WOODFIBRE LNG PROJECT

ASSESSMENT REPORT

With Respect to

the Application by Woodfibre LNG Limited

for an Environmental Assessment Certificate

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

and

the *Canadian Environmental Assessment Act, 2012*, S.C. 2012 c. 19,

as a substituted environmental assessment

Prepared by:

Environmental Assessment Office

August 19, 2015

BRITISH COLUMBIA

Preface

The Environmental Assessment Office (EAO) manages the assessment of proposed major projects in British Columbia, as required by the *Environmental Assessment Act* (Act). The process includes:

- Opportunities for the involvement of all interested parties;
- Consultation with Aboriginal Groups;
- Technical studies to identify and examine potential significant adverse effects;
- Strategies to prevent or reduce adverse effects; and
- Comprehensive reports summarizing input and findings.

At the conclusion of each environmental assessment (EA), EAO provides a comprehensive assessment report (Assessment Report), and makes recommendations to the Minister of Environment and, for natural gas proposals, to the Minister of Natural Gas Development. The Ministers may decide to certify a project, decline to certify a project, or require further assessment. As this project is also reviewable under the *Canadian Environmental Assessment Act, 2012*, EAO has conducted a substituted EA and will also provide the Assessment Report to the Canadian Environmental Assessment Agency to inform the federal Minister of Environment making the federal environmental assessment decision.

This Assessment Report (the Report) considers the potential for the Woodfibre LNG Project (proposed Project) to cause significant adverse environmental, economic, social, heritage and health effects. It identifies measures to prevent or reduce adverse effects and sets out EAO's analysis and conclusions. It also documents the work undertaken by EAO to consult and accommodate Aboriginal Groups, in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law. The Report also includes the results of procedural aspects of consultation with Aboriginal Groups and Métis Nation British Columbia on behalf of Canada.

Information and records relating to environmental assessments are available on the EAO website at www.eao.gov.bc.ca. Questions or comments can be directed to:

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Acronyms Used in the Assessment Report

AAC Annual Allowable Cut
Act *Environmental Assessment Act*
ADT average day traffic
AAQO ambient air quality objectives
Agency Canadian Environmental Assessment Agency
AIA Archaeological Impact Assessment
AIR Application Information Requirements
ASET Aboriginal Skills and Employment Training
BA Benefits Agreement
BAT best achievable technology
BC British Columbia
BMP best management practices
CAC criteria air contaminants
CEMP Construction Environmental Management Plan
CSA Canadian Standards Association
CSR Contaminated Sites Regulation
C&E Compliance and Enforcement (Program)
CCME Canadian Council of Ministers of the Environment
CDC Conservation Data Centre
CEAA *Canadian Environmental Assessment Act*
CEPA *Canadian Environmental Protection Act*, *1999*
CH_4 methane
CMP Compliance Management Plan
CMT Culturally Modified Trees
CO carbon monoxide
CO_2 carbon dioxide
CO_2e carbon dioxide equivalents
COC – Certificates of Compliance
COPC contaminants of particular concern
COSEWIC Committee on the Status of Endangered Wildlife in Canada
CPD Certified Project Description
CRA fisheries commercial, recreational and aboriginal fisheries
CTS Culture and Traditions Study
CWS Canadian Wildlife Service
dB decibel
DFO Fisheries and Oceans Canada
DOS District of Squamish
EA Environmental Assessment
EAO Environmental Assessment Office
EC Environment Canada
EMA *Environmental Management Act*
EMP Environmental Management Plan
EPC Engineering, Procurement and Construction
EPMR Environmental Protection and Management Regulation
e-PIC EAO electronic Project Information Centre
ERP Emergency Response Plan
FAQ frequently asked questions
FLNR Ministry of Forests, Lands and Natural Resource Operations
FRPA *Forest and Range Practices Act*
FSO floating storage and offloading unit
FTE Full-time equivalent
GDP Gross Domestic Product
GGRCTA *Greenhouse Gas Reduction (Cap and Trade) Act*
GHG greenhouse gas
ha hectare
HAP hazardous air pollutants
HC Health Canada
HCA *Heritage Conservation Act*
HHRA Human Health Risk Assessment
HHERA Human Health Environmental Risk Assessment
hr hour
HRIA heritage resource impact assessment
HROA heritage resource overview assessment
H_2O water
H_2S hydrogen sulphide
HFC hydro-fluorocarbons
IFRs instream flow requirements
IPCC Intergovernmental Panel on Climate Change
ISQG Interim Sediment Quality Guideline
kV kilovolt
LAA Local Assessment Area
LED light-emitting diode
LEH limited entry hunting
LHA Local Health Area
LNG liquefied natural gas
EPA Environmental Protection Agency
MEM Ministry of Energy and Mines
MOE Ministry of Environment
MOF materials offloading facility

MOTI Ministry of Transportation and Infrastructure
MOU Memorandum of Understanding
Mt million tonnes
MTPA million tonnes per annum
NAAQS National Ambient Air Quality Standards
N_2O nitrous oxide
NO_2 nitrogen dioxide
NRCan Natural Resources Canada
O_3 ozone
OGAA *Oil and Gas Activities Act*
OGC Oil and Gas Commission
OGMA old growth management area
PAH polycyclic aromatic hydrocarbons
PDA project development area
PFC perfluorocarbons
PJ Petajoule
Project proposed Woodfibre LNG Project
Proponent Woodfibre LNG Ltd.
PM particulate material
PM_{10} inhalable particulate material
PM_{25} respirable particulate material
PORs points of references
PY person years
QRA Quantitative Risk Assessment
RAA Regional Assessment Area
RCMP Royal Canadian Mounted Police
RMOW Resort Municipality of Whistler
RSTBC Recreation Sites and Trails BC
SARA *Species at Risk Act*
SF_6 sulphur hexafluoride
SIGTTO Society of International Gas Tanker & Terminal Operators Ltd
SLRD Squamish-Lillooet Regional District
SO_2 sulphur dioxide
TBT tributylin
TERMPOL Technical Review Process of Marine Terminal Systems and Transhipment Sites
THLB timber harvesting land base
TLUS Traditional Land Use Studies
TOC Table of Conditions
TSA timber supply area
TSP total suspended particulates
TSS total suspended solids
TUS Traditional Use Study
VC Valued Component
VOC volatile organic compounds
WFP Western Forest Products
WHO World Health Organization
WMU Wildlife Management Unit
WQG water quality guidelines

Executive Summary

Overview

Woodfibre LNG Limited (Proponent) is proposing the construction, operation, and decommissioning of the Woodfibre LNG Project (proposed Project), located approximately 7 km from Squamish, British Columbia (BC) at the former Woodfibre Pulp and Paper Mill site, a brownfield site that includes a deep-water harbour. The proposed Project would include a facility, with two natural gas liquefaction trains, a floating liquefied natural gas (LNG) storage and offloading unit, a seawater cooling system, as well as shipping of LNG in LNG carriers during operations. The proposed Project would be operational for a minimum of 25 years, and would produce an estimated 2.4 million tonnes of LNG per year at full build out. The proposed Project would be owned and operated by Woodfibre LNG Limited, an operating entity wholly owned by Pacific Oil & Gas Limited, which is an energy company within the RGE (Royal Golden Eagle) group of companies, headquartered in Singapore.

The proposed Project is subject to an environmental assessment under BC's *Environmental Assessment Act* by the BC Environmental Assessment Office (EAO), and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) by the Canadian Environmental Assessment Agency (the Agency). On February 19, 2014, the federal Minister of the Environment approved the substitution of the federal environmental assessment process under CEAA 2012 with the process conducted under BC's *Environmental Assessment Act*. The substitution decision was granted in consideration of the approach set out in the *Memorandum of Understanding between the Canadian Environmental Assessment Agency and BC's Environmental Assessment Office on the Substitution of Environmental Assessments, 2013*.

EAO prepared an Assessment Report in consultation with an advisory working group (Working Group), made up of federal, provincial and local government representatives with the mandates and skill sets relevant to the review of the proposed Project, as well as representatives of potentially affected Aboriginal Groups listed on Schedules B and C of the Section 11 Order. The Agency also provided advice to EAO in relation to fulfilling the requirements of CEAA 2012.

EAO undertook public consultation activities during the course of the environmental assessment, including holding two public comment periods. All public comments, and the Proponent's responses to these comments, were considered in completing the environmental assessment.

In conducting this environmental assessment, EAO considered the potential environmental, economic, social, heritage and health effects of the proposed Project, including cumulative effects of other past, current or reasonably foreseeable projects or activities. For the purposes of meeting the CEAA 2012 substitution requirements, EAO considered effects that the proposed Project may have on environmental effects

described in subsections 5(1) and 5(2) of CEAA 2012, as well as the *Species at Risk Act*, subsection 79(2).

Assessment of Effects

EAO uses valued components as an organizing framework for the assessment of the potential effects of proposed projects. Valued components are components of the natural and human environment that are considered by the Proponent, public, Aboriginal Groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

The environmental assessment focused on the valued components related to air quality, greenhouse gas management, freshwater fish and fish habitat, marine water quality and benthic habitat, marine fish and mammals, vegetation communities, terrestrial wildlife and marine birds, economics, infrastructure and community services, land and resource use, marine transport, visual quality, community health and well-being, heritage resources, and human health risk assessment.

EAO assessed the potential for the proposed Project to have significant adverse effects on the valued components and on the requirements of CEAA 2012. The assessment also considered how accidents and malfunctions and changes to the environment could affect the valued components. These assessments were based on the Application provided by the Proponent and informed by comments received from the Advisory Working Group, Aboriginal Groups, and the public.

The Proponent proposed mitigation measures to avoid or minimize the adverse effects of the proposed Project. In consideration of the Proponent's proposed mitigation measures and the comments received during the review of the Application, EAO is proposing 25 conditions, each of which includes measures to mitigate the effects of the proposed Project. If provincial Ministers issue an Environmental Assessment Certificate, they may establish these conditions as legally binding requirements. Additional mitigation conditions may be proposed by the Agency for consideration by the federal Minister of the Environment as legally binding conditions in a CEAA 2012 decision statement should the proposed Project be approved to proceed.

The following are some of the key mitigation measures and follow-up programs that are included in the conditions EAO proposes to provincial Ministers, some of which may also be incorporated in a decision statement under CEAA 2012:

- Management and monitoring of marine water quality during construction and operations, to ensure protection of the health of marine life and humans;
- Management and monitoring of marine fish and fish habitat to avoid or mitigate impacts to fish and fish habitat;
- Marine mammal monitoring and mitigation during construction;

- Development of a wildlife management plan to minimize impacts to wildlife, including timing of flaring events to reduce risks to birds and to reduce human-wildlife conflicts;
- A traffic impact assessment and development of a traffic control management plan to identify measures to minimize traffic disruptions and mitigate impacts on safety of other users on Highway 99 and at Darrel Bay ferry location during construction;
- Management and monitoring of impacts of the proposed Project's marine traffic during construction and operations to minimize disruption to commercial and recreational users in Howe Sound and to reduce disturbance to marine mammals;
- Monitoring to verify the assessment of the wake effects from LNG carriers, particularly in relation to potential safety hazards to marine and shoreline users, and including adaptive management measures;
- Communication of marine activities during construction and operations with impacted stakeholders and Aboriginal Groups; and
- Ongoing consultation with the public and Aboriginal Groups throughout all phases of the proposed Project.

