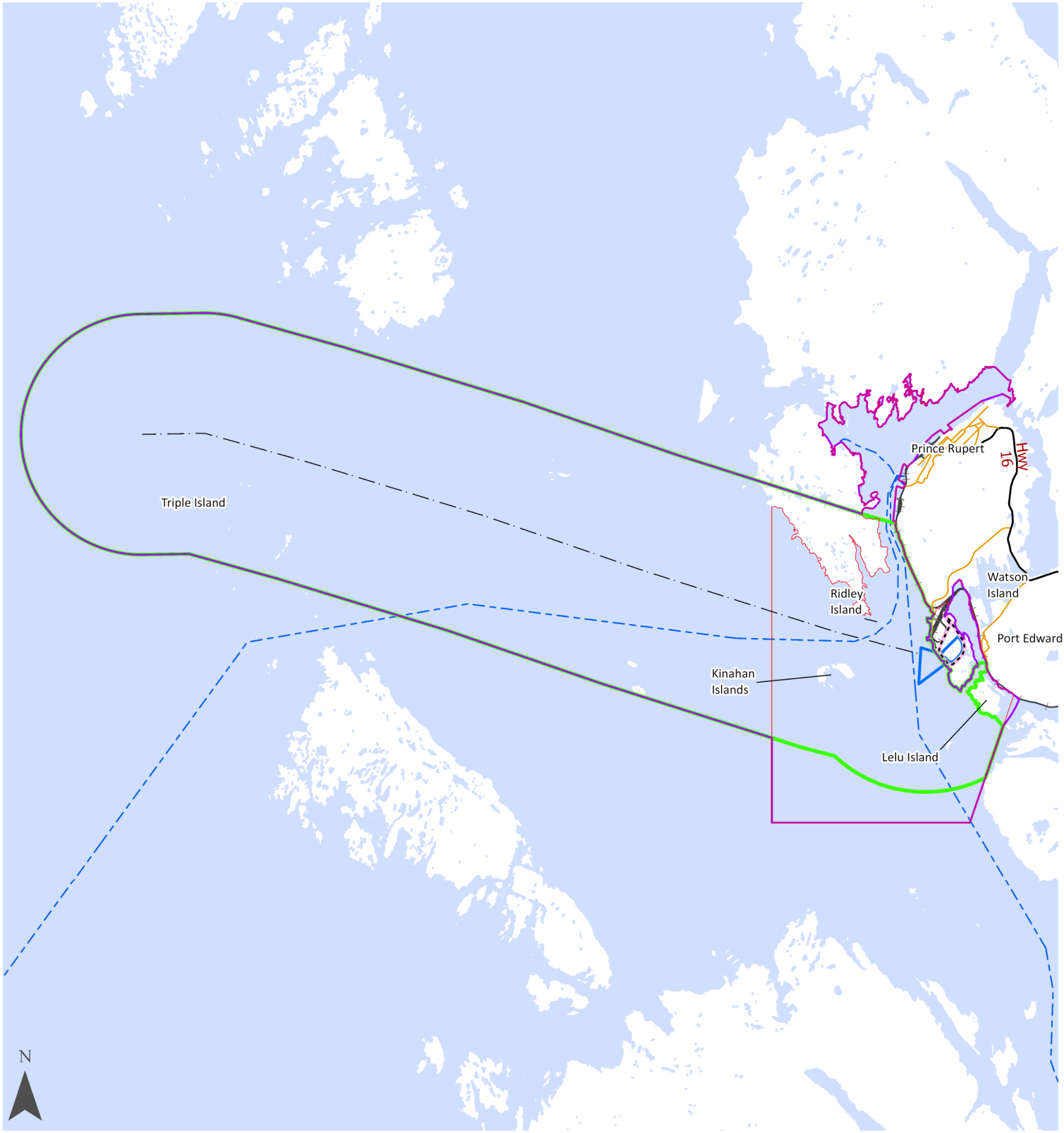

- Marine Access Route
- PRPA Jurisdiction
- PRPA Road, Rail, Utility Corridor (RRUC)
- Highways
- Major Streets
- Ferry/Water Routes
- Railway
- Marine Resources (Marine Mammals Subcomponent) Local Study Area
- Marine Resources (Marine Mammals Subcomponent) Regional Study Area
- Area of Interest
- Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Marine Resources Marine Mammal Subcomponent Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/05/17
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:265,000	Reference No: 655902-MD-16

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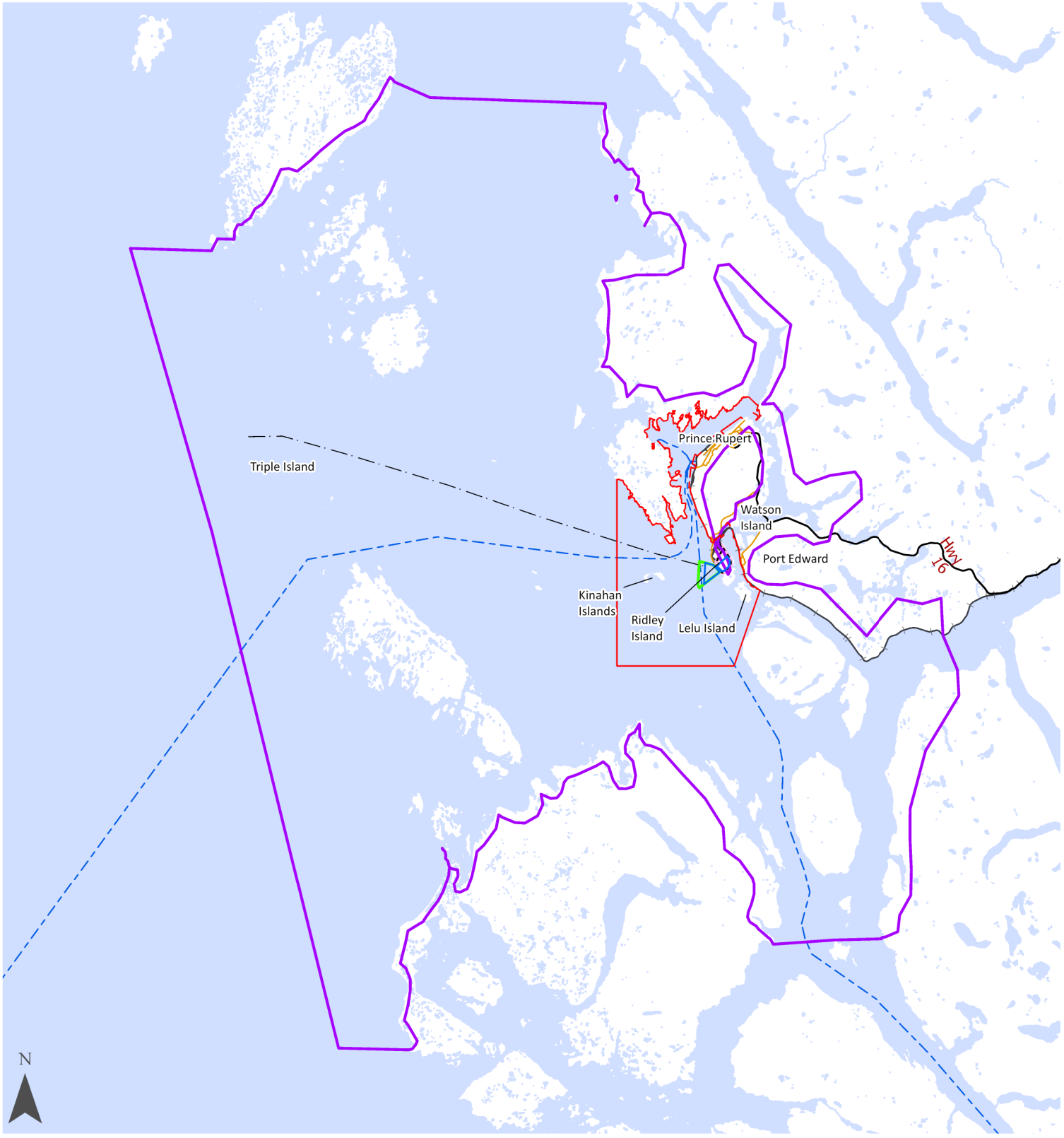