Other mitigation measures that would be requirements of subsequent regulatory processes, if an Environmental Assessment Certificate is issued, include:

- A waste water and discharge permit under the *Environmental Management Act*, which would include the allowable criteria air contaminant emission levels and detailed mitigation requirements;
- Fish habitat offsetting, as required under authorization contemplated under paragraph 35(2)(b) of the federal the *Fisheries Act,* if required by Fisheries and Oceans Canada;
- Development of an emergency response assistance plan, approved by Transport Canada, as required by the *Transportation of Dangerous Goods Act;* and
- Maintenance and preservation of marine access under the *Navigation Protection Act.*

In consideration of the mitigation measures that would be required of the proposed Project, either in the Environmental Assessment Certificate, if approved, or in subsequent regulatory processes, EAO concludes that the proposed Project would result in key residual adverse effects that include:

- Impact on the marine water quality from the potential for temporary marine sediment disturbance during construction and due to the seawater cooling system discharges during operations;
- Potential harm to freshwater fish and changes to freshwater fish habitat during construction;

- Potential harm to benthic communities and marine fish and changes to benthic habitat during construction and due to the seawater cooling intake and system discharges during operations;
- Change in access and alteration of forestry operations;
- Increased marine traffic during construction and operations in the already busy navigable waters of Howe Sound;
- Reduced visual quality during operations due to the ongoing presence of proposed Project infrastructure and the mooring of LNG carriers;
- Potential increase to human health risk due to inhalation of one potential contaminant of concern; and
- Potential harm to fish and marine mammals due to underwater noise impacts during construction.

For the purposes of the assessment required under CEAA 2012, EAO concludes that the proposed Project would result in key residual adverse effects that, in addition to those above, include:

- Increase in ambient sound levels during construction and operations on federal lands;
- Increase in ambient sound levels during construction and operations for Aboriginal peoples;
- Change in visual quality for Aboriginal peoples at terrestrial and marine viewpoints;
- Impacts to the current harvesting and consumption of traditional marine and non-marine foods by Aboriginal peoples;
- Impacts to health conditions of Aboriginal peoples due to inhalation of one potential contaminant of concern; and
- Impacts to socio-economic conditions of Aboriginal peoples due to potential marine transportation interference of fisheries and shoreline harvesting and changes in visual quality;

Aboriginal Consultation

EAO and the Agency worked together to identify which Aboriginal Groups could potentially be impacted by the proposed Project based on the following factors:

- Strength of the case for the claimed Aboriginal rights and title (Aboriginal Interests) that may be adversely affected; and
- Seriousness of the proposed Project's potential to adversely impact these Aboriginal Interests.

Potential direct effects from the proposed facility would occur in the asserted traditional territory of Squamish Nation. Potential effects along the shipping route through Howe Sound would occur in the asserted traditional territories of Squamish Nation and Tsleil-Waututh Nation. Potential effects at the mouth of Howe Sound along the shipping route would overlap the asserted traditional territories of Musqueam Nation, Cowichan

Tribes First Nation, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe, and Stz'uminus First Nation. EAO consulted these groups throughout the environmental assessment and assessed the potential adverse effects of the proposed Project on their Aboriginal Interests. EAO also consulted with these Aboriginal Groups throughout the environmental assessment, including the Métis Nation British Columbia on behalf of the federal government.

The proposed Project has the potential to impact claimed Aboriginal rights related to hunting, fishing, trapping, gathering, trails and travelways, and archaeological and heritage resources and sites. The proposed Project also has the potential to impact asserted Aboriginal title at the facility location. The key mitigation measures and proposed conditions would avoid, reduce or accommodate the assessed potential effects to Aboriginal Interests. In the context of potential impacts on Aboriginal Interests, EAO also considered: the importance of the proposed Project to the local, regional, and provincial economy; the resources or values that may no longer be available for future generations; and the benefits of the proposed Project to Aboriginal Groups.

Conclusion

EAO concludes that, considering the analysis and implementation of the proposed conditions, the proposed Project would not result in significant adverse effects.

PART A – INTRODUCTION AND BACKGROUND

1 Purpose of the Report

The purpose of this Assessment Report (Report) is to summarize the procedures and findings of the environmental assessment (EA) conducted on the Application by Woodfibre LNG Limited (the Proponent) for an EA Certificate for the Woodfibre LNG Project (proposed Project), submitted January 13, 2015.

The Environmental Assessment Office (EAO) is required to prepare this Report for provincial Ministers who are responsible for making a decision on the proposed Project under section 17 of the Act. For liquefied natural gas (LNG) facility projects, the deciding provincial Ministers are the Minister of the Environment and the Minister of Natural Gas Development.

On February 19, 2014 the federal Minister of the Environment approved the substitution of the British Columbia (BC) EA process for the federal process. The substituted process must meet the EA requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

The approval was granted with the understanding that the EA would be conducted by EAO in accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013) entered into by the Canadian Environmental Assessment Agency (Agency) and EAO. The essence of the memorandum of understanding (MOU) on substitution is that EAO would consider the factors as set out in subsection 19(1) of CEAA 2012, including but not limited to Section 5 of the Act, when conducting the EA, would gather information from Aboriginal Groups about the impacts of the proposed Project on their potential or established Aboriginal treaty rights and ways to prevent, mitigate or otherwise address those impacts as appropriate, and would provide an EA report to the Agency that includes the findings and conclusions of the EA with respect to those factors. Ultimately, substitution results in one EA process designed to support the making of both provincial and federal decision EA decisions.

The Report will be submitted to the Agency and will inform the federal Minister of the Environment's decision-making under CEAA 2012. Consistent with paragraph 34(1)(e) of CEAA 2012, the Report will be made available to the public at the conclusion of the EA.

This Report:

- Describes the proposed Project, substituted EA process, and consultation undertaken during the EA;
- Documents work undertaken by EAO to consult and accommodate Aboriginal

Groups in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law;
- Documents procedural aspects of consultation with Aboriginal Groups, including Métis Nation BC on behalf of Canada;
- Identifies the potential environmental, economic, social, heritage and health effects of the proposed Project and how the Proponent proposes to mitigate adverse effects;
- Identifies the residual adverse effects after mitigation;
- Identifies the conditions proposed by EAO; and
- Sets out conclusions based on the proposed Project's potential for significant adverse residual effects with respect to both the Act and CEAA 2012.

This Report does not replicate the content presented in the Application. In the preparation of this Report, the following information has been considered:

- The Application and supplemental information provided by the Proponent; and
- Comments provided on the Application and supplemental information by the Working Group, Aboriginal Groups and the public.

This information has been posted to EAO's electronic Project Information Centre (ePIC).

2 Project Overview

2.1 Proponent Description

If approved, the Environmental Assessment Certificate (EA Certificate) and operational permits for the Project would be held by Woodfibre LNG Limited (the Proponent), a Canadian company based in Vancouver, BC with a community office in Squamish, BC. The Proponent is an operating entity wholly owned by Pacific Oil & Gas Limited, which is an energy company within the RGE (Royal Golden Eagle) group of companies headquartered in Singapore.

On March 31, 2014, the Proponent received a Licence (GL-304) to Export LNG from the National Energy Board pursuant to section 117 of the *National Energy Board Act*. At full build-out the proposed Project would produce a maximum of 2.415 million tonnes of LNG per year.

2.2 Project Description and Scope

2.2.1 Project Description and Location

The proposed Project would be located in the District of Squamish (DOS), approximately 7 km west-southwest from the urban centre of Squamish, BC (see Figure 2-1). The Project would be located at the former Woodfibre Pulp and Paper Mill site, a

fee simple, industrially-zoned, brownfield site with a deep-water harbour (see Figure 2-2). Access to the Woodfibre site is by water or air only.

The proposed Project's site is in the asserted traditional territory of Squamish Nation and the proposed Project's shipping route is in the asserted traditional territories of Squamish Nation, Tsleil-Waututh Nation, Musqueam Nation, Cowichan Tribes First Nation, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe and Stz'uminus First Nation. Members of Métis Nation BC also reside in the area.

On December 22, 2014, the Ministry of Environment (MOE) issued two risk-based Certificates of Compliance (COC) to the former owner, Western Forest Products, for the Woodfibre property pursuant to the Contaminated Sites Regulation (CSR) under the *Environmental Management Act* (EMA). One COC covers the upland portion of the Woodfibre property and the other covers the sediment portion, contained within the existing water lots. The issuance of the COCs demonstrates that contaminants are not continuing to discharge into the aquatic environment (freshwater or marine) and any contaminants left *in situ* have been remediated to risk-based standards and would not be re-mobilized in the future. The issuance of the COC also demonstrates that risks to human health, wildlife, marine resources, and water quality are acceptably low. The COC conditions include requirements for additional management and monitoring, including performance verification plans for each COC.

A floating storage and offloading unit (FSO) would serve as both the LNG storage and a berthing and mooring facility for LNG carriers. The FSO would be permanently moored to the FSO jetty. The LNG facility would be powered by electricity supplied by BC Hydro and would require upgrades to the existing BC Hydro transmission system, which are not included within the scope of the EA.

Shipping activities would include up to 40 LNG carrier visits per year (approximately 3 – 4 LNG carriers per month) to the Project site. The marine access route to the Woodfibre site would follow established shipping routes within Howe Sound.

If an EA Certificate is issued, and other regulatory approvals are received, construction would be completed in approximately two years following issuance of permits. The proposed Project would be expected to be commissioned in 2017.

The proposed Project would be supplied with natural gas from the proposed Eagle Mountain – Woodfibre Gas Pipeline Project, owned and operated by FortisBC Energy Vancouver Island Inc., which is currently undergoing a provincial EA concurrently with the proposed Project.

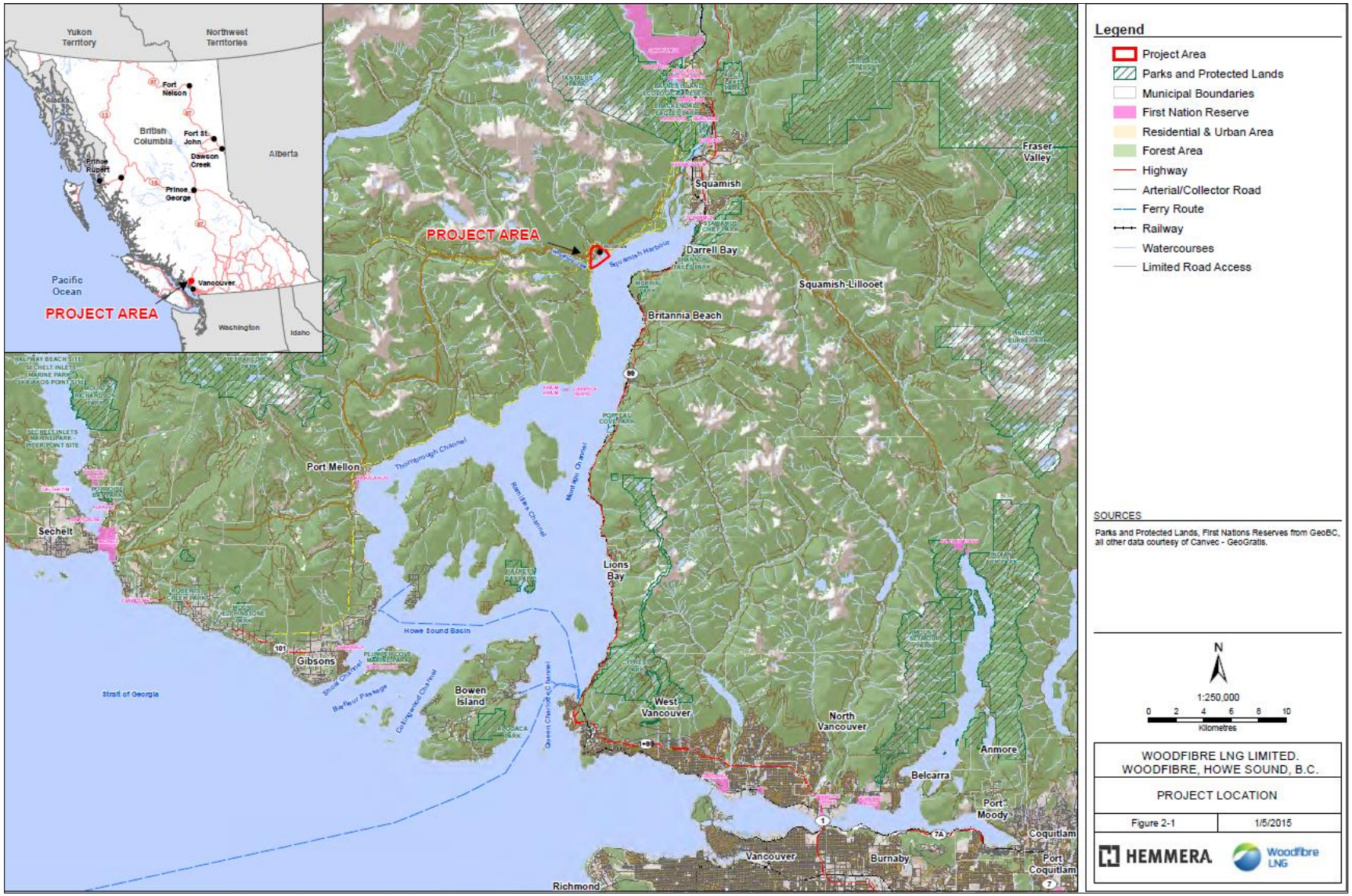


Figure 2-1: Project Location

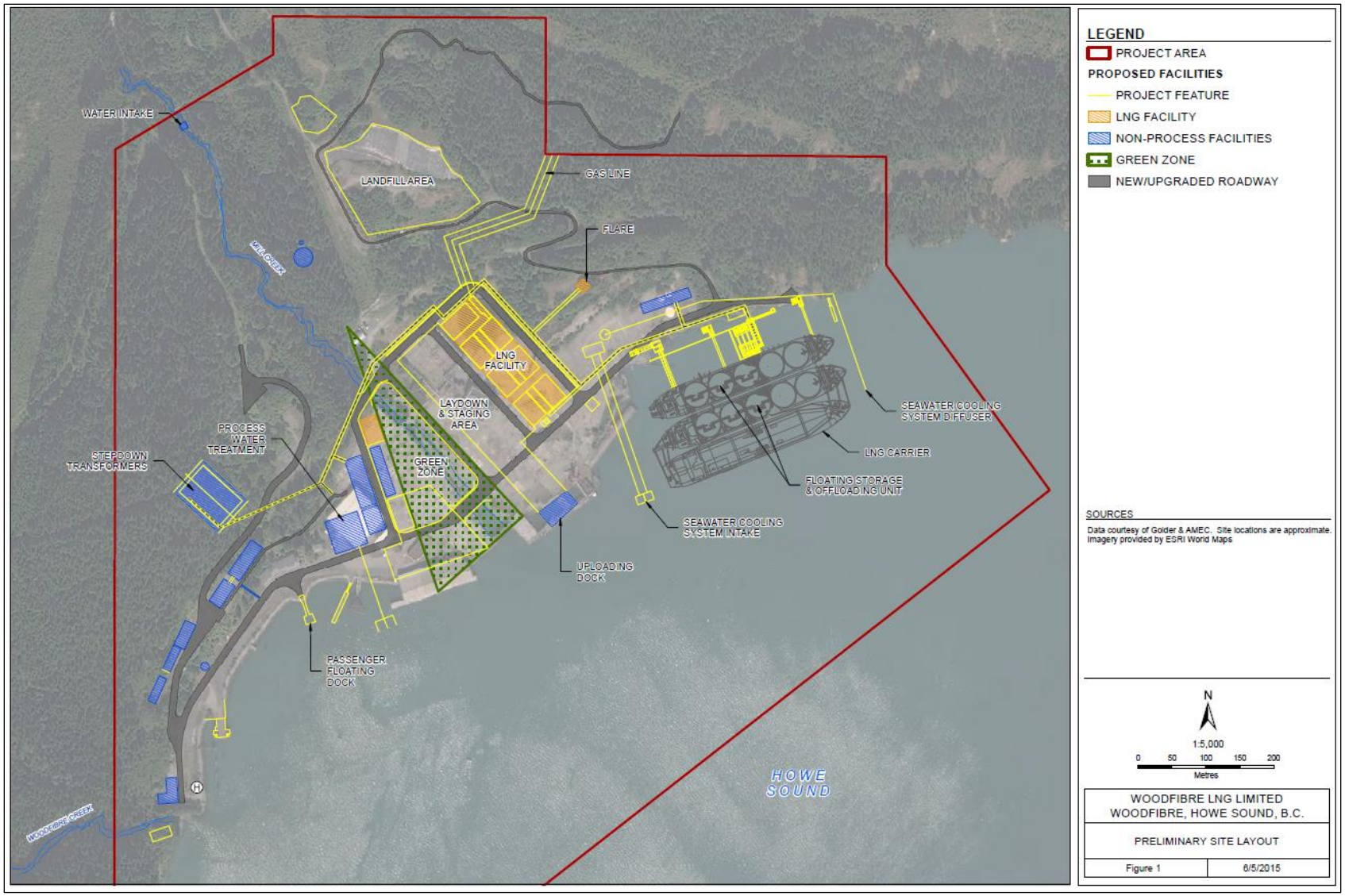


Figure 2-2: Detailed Project Site Plan

2.2.2 Project Components

The proposed Project would include the following components, described in further detail below:

- LNG facility and supporting infrastructure (also see Figure 2-2);
- Temporary construction-related infrastructure and facilities; and
- Shipping activities.

LNG Facility and Supporting Infrastructure

Natural gas received at the facility would be processed in two natural gas liquefaction trains, where condensate (e.g., natural gas liquids) and impurities (e.g., water) would be removed and the remaining natural gas would be converted into LNG through refrigeration and transferred into storage tanks. The proposed Project would include the following LNG processing and storage components:

- Natural gas inlet station;
- Two natural gas liquefaction trains (processing units), comprised of gas treatment and liquefaction facilities;
- The FSO, including mooring and marine terminal for carriers, consisting of two converted Moss-type LNG carriers with a total capacity of 250,000 m^3;
- A condensate storage tank with a volume of approximately 300 m^3;
- A seawater cooling system;
- Wastewater treatment facilities; and
- Flare systems, with a flare derrick of approximately 140 m.

The proposed Project would employ a seawater cooling system that includes an intake structure designed to withdraw approximately 17,000 m^3/h of seawater and a discharge diffuser (as shown in Figure 2-3). The LNG facility would use indirect cooling methods, meaning that the seawater would not come into direct contact with refrigerants used to produce the LNG.

The seawater cooling system intake structure would be fixed to the ocean floor at a depth of greater than 25 m and elevated approximately 2 m off of the seafloor to minimize potential entrainment of sediment. The intake structure would employ travelling screens to protect marine organisms entrained into the seawater cooling system; the screens would continuously rotate, such that small fish and other aquatic life would be washed into buckets and returned to Howe Sound. To prevent bio-fouling of the seawater cooling system, a chlorine-based bio-fouling agent, such as sodium hypochlorite, may be required. Prior to discharge, the seawater cooling water would

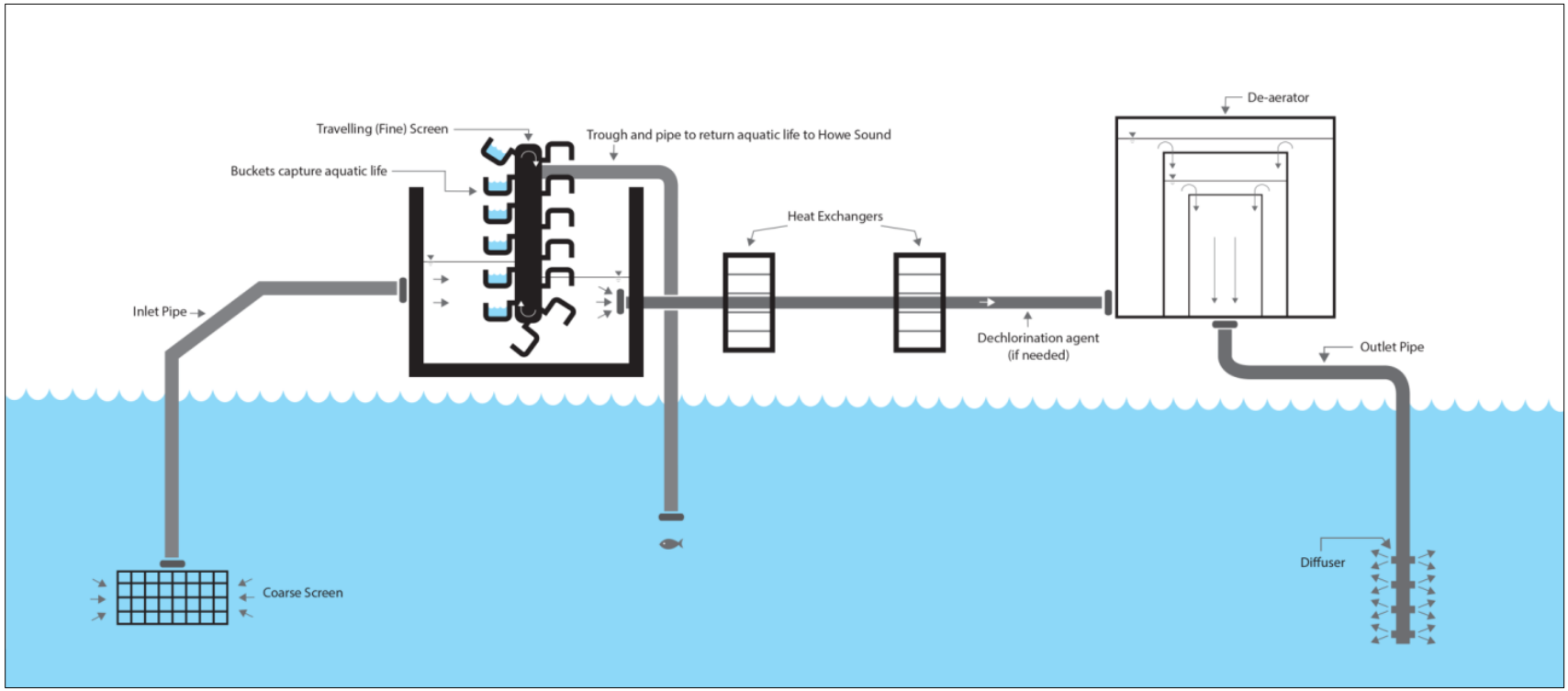


Figure 2-3: Components of Seawater Cooling System

pass through a de-aeration tank, and if required, a de-chlorination system would be added to remove residual chlorine before the seawater is discharged to Howe Sound. Operation of the seawater cooling system would require a waste discharge permit under section 14 of EMA and would need to comply with all applicable water quality guidelines and the *Fisheries Act*. The seawater diffuser would be installed on the seafloor at a minimum water depth of 40 m at a height of 2 m above the sea floor.