- Marine Access Route
- PRPA Jurisdiction
- PRPA Road, Rail, Utility Corridor (RRUC)
- Highways
- Major Streets
- Ferry/Water Routes
- Railway
- Marine Resources (Marine Habitats and Marine Sediment Quality) Local Study Area
- Marine Resources (Marine Habitats and Marine Sediment Quality) Regional Study Area
- Area of Interest
- Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Marine Resources Marine Habitats and Marine Sediment Quality Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/05/21
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:450,000	Reference No: 655902-MD-21

0 5,000 10,000 20,000 30,000 40,000 Meters

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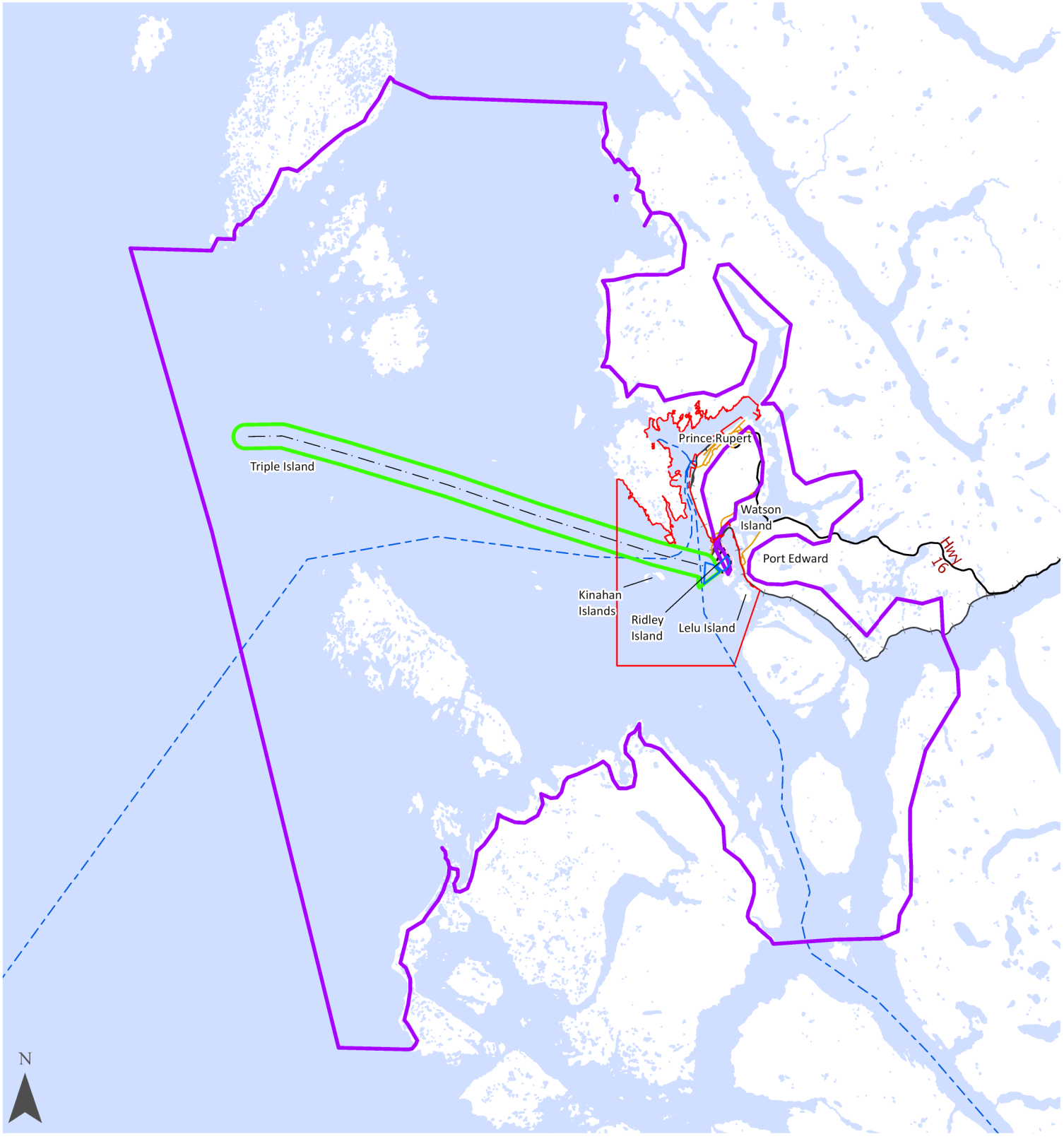

- Marine Access Route
- PRPA Jurisdiction
- Area of Interest
- Marine Resources (Marine Fish and Invertebrates) Local Study Area
- Marine Resources (Marine Fish and Invertebrates) Regional Study Area
- PRPA Road, Rail, Utility Corridor (RRUC)
- Highways
- Major Streets
- Ferry/Water Routes
- Railway
- Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Marine Resources VC (Marine Fish and Invertebrates) Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/05/21
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:450,000	Reference No: 655902-MD-22