The flaring system is an important component of an LNG facility's safety system. The purpose of the flare system is to collect and dispose of hydrocarbon-containing streams in a controlled manner. The flare derrick structure would have an approximate height of 140 m. There would be a continuously operational flare pilot. Controlled flaring is expected to have a maximum flare height of 30 m and the maximum flare height is anticipated to be approximately 60 m during unplanned shut-downs, emergency events and start-up and commissioning.

The LNG facility and terminal's electrical power would be sourced from BC Hydro.

Construction activities associated with the FSO jetty would include pile driving and excavation and placement of reinforced concrete bases at connection points. During construction, barges and lifting equipment would be required onsite to enable construction and installation of this facility. The FSO would be permanently moored to the jetty. Marine loading arms would be located on the FSO loading platform to transfer the LNG to the FSO for storage and also to load the LNG carrier at berth.

The existing barge ramp would be the primary access point for heavy equipment and materials. A passenger ferry would also provide access to the Project site for light supply vehicles and flat-deck trucks.

Supporting permanent infrastructure within the facility area would include:

- Electrical power supply infrastructure to supply power to the facility and terminal;
- Fresh water supply infrastructure, including intake, piping and storage tank;
- Main administrative building(s), control room(s), maintenance building(s), dry storage and chemical building(s), fire house(s), first aid building(s), and safety and guardhouse buildings;
- Facilities to provide site access, including floats, docks, barge ramp, passenger ferry terminal and helipad;
- Shoreline protection berm;
- Site security infrastructure;
- Water and wastewater treatment and discharge facilities;
- Stormwater management and discharge facilities;
- Roads and bridges; and
- Existing landfill (permitted for wood waste and miscellaneous waste).

Temporary Infrastructure and Facilities

The proposed Project would include the following construction-related temporary infrastructure and facilities:

- Concrete batch plant(s);
- Temporary buildings to house administration offices, temporary medical facilities, employee canteens and services, field offices, sanitary facilities and a shipping and receiving warehouse;
- Temporary utilities for construction, including water, power, gas, and wastewater and waste disposal; and
- Site drainage systems.

Temporary or permanent worker accommodation is not being proposed; construction and operations personnel are expected to reside in their own homes or use existing rental housing and temporary accommodation. Additional details related to potential effects on housing and accommodations are provided in section 7.1 (Infrastructure and Community Services) of this Report.

Shipping Activities

During operations, the proposed facility would receive up to 40 LNG carrier visits per year, or approximately 3 to 4 LNG carrier visits per month. Two BC Coast Pilots would take control of inbound LNG carriers outside of Victoria, BC near the Ogden Point Pilotage Station and pilot the ships through the Strait of Juan da Fuca and the Strait of Georgia, through Howe Sound to the Project Site, as shown in Figure 2-4. The LNG carriers would be accompanied by a minimum of three tugs, at least one of which would be tethered while in transit in Howe Sound.

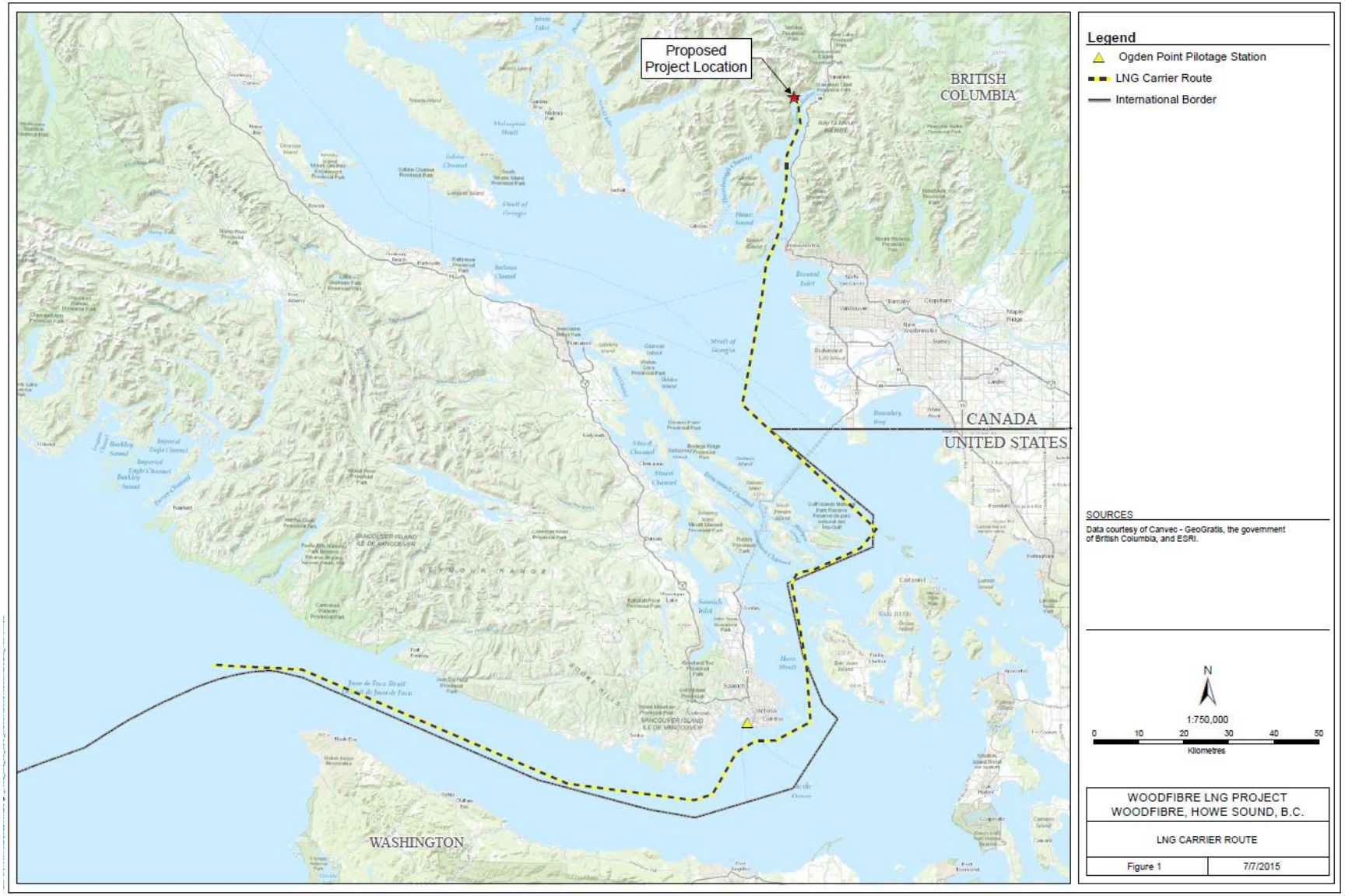


Figure 2-4: Proposed Shipping Route

2.2.3 Project Activities

Construction

The Proponent anticipates that the construction phase would be completed in approximately two years. The construction activities would include:

- Site preparation (land-based);
- Upgrades to existing roads and construction of new roads;
- Demolition and upgrades of existing structures;
- Creosote pile removal;
- Re-vegetation of the Mill Creek ‘Green Zone’;
- Removal of historic wood waste from the foreshore;
- Treatment and discharges of wastewater, stormwater and landfill leachate;
- Waste management and potential seismic upgrades to the landfill;
- Vehicle and vessel traffic; and
- Commissioning and start-up (including processing units, common utilities, loading and shipping facilities).

Operations

Once construction is complete, the operations phase would begin. The life of the proposed Project is estimated to be a minimum of 25 years. Operational activities would include:

- Natural gas treatment and natural gas liquids extraction;
- LNG production, storage and loading;
- Waste management; and
- Shipping.

Maintenance activities for the components of the proposed Project would be conducted on a regular maintenance schedule, which would include periodic total shutdown to ensure the proper functioning of safety systems and to maintain facility integrity to prevent uncontrolled releases of fluids or energy and ensure the facility can reliably meet production targets. Preventative maintenance would occur approximately every 2 to 3 years.

Decommissioning and Abandonment

At the end of the life of the proposed Project (estimated to be a minimum of 25 years) the facility would be decommissioned. Decommissioning and abandonment activities would likely include:

- Preparation of the site for future industrial use;
- Dismantling of land-based and marine infrastructure;

- Removal of the FSO;
- Phase II Contaminated Site Assessment;
- Site clean-up and reclamation; and
- Site decommissioning in accordance with the upland and waterlot COCs.

2.2.4 Alternative Means of Undertaking the Proposed Project

The Application includes a comparative evaluation of alternative practical means of implementing and carrying out various aspects of the proposed Project, consistent with paragraph 19(1)(g) and paragraph 34(1)(a) of CEAA 2012.

The specific alternative means that were evaluated included the following:

- Project location;
- Shipping route within Howe Sound;
- Layout of Project components;
- Construction methods;
- Power supply options; and
- Cooling technology.

The evaluation of alternatives means was conducted using the following general criteria:

- Technical requirements to construct and operate the facility and its related infrastructure;
- Economic feasibility;
- The potential for Project-related environmental effects, including the environmental effects as identified in section 5 of CEAA 2012; and
- Public interests, including health and socio-economic effects.

Based on:

- Information contained in the Proponent's Application and the supplemental information provided during Application review;
- The Proponent's and EAO's efforts at consultation with Aboriginal Groups, government agencies, including local governments, and the public, and the Proponent's commitment to ongoing consultation;
- Comments on the proposed Project made by Aboriginal Groups and government agencies, including local governments, as members of EAO's Working Group, and the Proponent's responses to these comments;
- Comments on the proposed Project received during the public comment period, and the Proponent's responses to these comments;
- Issues raised by Aboriginal Groups, including through the Squamish Process, regarding potential impacts of the proposed Project and the Proponent's responses and best efforts to address these issues;
- The design of the proposed Project as specified in the proposed Schedule A (Certified Project Description) of the EA Certificate to be implemented by the Proponent during all phases of the proposed Project; and,

- Mitigation measures identified as proposed conditions in Schedule B (Table of Conditions) of the EA Certificate to be undertaken by the Proponent during all phases of the proposed Project.

EAO is satisfied that:

- The EA process has adequately identified and assessed the potential adverse environmental, economic, social, heritage and health effects of the proposed Project, having regard to the proposed conditions set out in Schedule B (Table of Conditions) to the EA Certificate;
- Consultation with Aboriginal Groups, government agencies, and the public, and the distribution of information about the proposed Project have been adequately carried out by the Proponent and that efforts to consult with Aboriginal Groups will continue on an ongoing basis;
- Issues identified by Aboriginal Groups, government agencies, including local governments, and the public, which were within the scope of the EA, were adequately and reasonably addressed by the Proponent during the review of the Application;
- Practical means have been identified to prevent or reduce any potential adverse environmental, social, economic, heritage or health effects of the proposed Project such that no direct or indirect significant adverse effect is predicted or expected;
- The potential for adverse effects on the Aboriginal rights and title of Aboriginal Groups has been avoided, minimized or otherwise accommodated to an acceptable level;
- The provincial Crown has fulfilled its obligations for consultation and accommodation to Aboriginal Groups relating to the issuance of an EA Certificate for the proposed Project.

The provincial Minister of Environment and the Minister of Natural Gas Development will consider this assessment report, the summary assessment report and other accompanying materials in making their decision on the issuance of an EA Certificate to the Proponent under the Act.

Appendix 1: Summary Assessment of Alternatives Appendix 1: Summary Assessment of Alternatives, provides a detailed summary of the evaluation of the various alternative means considered in the Application.

During Application Review, EAO requested additional information on the evaluation of alternative cooling methods in response to concerns raised by the public and the Working Group related to potential adverse impacts to the marine environment due to the proposed seawater cooling system.

The Proponent provided a response to EAO's supplemental information request, *Assessment of Alternative Cooling Methods* (April 2015), which provided additional details on the evaluation of four technically and economically feasible alternative cooling methods:

- Air cooling;
- Evaporative cooling;
- Freshwater cooling; and
- Seawater cooling.

The memo determined that based on the relative environmental effects associated with the technically and economical feasible cooling alternatives the seawater cooling system was identified as the preferred cooling option. The memo identified that the air cooling systems would offer reduced stability in production (due to the high variability in air temperature compared to ambient seawater), would require larger amounts of energy (translating into increased operational costs) and would result in increased atmospheric environment effects (water vapour plume) and visual quality and wildlife sensory disturbances compared to the seawater cooling system. The seawater cooling system was identified as the most expensive with respect to initial purchase costs, but overall the most cost effective to operate compared to the alternative systems considered.

2.2.5 Project Design as a Result of the Environmental Assessment

Prior to the EA and during pre-Application, the Proponent selected a design for the proposed Project from several project design alternatives and made several changes to the selected project design to minimize or avoid potential adverse effects. These decisions framed the proposed Project as described in the Proponent's Application. A summary (as identified by the Proponent) of project design features, including changes, that occurred during the EA is provided in Table 2-1.

Table 2-1: Project Design Measures Resulting from Early Stakeholder Engagement and during the EA Process

Project Feature	Project Design Measures	Change in Potential Effects
Project location	• Utilization of a brownfield site • When possible, locating proposed Project components within the brownfield site, rather than on less disturbed or undisturbed land • The FSO, loading platform, utility and personnel access ramps, seawater cooling system intake and small craft float would be installed in the existing log sort area	• Reduced construction footprint in undisturbed area • Reduced loss of valuable terrestrial wildlife, marine bird, marine fish and freshwater fish habitats • Lower visual quality impacts
Power source	• Power the LNG facility and other Project components with electricity from BC Hydro	• Reduced potential adverse effects to air quality and human health and GHG management
LNG loading	• Shore power made available at the FSO docking facility to LNG carriers that are equipped to use this power	• Potential reduction in vessel emissions • Reduced potential adverse effects to air quality and human health and GHG management
Location of components	• Shifted to a land-based LNG facility	• Reduced underwater noise and vibration • Increased local construction jobs
Location of components	• Where possible, existing linear infrastructure would be reused rather than developing new corridors	• Reduced habitat fragmentation
Mill Creek re-vegetation	• A 23,000 m^2 area within the vicinity of the lower reaches of Mill Creek would be re-vegetated with a variety of low-level, shallow root native plant species, including approximately 270 trees and a variety of native ground cover and shrubs	• Increased riparian and vegetated habitats • Increased nutrient input into downstream fish habitats
Shipping	• Limited vessel speeds	• Reduced potential effects from wake from LNG carriers • Reduced risk to marine mammals, recreational boaters, Aboriginal Interests, and heritage resources

2.3 Project Benefits and Purpose

2.3.1 Project Purpose

The purpose of the proposed Project would be to receive, process, and liquefy natural gas, and to store and transfer LNG to marine carriers for export to offshore markets. The proposed Project would be located at an existing industrial site with a deep-water harbour having an existing electric power and gas supply. The proposed Project site would be located to enable shipment of LNG to international markets through existing marine shipping and navigation channels from Squamish, BC to the Pacific Ocean via Howe Sound.

Pacific Rim markets offer a new long-term opportunity to Canadian natural gas producers. The price of natural gas in North American markets is lower than the price in international markets. Exporting LNG offers the opportunity for Canadian producers to access international markets, potentially allowing them to obtain higher prices for the natural gas they produce.

Canada is seen as a desirable source of natural gas supply because of its political and regulatory stability, and its relatively short shipping distance to the Pacific Rim. The Pacific Rim therefore represents a substantial market opportunity for Canadian producers. The Proponent seeks to export LNG from the proposed Project for delivery to wholesale importers throughout the Pacific Rim.

2.3.2 Economic Benefits of the Proposed Project

This section summarizes the proposed Project benefits during construction and operations, as reported in the Proponent's Application.

Economic Benefits from Project Construction

The proposed Project capital costs would be expected to be in the range of $1.4 to $1.8[1] billion. According to the Proponent's preliminary estimates, total construction expenditures would be approximately $619.6 million, of which approximately $341.0 million (55%) would be spent in BC. Table 2-2 summarizes the economic benefits that the Proponent estimates would be generated locally and provincially as a result of Project construction.

Construction would span an estimated 24-month period; during which direct spending on labour in BC would be expected to be approximately $122.4 million (see Table 2-2). Approximately 86% of the construction workforce would be sourced from within Canada, while the remaining 14% would be expected to be international workers possessing

[1] All dollar values in this Report are provided in 2014 Canadian dollars.

unique skills not available in Canada. During construction, the proposed Project would create approximately 1,975 person years (PYs) of employment in Canada and 1,715 PYs of employment in BC, with an average annual income of approximately $62,300 (see Table 2-2 and Table 2-3).

Table 2-2: Summary of Estimated Economic Benefits during Project Construction ($million)

	Local	BC
Direct Project Construction Expenditures	**$261.6**	**$341.0**
Gross Output		
Direct	$262.6	$342.0
Indirect	$93.8	$123.5
Contribution to Gross Domestic Product (GDP)		
Direct	$139.3	$179.3
Indirect	$50.9	$67.1
Labour Income		
Direct	$95.6	$122.4
Indirect	$36.0	$47.5
Effects on Government Revenues		
Federal Taxes	**-**	**$97.8**
Provincial Taxes	**-**	**$80.3**
Municipal Taxes (including property taxes)	**$6.2**	**$7.5**

Table 2-3: Estimated Employment during Construction

	Local (PYs)	BC (PYs)
Direct	1,324	1,715
Indirect	605	797
Induced	477	614
Total Employment	**2,406**	**3,126**

Note: based on Proponent estimates and Statistics Canada Input-Output Model; Proponent was unable to provide estimates for Canada

Economic Benefits from Project Operations

Table 2-4 provides a summary of economic benefits from Project operations. The proposed Project would generate economic impacts through direct expenditures on goods and services, creation of employment opportunities and generation of tax revenues for local, provincial and federal governments. The Proponent estimates that approximately $540.2 million would be spent annually in BC, representing almost 100% of total annual expenditures.

Table 2-4: Estimated Annual Economic Benefits from Project Operations*

	Local ($ millions)	BC ($ millions)
Estimated Direct Expenditures in Canada (excluding labour)	**$540.1**	**$540.2**
Gross Output		
Direct	$540.1	$540.2
Indirect	$6.2	$57.0
Gross Domestic Product		
Direct	$67.0	$67.0
Indirect	$41.6	$407.0
Labour Income		
Direct	$10.2	$10.2
Indirect	$18.2	$174.1
Government Revenues		
Federal Taxes*	-	$129.5
Provincial Taxes*,**	-	$140.7
Municipal Tax Revenues	$4.2	$21.5

* includes taxes resulting from direct, indirect and induced spending
** does not include LNG tax as estimates were not available

Table 2-5 provides a summary of anticipated annual employment benefits during Project operations. Annual Project operations would be expected to create direct employment for 102 Full-time equivalent (FTEs) per annum in BC, with an average annual income of approximately $100,000. After the initial two-year operation phase, all workers are expected to be local residents. Suppliers to the Project operations would be expected to generate indirect employment of about 2,002 FTEs in BC.

Table 2-5: Estimated Annual Employment during Operations

	Local (FTEs)	BC (FTEs)
Direct	102	102
Indirect*	214	2,002
Induced*	128	861
Total Employment	**444**	**2,965**

*Note: Based on Proponent's estimates and Statistics Canada Input-Output Model; Proponent was unable to provide estimates for Canada

Project Contributions to Business Development

The proposed Project would be expected to create procurement opportunities for business. In addition to increased spending resulting from employment wages, the Proponent estimates that $16.0 million would be spent on services contracted locally and $62.9 million would be spent locally on capital goods. The Proponent estimates that during operations, $1.5 million would be spent annually on services contracted from the local area and $400,000 would be spent locally on replacement capital goods.

The Proponent indicates that the following local business types would be expected to benefit from Project construction:

- Civil/earthworks contractors, construction suppliers, trades (including piping, electrical and mechanical contractors) and waste management businesses;
- Marine transportation and related services including water taxi, tug operation, barging services, drydock and construction supplies laydown areas;
- Hospitality services including accommodation, food and beverage, entertainment, tourism and recreation equipment business types; and
- Aboriginal businesses.

The following major provincial and national business types would be expected to benefit from Project construction:

- Project partners, including BC Hydro and FortisBC;
- Engineering and other professional services; and
- Fabricators, equipment, materials and fuel suppliers.

2.4 Community, Ecological and Social Benefits of Proposed Project

The Proponent has provided funding to community groups to support local initiatives. The Application states that the Proponent would establish a community development and grant program to fund community group initiatives.

Since the 2006 closure of the Woodfibre Pulp and Paper Mill, the site has been maintained as a non-operational brownfield. The Proponent would conduct remediation and ecosystem restoration including the removal of approximately 3,000 existing creosote-coated piles from the waterfront in the Project area, creation of a Green Zone around Mill Creek and the containment and closure of the on-site landfill, once it reaches maximum authorized capacity. Where suitable, this work would be carried out in partnership with community and Aboriginal groups, o that local conservation and restoration targets can be met.

2.5 Applicable Permits

In addition to provincial and federal EA approvals, the proposed Project would need various permits and authorizations from federal, provincial, and local governments.

2.5.1 Federal Regulatory Environment

The Proponent anticipates that the following key federal permits, approvals and authorizations would be required:

- A notice of proposed work under the *Navigation Protection Act* would be submitted to Transport Canada to review and determine whether the works (e.g. the FSO jetty) would substantially interfere with navigation;
- Possible approval under subsection 9(1) of the *Navigation Protection Act* for works in and about navigable water;
- Export licence under section 117 of the *National Energy Board Act*, which was issued on March 31, 2014;
- Potential approved Facility Security Plan under the *Marine Transportation Security Regulations*;
- Obstruction Clearance Permit(s) under the *Canadian Aviation Regulations* of the *Aeronautics Act* for any flare towers or construction equipment that may require marking and/or lighting during construction or operation of the facility;
- Approval of a land use proposal submission form to NAV Canada which would be responsible for aeronautical safety mapping;
- Possible authorization under subsection 35(2) the *Fisheries Act* for serious harm to fish; and
- Possible monitoring permit under the *Species at Risk Act.*

2.5.2 Provincial Permits

The primary regulator for construction and operation of an LNG facility in BC is the Oil and Gas Commission (OGC), pursuant to the *Oil and Gas Activities Act* (OGAA) and the LNG Facility Regulation. The OGC is an independent, single-window regulatory agency responsible for overseeing oil and gas operations in BC. Regulatory responsibility is delegated to OGC through the OGAA and includes specified enactments under the *Forest Act*, *Heritage Conservation Act*, *Land Act*, EMA, and *Water Act*.