0 5,000 10,000 20,000 30,000 40,000 Meters

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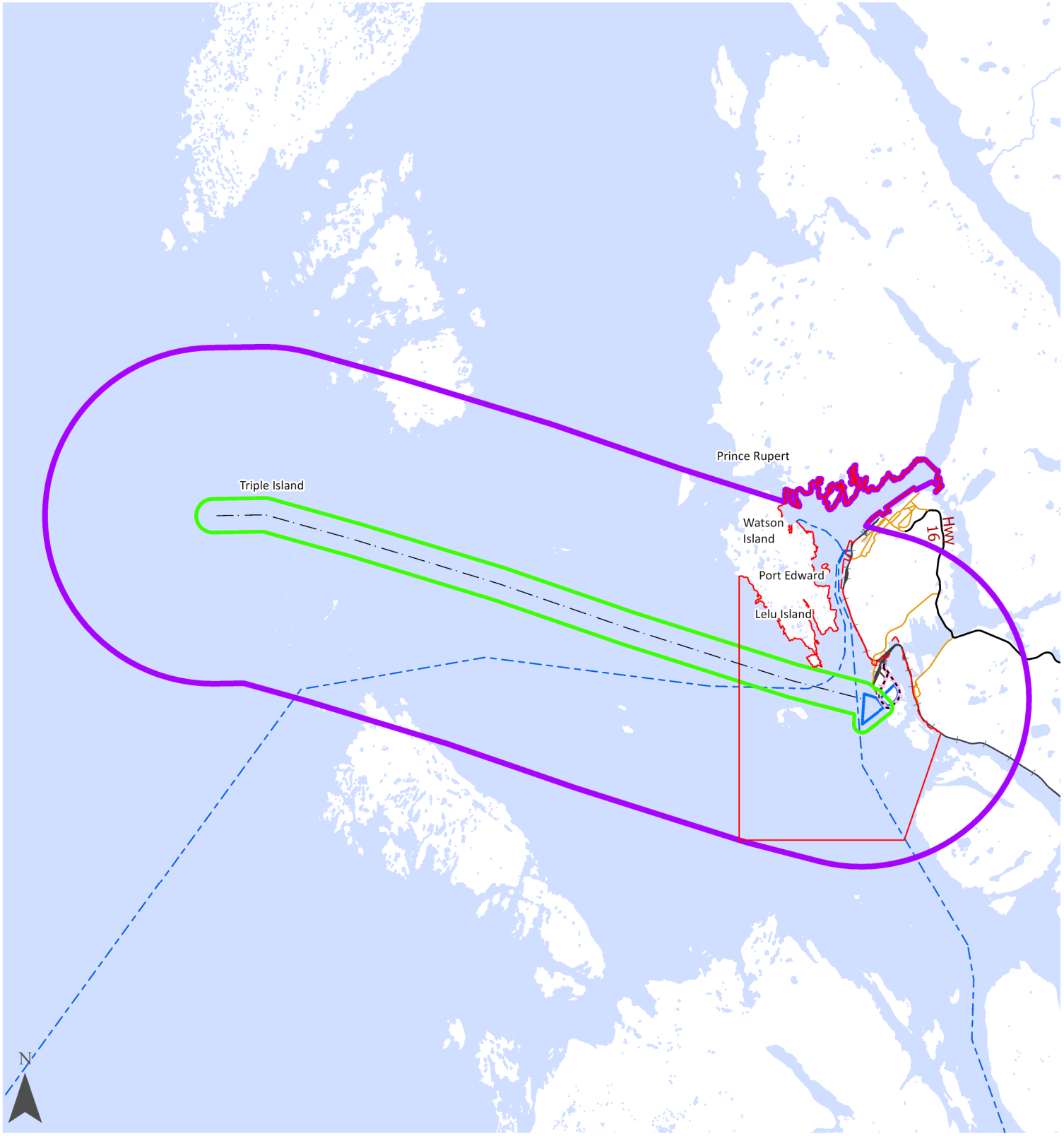

Marine Access Route

PRPA Jurisdiction

Marine Birds Local Study Area

Marine Birds Regional Study Area

PRPA Road, Rail, Utility Corridor (RRUC)

Highways

Major Streets

Ferry/Water Routes

Railway

Area of Interest

Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Marine Birds
Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/08
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:317,887	Reference No: 655902-MD-20

0 3.5 7 14 21 28 Kilometers

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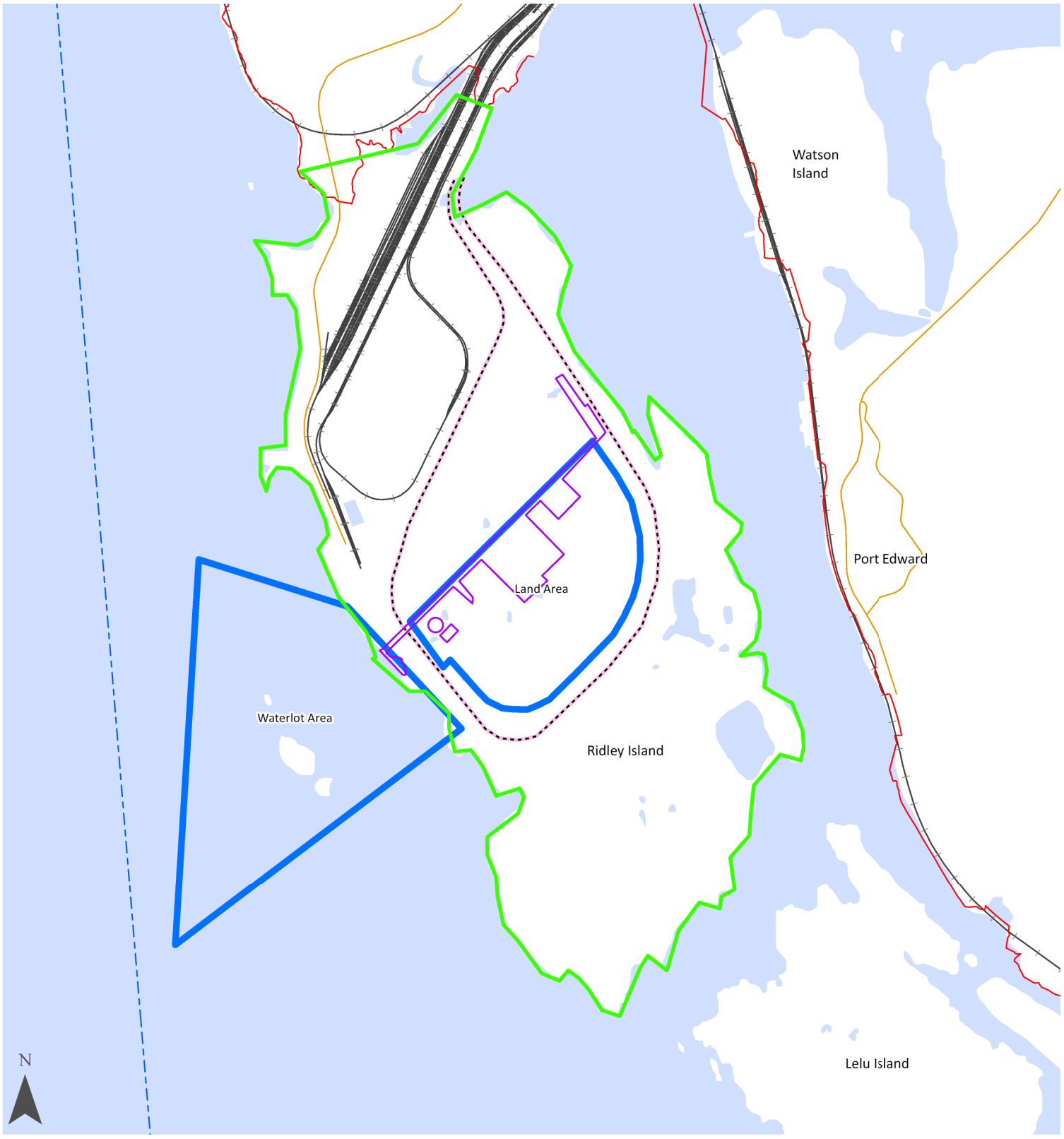


PRPA Jurisdiction
PRPA Road, Rail, Utility Corridor (RRUC)
Highways
Major Streets
Ferry/Water Routes
Railway
Terrain and Soils Local Study Area
Terrain and Soils Regional Study Area
Area of Interest
Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