Key provincial permits, approvals, and authorizations that would be required include the following:

- Permit for construction and operation of the LNG facility under OGAA;
- Waste discharge permits for effluent and air emissions under EMA*;*
- Heritage Investigation Permit under section 14 of the *Heritage Conservation Ac*t;
- Application to change purpose of the existing water licences on Mill Creek (F17347 and F44330)

- Water supply system construction and operation permit(s) under the *Drinking Water Protection Act*;
- Application to transfer the permit of the Crown land, which allows the licence holder to maintain and operate the works authorized under water licence F17347;
- Application to transfer the lease for submerged Crown land adjacent to the fee simple lots (DL 5095 and DL 7286);
- Application for new Crown land tenures that would include the control zone and the piece of Crown land in the northwest corner of the Project area;
- Notification under section 9 of the *Water Act* would be required for the new clear-span bridges planned for Mill Creek;
- Possible amendment to the existing discharge of treated leachate from the landfill (Permit 1239) under EMA;
- Possible amendment to the existing discharge of effluent from sewer sources (Permits 2334) under EMA;
- Maintenance of the existing discharge of refuse to the landfill (Permit 7322) under EMA;
- Possible fish collection permit under the *Wildlife Act*; and
- Possible permit to remove a nest protection under section 34 of the *Wildlife Act.*

The Proponent is not pursuing a synchronous permitting process for provincial permits and approvals with OGC.

2.5.3 Municipal Permits and Approvals

Key municipal permits that would be required include the following:

- Development and building permit(s) issued by the DOS;
- Temporary Noise Exemption Permit under DOS noise bylaw No. 2312;
- Approval of an assessment report submitted under subsection 4(2) of the Riparian Area Regulation, administered by DOS and Squamish Lillooet Regional District for work within 30 m of either Mill or Woodfibre creeks; and
- Permit from Squamish Nation prior to commencing archaeology field work.

3 Assessment Process

3.1 Overview and Scope of the Environmental Assessment

EAO determined that the proposed Project was reviewable pursuant to Part 4 of the Reviewable Projects Regulation because the proposed Project would:

- Have the capability to store energy resources in a quantity that can yield by combustion $\geq$ 3PJ of energy.

The proposed Project is also subject to a federal EA because Project activities exceed thresholds in the *CEAA 2012 Regulations Designating Physical Activities* schedule section 14(d). The proposed Project would include the construction, operation, and

decommissioning of a new facility for the liquefaction, storage, or regasification of LNG, with an LNG processing capacity of 3,000 t/day or more, or a LNG storage capacity of 55,000 t or more. The proposed Project would use a marine terminal on lands that are routinely, and have been historically, used as a marine terminal.

The federal Minister of the Environment announced on January 31, 2014 that a federal EA would be required for the proposed Project. On February 19, 2014, the federal Minister of the Environment approved EAO's application to have the provincial EA process substitute for the federal process in accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013). Through an Order issued under section 11 of the Act, the scope of the assessment was required to take into account the factors identified under subsection 19(1) of CEAA 2012, including, but not limited to, any environmental effects as defined by section 5 of that Act.

This Report and EAO's Aboriginal Consultation Report (in Part C of this Report) were provided to the responsible provincial Ministers for consideration in their decision of whether or not to issue an EA Certificate for the proposed Project, and submitted to the Agency for the purposes of informing the federal Minister of the Environment's decisions under CEAA 2012.

3.2 Major Milestones of the Environmental Assessment

November 27, 2013: EAO issued an Order under Section 10 of the Act to start the provincial EA.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_36411.html

December 17, 2013: The Agency invited public comment on the proposed Project, its potential effects on the environment, whether a federal EA should be required, and the BC Government's request that the BC EA process be a substitute for the CEAA 2012 (if it was determined that a federal EA was required). https://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=97109

February 3, 2014: The Agency posted the Notice of Commencement of an EA, under CEAA 2012. https://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=98173

February 19, 2014: The federal Minister of the Environment granted substitution of the federal EA for the proposed Project and posted the substitution approval notice.
https://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=98304

March 21, 2014: EAO issued an Order under Section 11 of the Act, which set the scope, procedures and methods of the EA.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_37417.html

June 3, 2014: EAO issued an Order under Section 13, which amended the Section 11 Order to permit for public consultation on the draft Valued Component (VC) proposal and specified Pre-Application information rather than the draft Application

Information Requirements (AIR).
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_37645.html

June 12, 2014: EAO initiated a 30-day public comment period on the draft VC proposal and specified Pre-Application information. EAO extended the public comment period to July 27, 2014 in order to provide more time for the public to review the supplemental information and to compensate for a few days during which the EAO website experienced technical issues preventing access to the EAO e-PIC.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_37650.html

June 24, 2014: EAO issued an Order under Section 13, which amended the section 11 Order to reflect a legal name change from "Woodfibre Natural Gas Limited" to "Woodfibre LNG Limited".
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_37717.html

November 6, 2014: EAO issued an Order under Section 13, which amended the section 11 Order to reflect a process for consultation that Squamish Nation and the Proponent had established through an agreement.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38181.html

November 26, 2014: EAO issued the final AIR.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38414.html

November 28, 2014: The Proponent submitted an Application for an EA Certificate for the proposed Project. From November 28, 2014 to December 29, 2014, EAO evaluated the Application against the AIR, and determined that the Application met the AIR.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38494.html

January 13, 2015: The Proponent submitted the copies of the Application and the 180-day Application Review period began.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38525.html

January 22, 2015: EAO initiated a 45-day comment period on the Application.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38541.html

February 23, 2015: EAO extended to the public comment period to 60 days in order to provide more time for the public to review the Proponent's Application.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38754.html

June 30, 2015: EAO's Executive Director suspended the 180-day time limit for Application review of the proposed Project.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39147.html

August 10, 2015: EAO lifted the suspension of the 180-day time limit for the Application review of the proposed Project.
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39258.html

August 19, 2015: EAO referred the proposed Project to provincial Ministers for decision and provided the referral package to the Agency for the federal decision.

3.3 Role of the Advisory Working Group

EAO established a Working Group, made up of federal, provincial and local government staff or representatives with the mandates and skill sets relevant to the review of the proposed Project, as well as representatives of potentially affected Aboriginal Groups listed on Schedules B and C of the section 11 Order. See list of Working Group members in Appendix 3: List of Working Group Members.

EAO sought and considered advice from the Working Group in order to understand and assess any potential adverse effects associated with the proposed Project.
Working Group members were responsible for providing timely advice to EAO on:

- Key EA documents including, but not limited to, the selection of VCs, AIR, Application and EAO's Assessment Report and proposed provincial conditions;
- Government policy direction and/or gaps that could affect the conduct of the EA;
- Potential conflicts with the legislation and/or regulations of their organizations;
- EA information requirements, as compared with permitting design and information requirements; and
- Technical issues raised by the public and Aboriginal Groups during the public consultation process.

The following federal departments with specialist information or expert knowledge relevant to the proposed Project participated in the evaluation and the review of the Proponent's Application:

- The Agency provided guidance and information directly to EAO regarding the substituted process and federal EA requirements under CEAA 2012, but did not participate in the Working Group;
- Environment Canada (EC) provided comments and information related to its regulatory and statutory responsibilities within the themes of vegetation resources, wildlife resources, surface water quality, marine resources, human health, cumulative effects, air quality, greenhouse gas (GHG) management, accidents and malfunctions and Aboriginal Interests;
- Fisheries and Oceans Canada (DFO) provided comments and information related to its regulatory and statutory responsibilities within the themes of freshwater fish, marine fish, marine mammals and fish habitat;
- Health Canada (HC) provided advice and information related to its regulatory and statutory responsibilities in regard to human health, with a primary focus on Aboriginal health;

- Natural Resources Canada (NRCan) provided advice and information related to its expertise in seismicity, marine geohazards, and sediment dispersion modelling; and
- Transport Canada (TC) provided comments and information related to its regulatory and statutory responsibilities within the themes of marine transportation and use, accidents and malfunctions, Aboriginal Interests, and cumulative effects.

EAO reviewed the adequacy of the Proponent's responses to all comments received from Working Group members,[2] and held various meetings with Working Group members to discuss outstanding issues and concerns. In development of this Report and recommended provincial conditions, EAO considered all comments and issues raised during the EA.

3.4 Aboriginal Consultation

On March 21, 2014, EAO issued a section 11 Order that specified the consultation activities that both EAO and the Proponent would undertake with all Aboriginal Groups potentially affected by the proposed Project. The Proponent and Squamish Nation entered into an agreement early in the EA that set out a process between the parties to discuss the potential effects of the proposed Project on the asserted Squamish Nation Aboriginal Rights and Title (the 'Squamish Process'). At the request of the Proponent and in consultation with Squamish Nation, on November 6, 2014, EAO issued a section 13 Order, amending the procedural requirements for the Proponent, related to consultation with Squamish Nation.

In accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013), EAO also ensured that consultation was carried out in a manner consistent with Canada's determination of the scope and content of consultation.

Aboriginal Groups on Schedule B (Squamish Nation) and C (Tsleil-Waututh Nation) of the section 11 Order were provided the following opportunities:

- Participation as members of the Working Group;
- Discuss their Aboriginal Interests in relation to the proposed Project and measures to avoid, mitigate, or otherwise manage potential adverse impacts on Aboriginal Interests, as appropriate;

[2] Pre-Application Working Group and First Nations Issues Tracking Table (November 26, 2014)
Application Review – Working Group Tracking Table and attachments (August, 2015)
Application Review – Supplemental Information Working Group Tracking Table and attachments (August, 2015)

- Identify their respective Aboriginal Interests that may be adversely affected by the proposed Project;
- Review and comment on key documents, including the draft VC Selection, draft AIR, the Proponent's Application for an EA Certificate, and EAO's draft proposed conditions and Report, including the Aboriginal Consultation Report;
- Determine the adequacy of the Proponent's responses to the comments received from such Aboriginal Groups; and
- Submit a document outlining their views on the Report to be included in the package of materials sent to Ministers when the proposed Project is referred for decision.

Aboriginal Groups on Schedule D of the Order were provided the following opportunities:

- Notification of key milestones of the proposed Project, including, but not limited to, the issuance of the AIR, the acceptance of the Application to EAO for review, the timing of public comment periods, including open houses, referral of the final Report to Ministers, and the decision of Ministers;
- Offers to meet and consider information regarding Aboriginal Interests in the proposed Project area; and,
- A draft of the Report, CPD and provincial conditions with an opportunity to provide comments within established timelines.

Aboriginal Groups consulted at notification level (i.e., on Schedule D of the section 11 Order) were:

- Cowichan Tribes First Nation
- Halalt First Nation
- Lake Cowichan First Nation
- Lyackson First Nation
- Musqueam First Nation
- Penelakut Tribe
- Stz'uminus First Nation
- Métis Nation BC[3]

Further detail regarding consultation with Aboriginal Groups is in EAO's Aboriginal Consultation Report (Part C of this Report).

[3] In accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013) the Métis are included on Schedule D and consulted on behalf of the Government of Canada.

3.4.1 Ensuring the Crown's Duties to Consult and Accommodate Aboriginal Groups

EAO is required to ensure that the honour of the Crown is discharged by ensuring appropriate consultation and accommodation of potential impacts of the proposed Project on the exercise of Treaty rights, proven Aboriginal rights, and asserted Aboriginal rights and title (Aboriginal Interests) in respect of the decision by Ministers as to whether to issue an EA Certificate. In accordance with the *Memorandum of Understanding on Substitution of Environmental Assessments* (2013), on substituted projects, EAO is also responsible for the procedural aspects of consultation on behalf of Canada and is required to ensure that consultation is carried out in a manner consistent with Canada's determination of the scope and content of consultation. Aboriginal Groups' comments and interests in terms of consultation and specific consideration of the Crown's duty to consult and accommodate Aboriginal Interests are factored into the analysis in Part C of this Report.

There is often considerable overlap between the interests of Aboriginal Groups and the assessment of environmental, economic, social, heritage and health effects. Aboriginal Group's comments and interests that directly relate to the environmental, economic, social, heritage and health assessments are discussed in Part B of this Report.

3.4.2 Funds Distributed by EAO to Assist Aboriginal Participation and Consultation

EAO distributed provincial funding to assist Aboriginal Groups to participate in the EA process. Additionally, EAO distributed funding provided by the Agency to support potentially affected Aboriginal Groups' participation in the substituted EA. Refer to Part C of this Report for additional details regarding funding.

3.5 Local Government Consultation

District of Squamish

A staff member represented the DOS on the Working Group and provided technical review comments and participated in Working Group meetings.

The DOS conducted additional activities outside of the EA process to support its review of the proposed Project, including:

- Establishing a Community Committee on the proposed Project to help staff objectively asses the proposed Project and provide input to both District Council and the Proponent; and
- Hosting a two-week community consultation period during March 9 – 23, 2015 to inform Council on the opinions of the community prior to Council submitting an official response to EAO on the proposed Project and the proposed Eagle Mountain – Woodfibre Gas Pipeline Project.

The Proponent supported the DOS's community consultation and the Community Committee on the proposed Project. Operations staff from EAO presented to the committee on the EA process on August 21, 2014 and February 10, 2015.

The DOS submitted a letter to EAO on April 30, 2015, characterizing its areas of concern and specifying a number of requests, which ranged in scope from:

- Local issues (e.g., social and economic impacts to Squamish, potential harm to the marine environment and negative effects to local tourism and recreational values, etc.);
- Howe Sound (e.g., cumulative effects);
- Regulatory issues (e.g., coordination of monitoring and enforcement, implementation of new regulations related to shipping of noxious and hazardous substances and international best practices);
- Global issues (e.g., unconventional natural gas extraction methods, greenhouse gas emissions and climate change); and
- Environmental assessment process (scoping and public consultation).

Subsequently, EAO and the Proponent met with the DOS Council to discuss the District's outstanding concerns with the proposed Project. EAO considered the information provided by the DOS in its April 30, 2015 letter and technical submissions received through the Working Group during the EA for the proposed Project and in development of EA Certificate conditions.

Sunshine Coast Regional District & Squamish-Lillooet Regional District

Regional District staff members represented the Sunshine Coast Regional District (SCRD) and the Squamish-Lillooet Regional District on the Working Group and provided technical review comments through Working Group review and participated in Working Group meetings throughout the EA process.

SCRD submitted a letter to EAO on June 2, 2015, which identified its areas of outstanding concern, which included: lack of opportunities for public and local governments input into TERMPOL; residual effects on marine mammals and need for public consultation on the marine mammal management plan; need for a better network of air quality monitoring stations; a desire for marine rescue and emergency management as a requirement of the EA Certificate; the location of the seawater cooling system intake within 2 km of herring spawning grounds; and the limited scope for risk assessment related to shipping within Howe Sound.

Other Local Governments

The Islands Trust was invited to participate on the Working Group in September 2014. A staff member represented Islands Trust on the Working Group and provided technical review comments through Working Group review and participated in Working Group meetings throughout the EA process.

Initially, the Bowen Island Municipality was represented on the Working Group by Islands Trust. The Bowen Island Municipality was invited to join the Working Group following the January 30, 2015 open house event. A staff member represented the Bowen Island Municipality on the Working Group and provided technical review and comments through Working Group review and participated in Working Group meetings during the Application Review phase of the EA Process.

The District of West Vancouver and the Municipality of the Village of Lions Bay were invited to join the Working Group on December 29, 2014. Staff members and elected councillors represented the District of West Vancouver on the Working Group and provided comments through Working Group review and participated in Working Group meetings during the Application Review phase of the EA process. A nominated citizen represented the Municipality of the Village of Lions Bay on the Working Group and provided technical review and comments through Working Group review and participated in Working Group meetings during the Application Review phase of the EA process.

The District of West Vancouver, the Municipality of Bowen Island and SCRD adopted a resolution to ban the passage of LNG tankers in the waters of Howe Sound.

3.6 Public Consultation

Public consultation requirements are set out in the Section 11 Order, and are intended to provide multiple opportunities for the public to provide input. Shortly after the issuance of the Section 11 Order, the Proponent was required to prepare a Public Consultation Plan. The plan laid out the Proponent's consultation objectives and activities. Through the course of the EA, the Proponent submitted multiple Public Consultation Reports to EAO. The first Public Consultation Report was submitted during the Pre-Application Stage, the second was submitted with the Application, and the third was submitted near the end of Application Review. The Public Consultation Plan and all Public Consultation Reports are posted on EAO's ePIC website.[4]

3.6.1 Summary of Proponent Activities

Following is a summary of the public consultation activities carried out by the Proponent during the EA process:

- Public open houses and roundtable meetings;
- Stakeholder meetings, phone calls and email with community groups, individuals and local governments:
- Round table meetings with 10 key stakeholder and local community groups;
- Hosted over 25 site tours for stakeholders and local groups;

[4] http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_408.html

- Hosted two telephone town hall meetings;
- Supported the DOS Community Committee for the Woodfibre LNG Project;
- Supported community engagement by the DOS, including funding a third-party facilitator, holding a community event, holding a number of informal briefings, initiating an online discussion forum and a questionnaire (print and online);
- Established a community office in Squamish;
- Hired a community relations manager;
- Regularly monitored a general e-mail address and telephone line for inquiries from the public;
- Circulated approximately 25 project information inserts in the *Squamish Chief*;
- Advertised key updates, event information sessions, procurement opportunities, employment opportunities and other relevant information in multiple local newspapers;
- Information on employees, economic benefits, permitting status, safety, marine transport and other topics relevant to the proposed Project have been sent to multiple stakeholders and members of the public through Newsletters and bulk mail-outs;
- Produced information sheets focused on key public concerns
- Launched a Project website (www.woodfibrelng.ca) with project information, resources (newsletters, information sheets);
- Launched a project question and answer website – www.askwoodfibrelng.ca;
- Maintained a YouTube Channel, which includes project overview video, subject matter expert videos, community member question and project statement videos.

Through public engagement during the course of the EA, EAO has been satisfied with the Proponent's understanding and responsiveness to public interests.

3.6.2 Summary of EAO Activities

EAO hosted the following two public comment periods and four open houses over the span of the EA:

- The 45-day public comment period on the draft VC proposal and other Pre-Application Information was held from June 12 to July 27, 2014 and 1,299 public comment submissions were made. A public open house was held in Squamish on June 18, 2014. Approximately 220 people attended the open house.
- The 60-day public comment period on the Proponent's Application was held from January 22 to March 23, 2015 and 1,743 public comment submissions were made. Public open houses were held in Squamish on January 28, 2015, in West Vancouver on January 29, 2015 and in Bowen Island on January 30, 2015. In total, approximately 443 people attended the open house events.

EAO participated in a public information session hosted by the Future of Howe Sound Society and My Sea to Sky at the Public Library in West Vancouver on July 8, 2014. The key issues of concern raised included: LNG and fracking, marine tankers and

concern about safety from wake and accidents and malfunctions, recreation exclusion zones, air quality and marine wildlife (especially marine mammals).

EAO participated in a public open house event and roundtable discussion about the proposed Project, hosted by the Proponent in cooperation with the SCRD and Gambier Island Local Trust Committee, on Gambier Island, March 21, 2015. Roundtable discussions focused on shipping routes and concerns, wake and recreational activities, impacts on marine life and the EA process.

The key issues raised by the public through the submitted public comments included the following:

- **Project location/siting** – Concerns that the proposed Project would be located close to communities along the Sea-to-Sky and in a waterway with high recreational boating use.
- **Public safety** – Concerns about accidents and malfunctions and risks to public safety.
- **Tourism, recreation and the 'Squamish Brand'** – Concerns that the presence of an industrial facility in Squamish would have negative effects on tourism, recreation and the perception of Squamish as a wilderness/recreational destination.
- **Property values** – Concerns that shipping of LNG and impacts to visual quality would translate into reduced property values along the shipping route.
- **Air quality and human health** – Concerns about emissions from the proposed Project and potential effects on the local airshed and human health.
- **Economic benefits –** Concerns that the amount of tax revenues and creation of jobs were insufficient compared to the potential for adverse effects of the proposed Project. Questions about the financial viability of the LNG industry in BC.
- **Health of Howe Sound –** Concerns that the proposed Project would jeopardize ongoing restoration and the overall health of Howe Sound through industrial discharges to the marine environment.
- **Marine fish** – Concerns that the marine water intake and treated thermal discharges from the seawater cooling system would impact local populations of marine fish, especially Pacific herring and salmonids.
- **Impacts to marine mammals** – Concerns that underwater noise and collisions with LNG carriers would have negative effects on marine mammal populations.
- **Hydraulic fracking, greenhouse gas emissions and climate change** – Concerns about the potential environmental impacts of upstream gas production and associated pipelines. Concerns about the greenhouse gas emissions from the proposed Project and potential effects to climate change.
- **Government oversight, regulation, compliance and enforcement** – Apprehension that under the current regulatory regime there is insufficient government oversight and regulation of LNG facilities and shipping of LNG in BC. Concern that there would be a lack of compliance by the Proponent and limited enforcement capability by the regulators to ensure compliance.

- **EA process** – Comments and questions related to the rigour of the EA process such as, technical review, neutrality of EAO and transparency.
- **Public consultation process** – Request for extension of the public comment period. Questions and comments about the format and locations of the open house events. Concerns that the public comments would not be considered in the decision by the Ministers.

A summary of the key issues raised by the public and EAO's responses is provided in Appendix 2: Key Issues Raised by the Public and EAO's Responses of this Report.

Public comments from both public comment periods and the Proponent's responses are posted on the EAO's ePIC website.[5] In addition to the Proponent's responses to public comments submitted during Application Review, the Proponent also provided a Frequently Asked Questions document. EAO also developed a document that responded to common questions and concerns related to the EA[6].