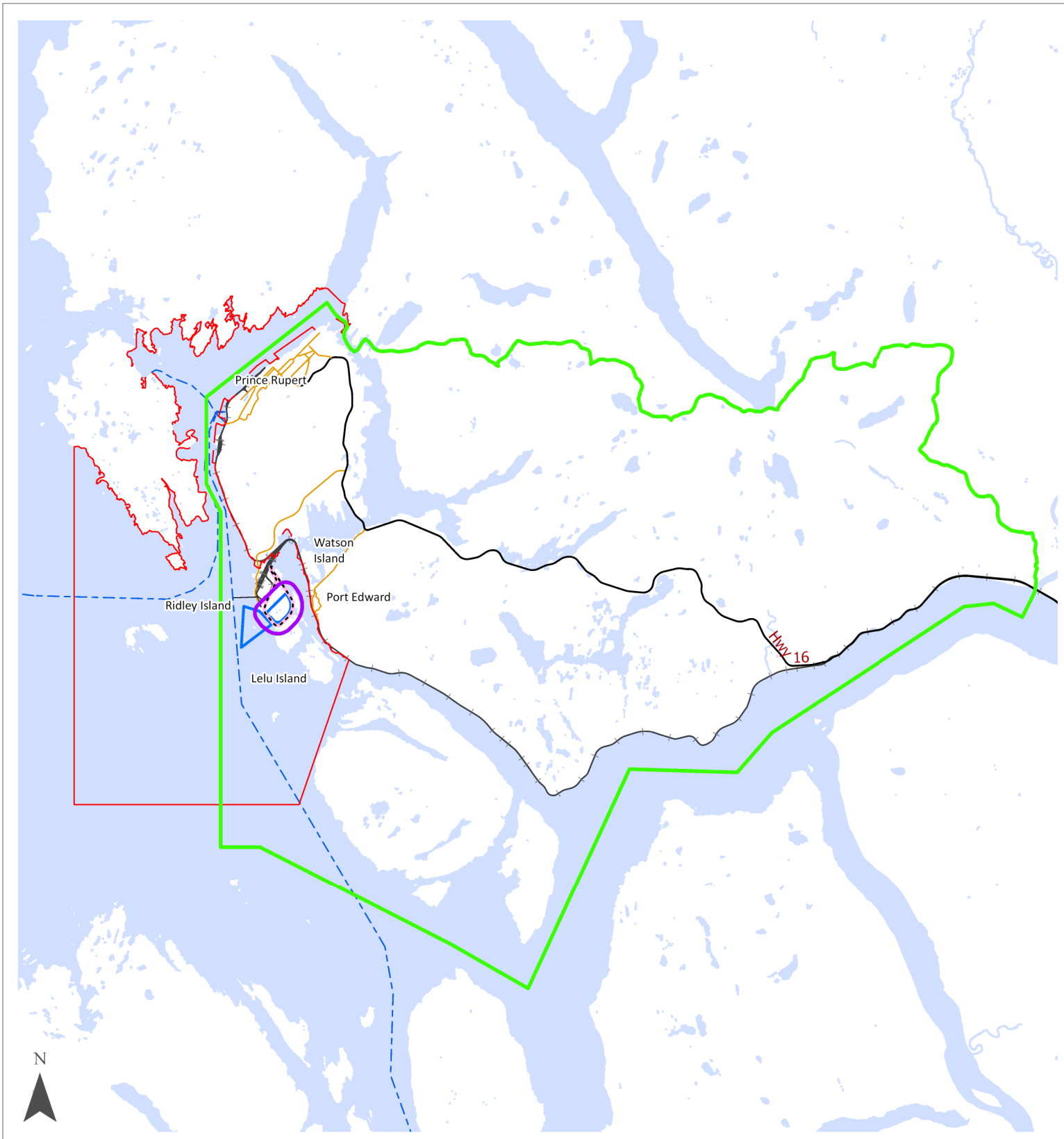
SNC·LAVALIN

Terrain and Soils Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/07
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:25,000	Reference No: 655902-MD-10

0 287.5 575 1,150 1,725 2,300 Meters

MXD Path: P:\Current Projects\Vopak Development\656431 Env Assmt\40_Execution\45_GIS_Dwgs\GIS\656431_Pro_2.aprx



PRPA Jurisdiction
PRPA Road, Rail, Utility Corridor (RRUC)
Highways
Major Streets
Ferry/Water Routes
Railway
Area of Interest
Ocean
Terrestrial Local Study Area
Terrestrial Regional Study Area

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Terrestrial Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/08
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:230,400	Reference No: 655902-MD-1

0 2,500 5,000 10,000 15,000 20,000 Meters

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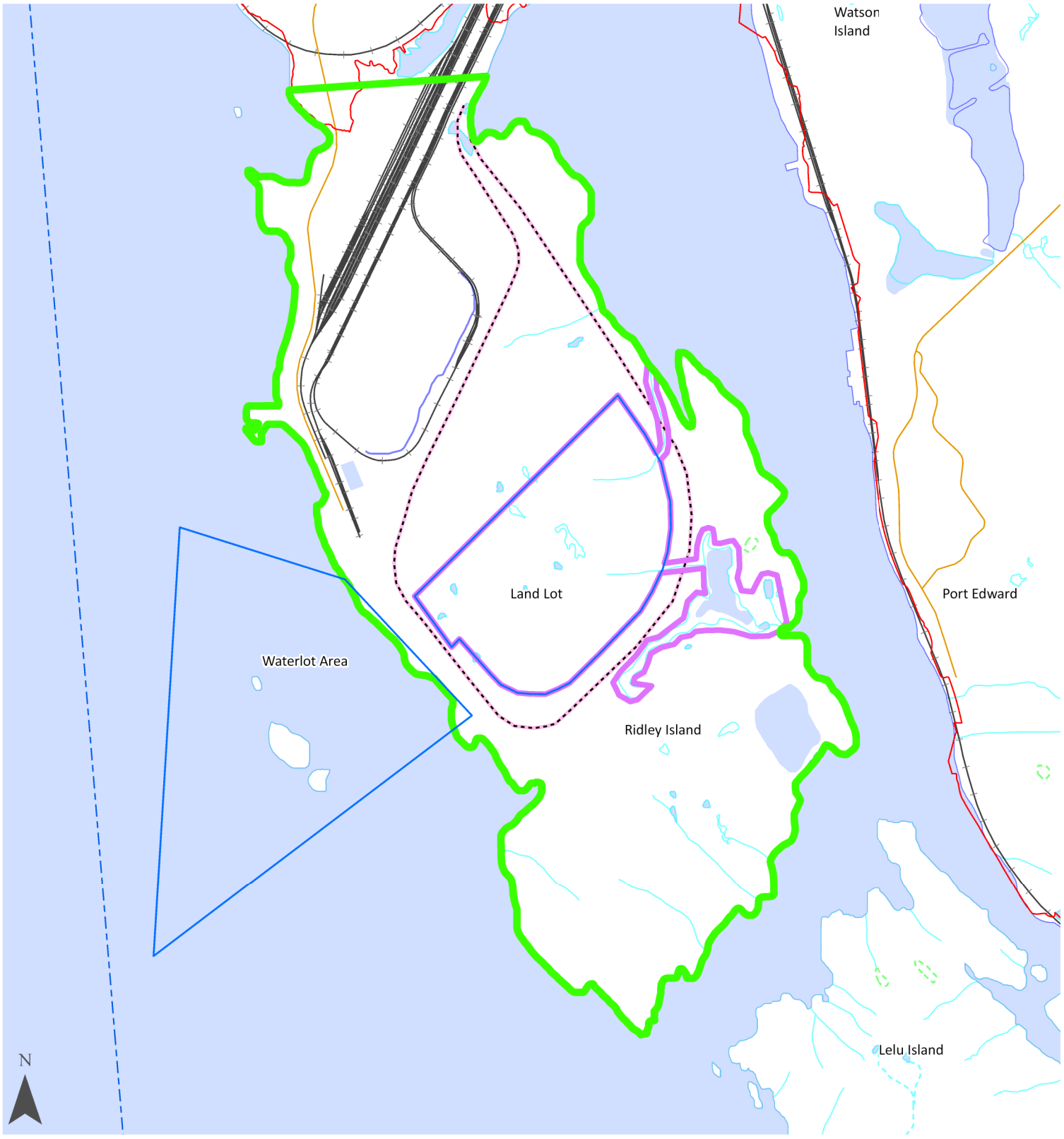

- PRPA Jurisdiction
- PRPA Road, Rail, Utility Corridor (RRUC)
- Major Streets
- Ferry/Water Routes
- Railway
- Freshwater Fish and Fish Habitat Local Study Area
- Freshwater Fish and Fish Habitat Regional Study Area
- Area of Interest
- Ditch
- River or Stream - Definite
- River or Stream - Indefinite
- Lake - Definite
- Marsh
- Swamp
- Dyke or Levee
- Island - Definite
- Coastline - Definite
- Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Freshwater Fish and Fish Habitat Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/13
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:22,475	Reference No: 655902-MD-2

0 260 520 1,040 1,560 2,080 Meters

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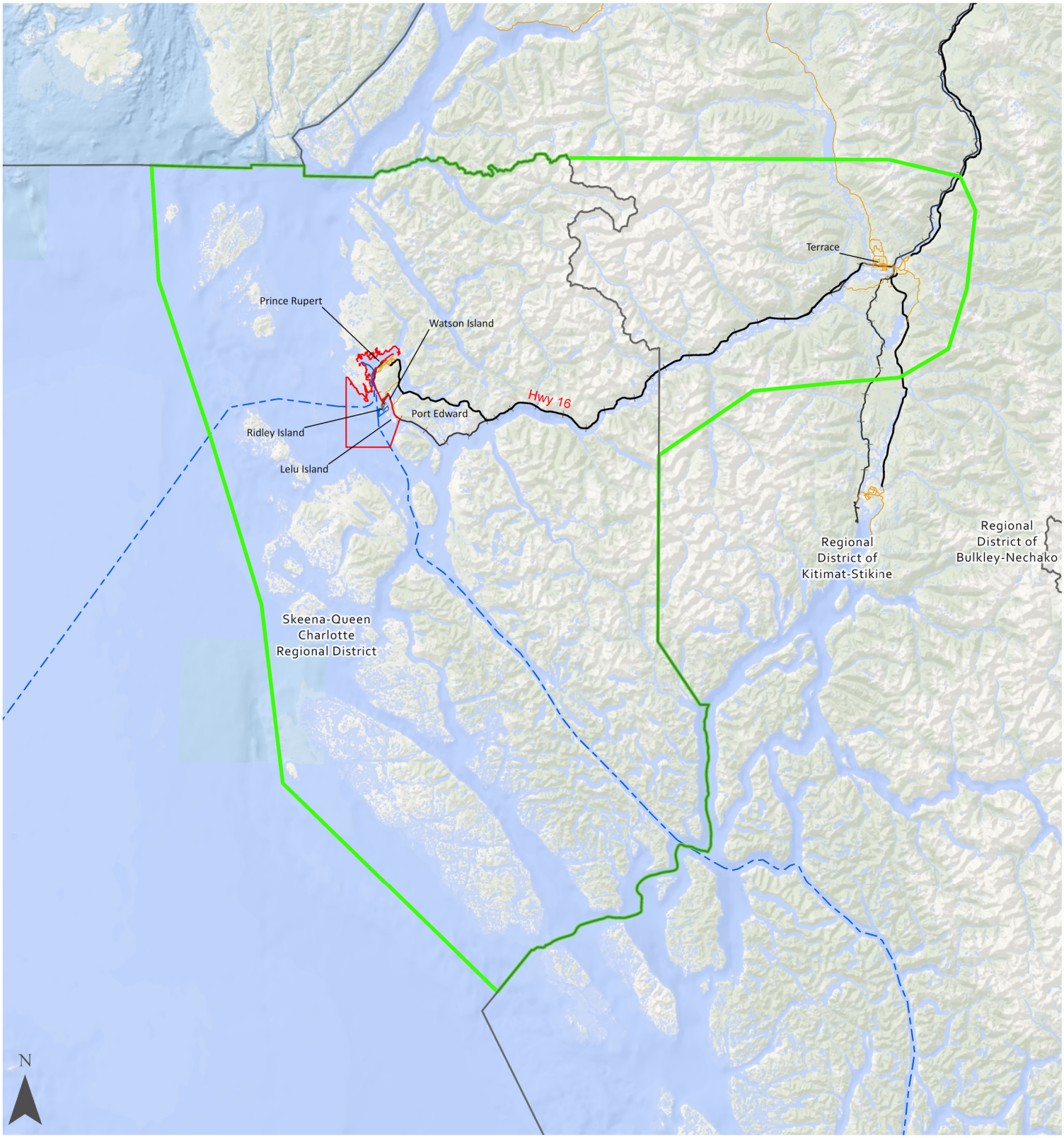

PRPA Jurisdiction

PRPA Road, Rail, Utility Corridor (RRUC)

Highways

Major Streets

Ferry/Water Routes

Railway

Economic Conditions Local and Regional Study Area*

Area of Interest

Regional District Boundaries

Ocean

* Local and Regional Study Area are identical

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Economic Conditions Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/07
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:1,200,000	Reference No: 655902-MD-9

0 12.5 25 50 75 100 Kilometers

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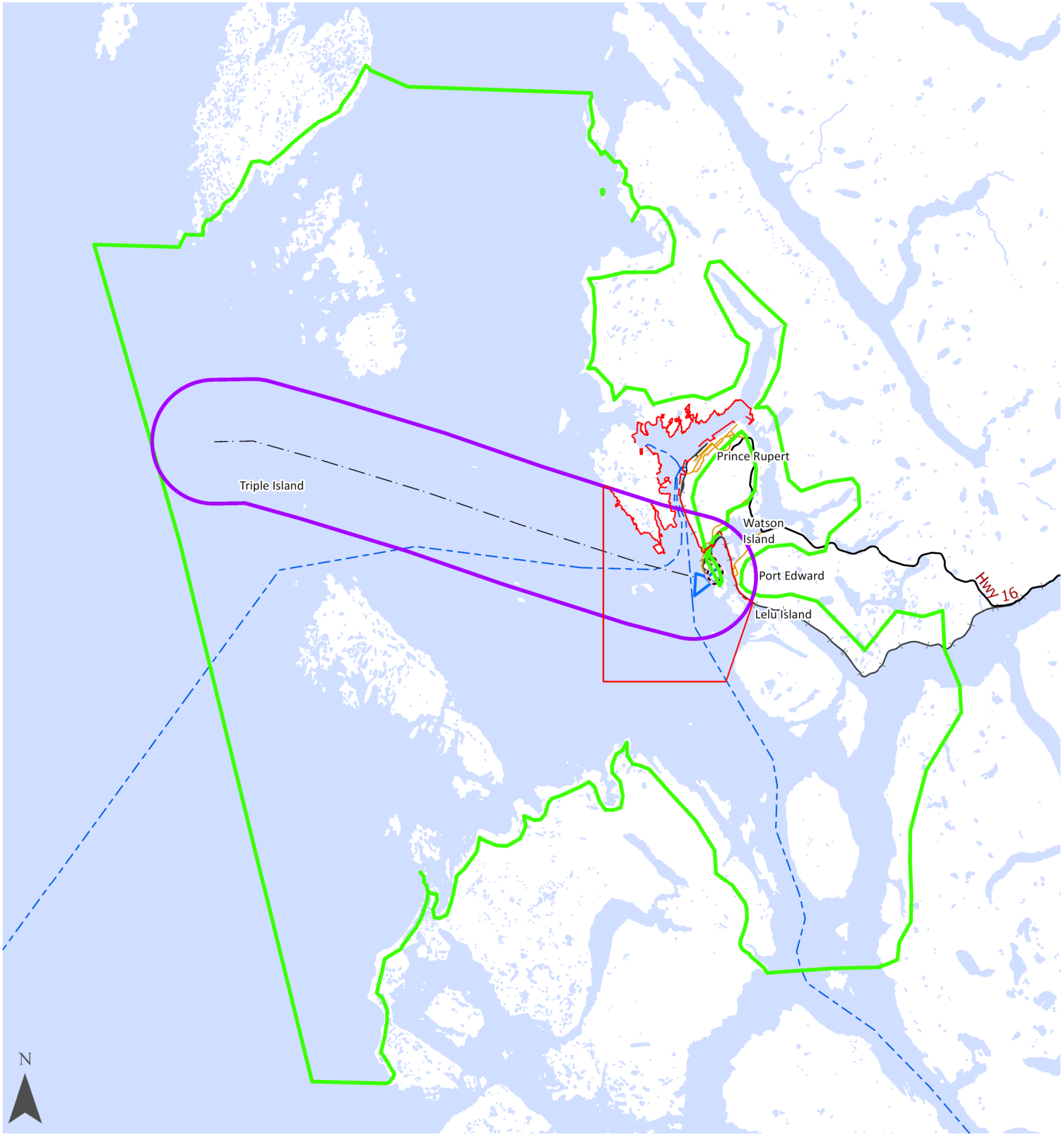


PRPA Jurisdiction

Marine Access Route

PRPA Road, Rail, Utility Corridor (RRUC)

Highways

Major Streets

Ferry/Water Routes

Railway

Area of Interest

Ocean

Marine Use and Navigation Local Study Areas

Marine Use and Navigation Regional Study Areas

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

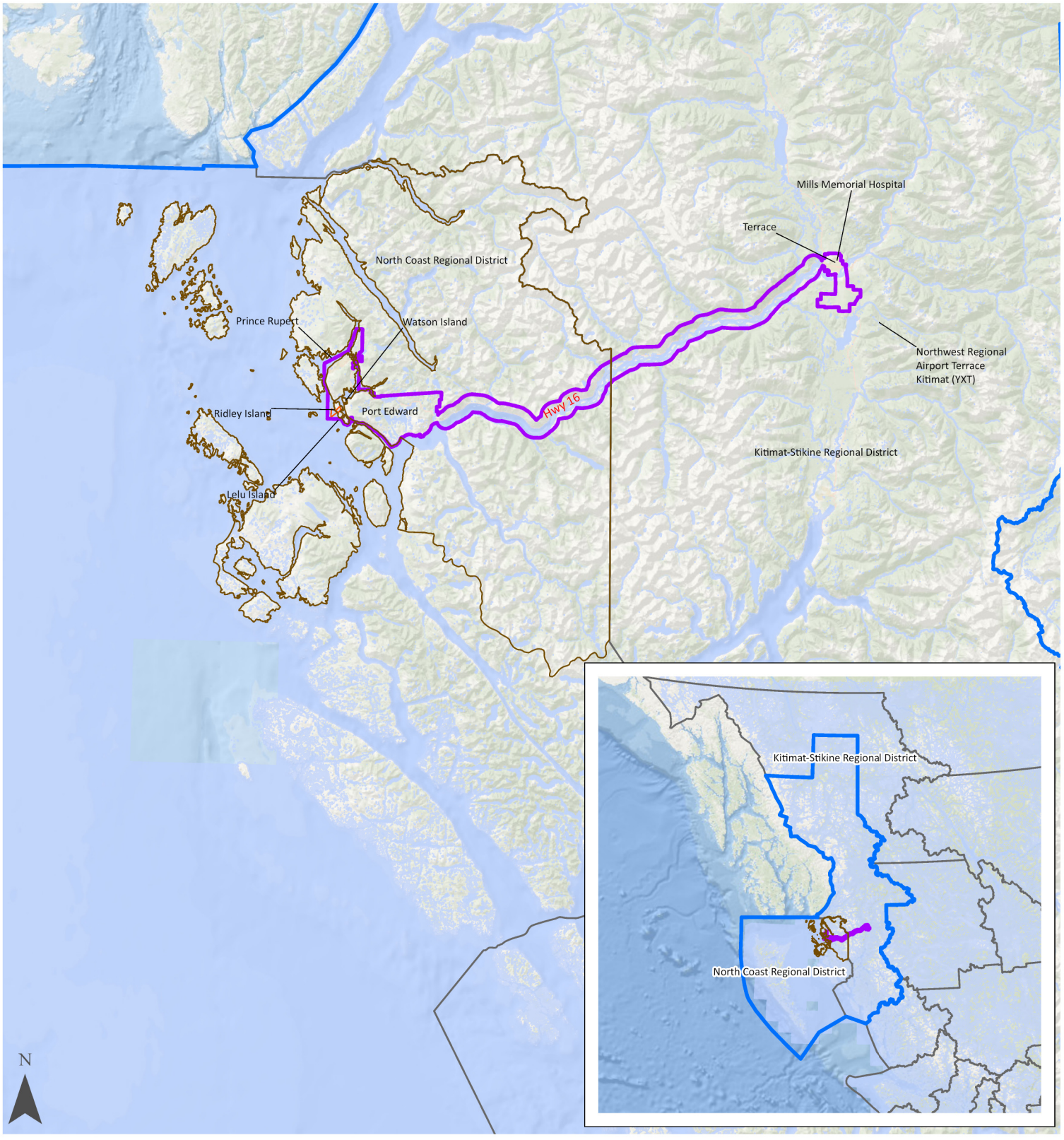
SNC·LAVALIN

Marine Use and Navigation Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/08
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:430,000	Reference No: 655902-MD-12

0 4.75 9.5 19 28.5 38 Kilometers

MXD Path: P:\Current Projects\Vopak Development\656431 Env Assmt\40_Execution\45_GIS_Dwgs\GIS\656431_Pro_2.aprx



Community Services and Infrastructure LSA

Community Services and Infrastructure RSA

Regional District Boundaries

Area of Interest

Ocean

Prince Rupert Local Health Authority

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

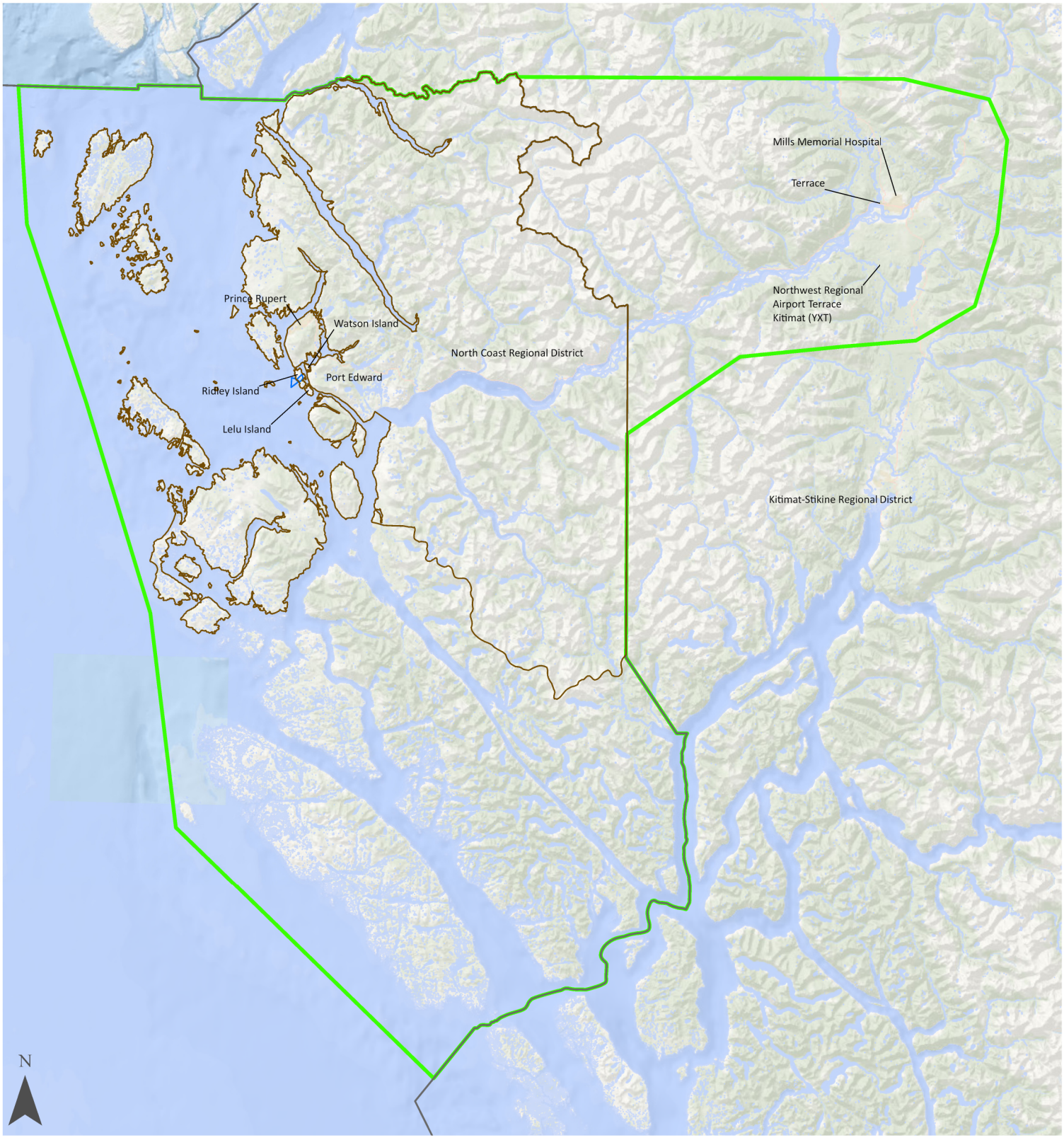
SNC·LAVALIN

Community Infrastructure and Services Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/07
Coord. Sys.:	Scale: 1:1,200,000	Reference No: 655902-MD-14

0 12.5 25 50 75 100 Kilometers

MXD Path: P:\Current Projects\Vopak Development\656431 Env Assmt\40_Execution\45_GIS_Dwgs\GIS\656431_Pro_2.aprx



Community Well-Being Local and Regional Study Area*

Area of Interest

Regional District Boundaries

Ocean

Prince Rupert Local Health Authority

* Local and Regional Study Area are identical

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Community Well-Being Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/07
Coord. Sys.:	Scale: 1:1,000,000	Reference No: 655902-MD-19

0 10 20 40 60 80 Kilometers

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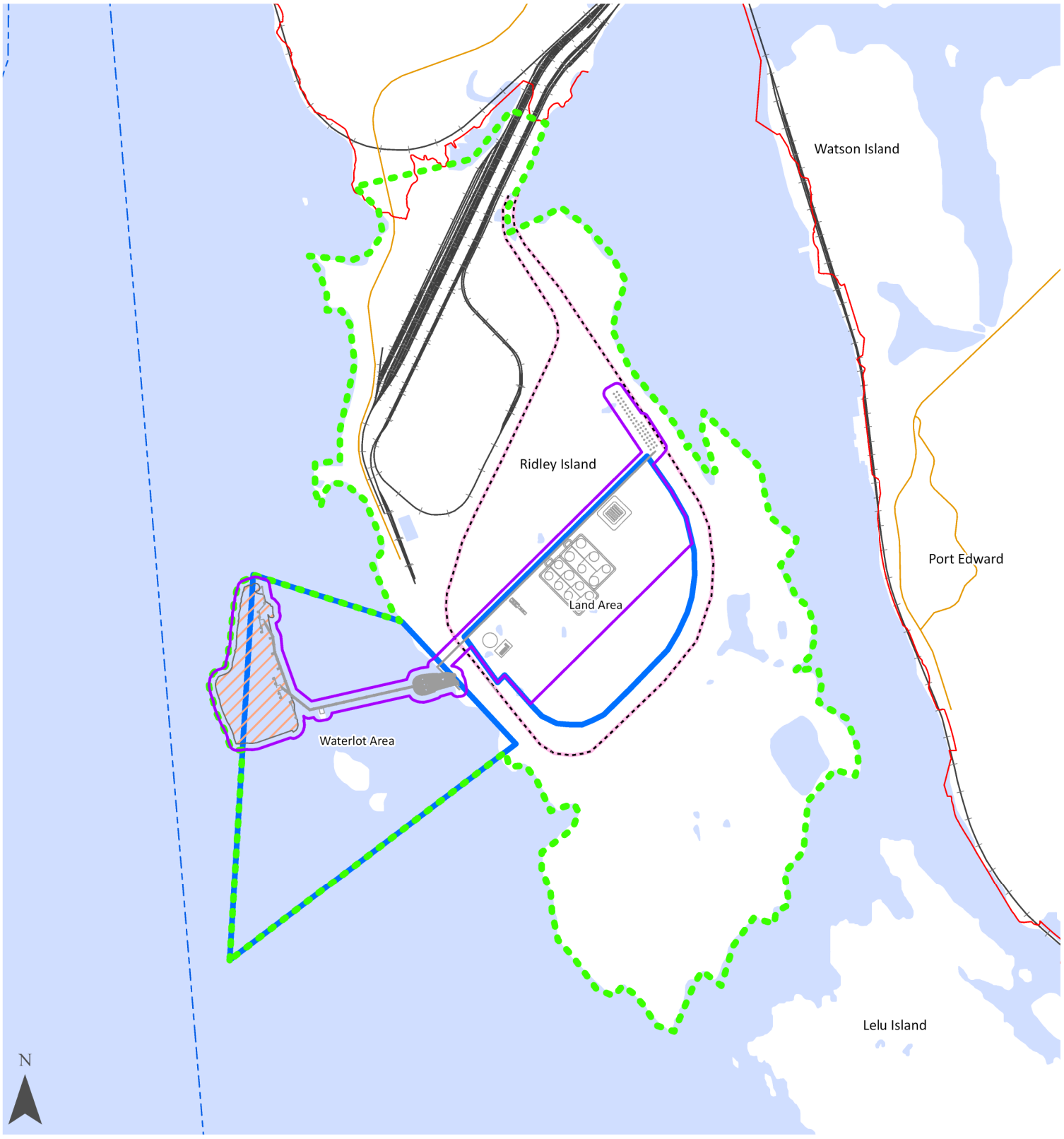


PRPA Jurisdiction
PRPA Road, Rail, Utility Corridor (RRUC)
Project Footprint
Highways
Major Streets
Ferry/Water Routes
Railway
Archaeology Local Study Area
Archaeology Regional Study Area
Area of Interest
Ocean
Dredging Area

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

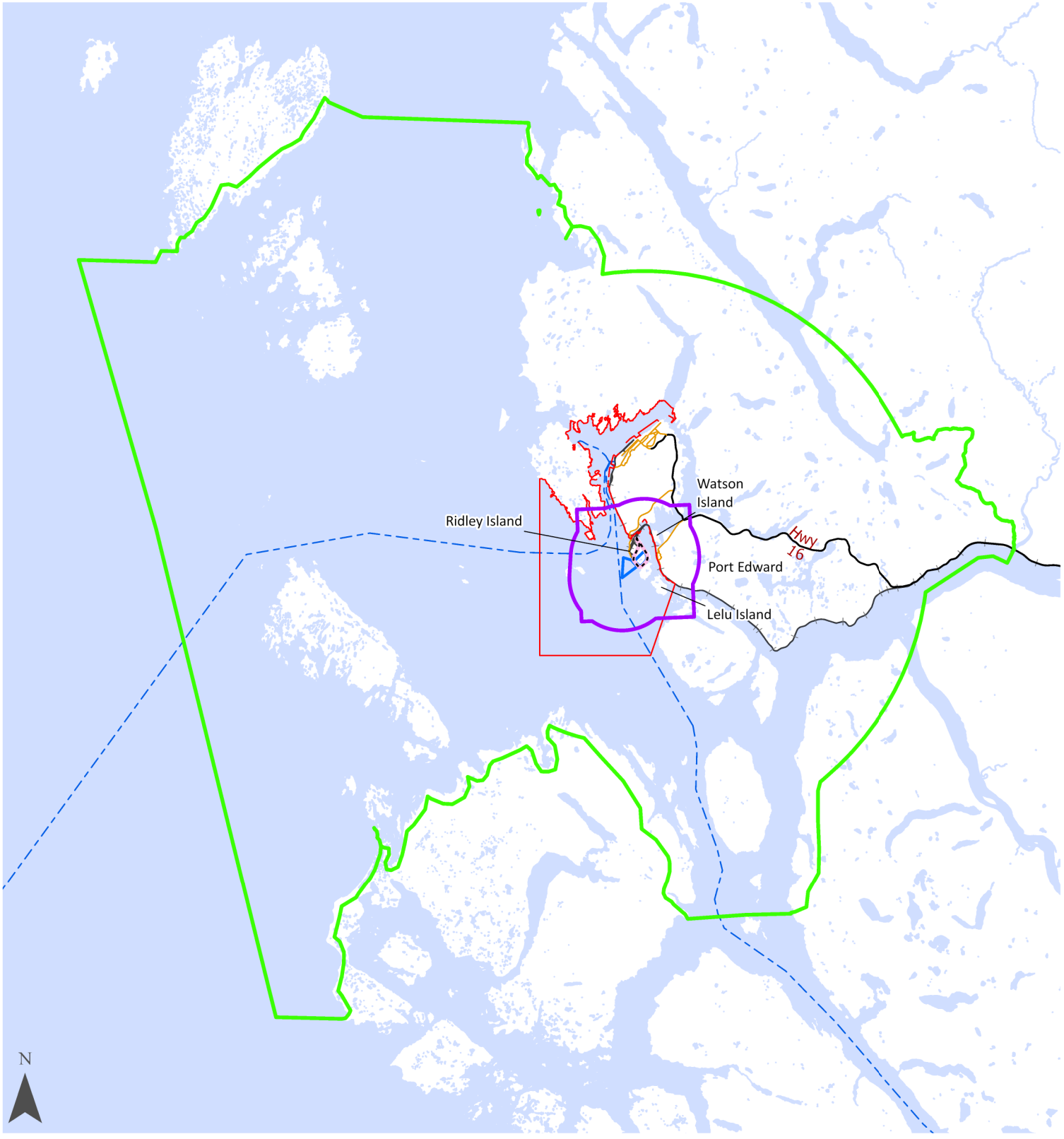
SNC·LAVALIN

Archaeological and Heritage Resources VC LSA and RSA

Created by: ECH	Checked by: MB/EM	Date: 2019/05/15
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:25,000	Reference No: 655902-MD-11

0 287.5 575 1,150 1,725 2,300 Meters

MXD Path: P:\Current Projects\Vopak Development\656431 Env Assmt\40_Execution\45_GIS_Dwgs\GIS\656431_Pro_2.aprx



PRPA Jurisdiction
PRPA Road, Rail, Utility Corridor (RRUC)
Highways
Major Streets
Ferry/Water Routes
Railway
Human Health Local Study Area
Human Health Regional Study Area
Area of Interest
Ocean

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada

SNC·LAVALIN

Human Health Local and Regional Study Areas

Created by: ECH	Checked by: MB/EM	Date: 2019/03/26
Coord. Sys.:NAD 1983 CSRS UTM Zone	Scale: 1:475,000	Reference No: 655902-MD-6

0 5,000 10,000 20,000 30,000 40,000 Meters

MXD Path: P:\Current Projects\Vopak Development\656431 Env Assmt\40_Execution\45_GIS_Dwgs\GIS\656431_Pro_2.aprx