3.7 Information Requests during Application Review

During Application Review, EAO requested additional reference materials and supplemental information from the Proponent to support the EA of the proposed Project. EAO's requests for additional information were primarily driven by concerns raised and requests submitted by the public, Working Group and Aboriginal Groups. Notably, EAO issued a request for additional information on vessel wake effects, the seawater cooling system and accidents and malfunctions on April 10, 2015.[7]

Key information that was provided to EAO by the Proponent during Application Review, which included, but is not limited to:

- Woodfibre LNG Geotechnical Assessment;
- Woodfibre LNG Limited Foreshore Geotechnical Site Investigation Report;
- Woodfibre PMC Project Safety Studies – HAZID Study Report;
- Mill Creek Flood Study;
- Removal of Creosote Treated Timber Piles;
- Report on Marine Activities in Howe Sound;
- Supplemental Report on Accidents and Malfunctions;
- Emergency Response Plan Outline;
- Supplementary Study of the Tsunami Hazard due to Submarine Landslides;

[5] Public comments on the draft AIR and the Proponent's responses:
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38421.html
Public comments on the Application and the Proponent's responses:
http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39160.html
[6] http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39256.html
[7] http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_38944.html

- Herring Spawn Summary Report;
- Sediment Human Health and Ecological Risk Assessment Report;
- Uplands Human Health and Ecological Risk Assessment Report;
- Woodfibre Vessel Wake Study;
- Assessment of Alternative Cooling Methods;
- Response to Seawater Cooling System Discharges Information Request;
- Response to Seawater Cooling System Intake Information Request; and
- Response to SIGTTO (the Society of International Gas Tanker and Terminal Operators) LNG Ports and Risk Reduction Options

During Application Review, Working Group comments on the Application and key supplemental information and Proponent responses were captured in issues tracking tables:

- Woodfibre LNG Project – Application Review – Working Group Tracking Table; and
- Woodfibre LNG Project – Application Review – Supplemental Information – Working Group Tracking Table.

EAO reviewed and considered all Working Group comments and Proponent responses in preparing this Report.

EAO hosted Working Group meetings during Application Review, in which the Proponent was required to respond to Working Group questions and concerns. The meeting minutes were made available on EAO's e-PIC website:

- Working Group Meeting Minutes - March 4 - 5, 2015; and
- Shipping Meeting Minutes – Woodfibre LNG Working Group Meeting – April 13, 2015.

Project-related information was made available to the public on EAO's e-PIC, at www.eao.gov.bc.ca.

PART B – ASSESSMENT OF POTENTIAL ADVERSE EFFECTS

4 Assessment Methodology and Overview of Potential Effects

4.1 General

4.1.1 Environmental Assessment Methods

In this Report, EAO assesses whether the proposed Project is likely to have significant adverse environmental, economic, social, heritage and health effects, including cumulative effects, having regard for the mitigation measures proposed in the Application or otherwise developed through the provincial and federal EA processes, in addition to conditions proposed by EAO.

To conduct this assessment, EAO followed the methods outlined in its *Guideline for the Assessment of Valued Components and Assessment of Potential Effects* (2013). This section provides a brief summary of the methodology followed.[8] The general steps in EAO's EA process are shown in Figure 4-1.

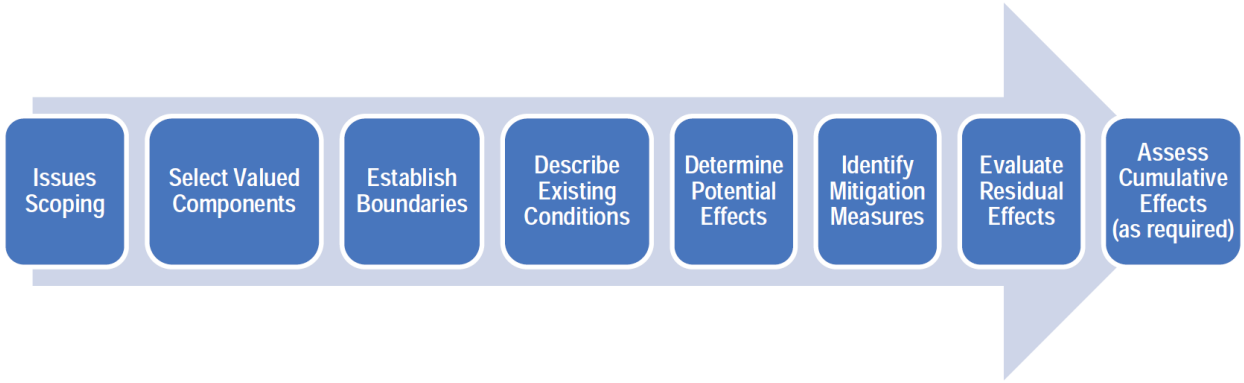


Figure 4-1: EAO's Environmental Assessment Methods

EA in BC uses a values-based framework to promote a comprehensive, yet focused, understandable, and accessible assessment of the potential effects of proposed projects. This framework relies on the use of VCs as a foundation for the assessment. VCs are components of the natural and human environment that are considered by the Proponent, public, Aboriginal Groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

[8] The *Guideline for the Assessment of Valued Components and Assessment of Potential Effects* is available at http://www.eao.gov.bc.ca/pdf/EAO_Valued_Components_Guideline_2013_09_09.pdf.

Appropriate VCs are identified and selected during the Pre-Application phase of the EA. Ultimately, the VCs required to be in the Application are established by EAO upon issuance of the AIR. Much of the early part of the Pre-Application phase is focused on consultation on the VCs, intermediate components, key indicators, study area boundaries and technical requirements with Working Group members (including Aboriginal Groups) and the public.

4.1.1.1 Intermediate Components and Pathway of Effects

Intermediate Components (ICs) are part of the pathway between a proposed project and the ultimate receptor. For example, sediment-laden discharge from a project to a stream may adversely affect water quality and benthic habitat and these changes may consequently affect the health and survival of fish that depend on those habitat attributes. In this example, water quality and benthic habitat would be ICs and fish health and survival would be the ultimate receptor, or the VC. The ICs and pathway effects on VCs that were included in the Proponent's Application for the proposed Project are described in Table 4-1.

Table 4-1: Intermediate Components and Pathway Effects on Valued Components Assessed in the Proponent's Application for the Proposed Woodfibre LNG Project.

Intermediate Components	Valued Components								
	Air Quality	Terrestrial Wildlife & Marine Birds[1]	Freshwater Fish & Fish Habitat	Marine Benthic Habitat	Marine Fish & Marine Mammals[2]	Land & Resource Use	Visual Quality	Current Use of Land & Resource for Traditional Purposes	Public Health
Atmospheric Sound		•			•	•		•	•
Light		•					•	•	•
Geotechnical & Natural Hazards				•					
Site Contamination	•		•	•					•
Surface Water Quality		•	•		•			•	•
Surface Water Quantity		•	•					•	
Marine Water Quality		•	•	•	•			•	•

[1]The Proponent's Application assessed Avifauna, At-risk Bat Species, Amphibians and Marine Birds as separate VCs.
[2]The Proponent's Application assessed Forage Fish and Other Fish (Marine) and Marine Mammals as separate VCs.

EAO considered the potential effects of the changes to ICs through the assessment of VCs in this Report. Subsequently the Report does not include separate sections on the following ICs: Atmospheric Sound, Light, Geotechnical and Natural Hazards, Site Contamination, Marine Water Quality, Surface Water Quality and Surface Water Quantity. While the Application assessed Current Land and Resource Use for Traditional Purposes as a VC, EAO has considered and incorporated the information into Part C of this Report.

4.1.2 Study Boundaries

Assessment boundaries serve to define the scope or limits of the assessment. They encompass the areas within and times during which the proposed Project is expected to interact with the VCs (spatial and temporal boundaries). These boundaries are discussed in the Application for each VC.

Spatial boundaries encompass the areas within which the proposed Project is expected to have potential effects on the selected VCs. The study areas generally include the:

- Project area or Project footprint – the area directly disturbed by the proposed Project's physical works and activities;
- Local Assessment Area (LAA) – varies by VC, the area surrounding and including the Project area, where there would be reasonable potential for the proposed Project or Project-related activities to interact with and potentially have an adverse effect on the VC; and
- Regional Assessment Area (RAA) – varies by VC, provides the regional context for the assessment of potential Project-related effects within the LAA, in most cases encompassing the area within which potential residual adverse effects of the Project would likely to cumulate with effects of other project and activities. The cumulative effects assessment area may include the RAA as well as areas outside of the RAA.

Temporal boundaries encompass the periods during which the proposed Project is expected to have potential effects on the selected ICs and VCs. The temporal phases discussed under each VC included:

- Construction – 24 months;
- Operation – 25 years; and
- Decommissioning – 24 months.

4.1.3 Assessment of Valued Components

For each selected VC, the Application describes the existing conditions within the study area in sufficient detail to enable potential Project-VC interactions to be identified, understood and assessed. The description of existing conditions includes, as relevant, natural and/or human-caused trends that may alter the environmental or socio-economic setting irrespective of the changes that may be caused by the proposed Project or other projects and activities in the local area.

The assessment then considers the potential interactions of the proposed Project with the VC, and the potential effects that could arise. These potential effects are identified and described, and an analysis is presented of the potential adverse effects resulting from the proposed Project.

The assessment then describes the mitigation measures that would be incorporated into the Project, including site and route selection, project scheduling, project design, and construction and operation procedures and practices. Consistent with MOE's Environmental Mitigation Policy and Procedures, EAO considers mitigation to be any practical means or measures taken to avoid, minimize, restore on-site, compensate or offset potential adverse effects. Also described are standard mitigation, best management practices (BMP), environmental management plans (EMP), contingency plans, emergency response plans (ERP), and other practices proposed to be implemented.

The residual effects on each VC are then identified. Residual effects are those effects remaining after the implementation of all mitigation measures, and are, therefore, the expected consequences of the proposed Project for the selected VCs. To inform the determination of the significance of a residual (adverse) effect, it is necessary to characterize the residual effect.

Residual effects are usually described using standard criteria: context, magnitude, extent, duration, reversibility and frequency. These criteria, as well as likelihood, are summarized in the following box.

Summary of Criteria for Characterizing Residual Effects

Context refers primarily to the current and future sensitivity and resilience of the VCs to change caused by the Project. Consideration of context draws heavily on the description of existing conditions of the VC, which reflect cumulative effects of other projects, and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.

Magnitude refers to the expected size or severity of the residual effect. When evaluating magnitude of residual effects, consider the proportion of the VC affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristic).

Extent refers to the spatial scale over which the residual effect is expected to occur.

Duration refers to the length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect).

Reversibility pertains to whether or not the residual effect on the VC can be reversed once the physical work or activity causing the disturbance ceases.

Frequency refers to how often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.

Likelihood refers to whether or not a residual effect is likely to occur. It may be influenced by a variety of factors, such as the likelihood of a causal disturbance, occurring or the likelihood of mitigation being successful. Generally speaking, the residual effects described in the assessment comprise the best prediction of what is likely to occur as a result of a proposed Project, assuming a suite of proposed mitigation is implemented.

The identification of significant adverse residual effects is a requirement of the Act and CEAA 2012. When determining significance for each VC, consideration should be given to how each of the criteria for characterizing residual effects informs the determination of significance. Significance may be determined based on a quantitative or qualitative threshold that describes the point beyond which a residual effect would be considered significant. In some instances, thresholds established for some VCs by legislation, regulation, or regulatory standard are used.

Once the residual effect prediction has been described in terms of significance and likelihood, it is important to explain the level of confidence in each prediction. The level of confidence, typically based on expert judgement, characterizes the level of uncertainty associated with both the significance and likelihood determinations. Specifying the level of confidence associated with these determinations allows the decision-maker to better evaluate the risk associated with the proposed Project. The assessment of confidence also informs the need for and scope of monitoring or other follow-up programs, including adaptive management.

Significance is usually determined for both the residual effects of the proposed Project and the cumulative effects. This is critical for making an informed decision about the proposed Project. It is important to understand the characteristics and significance of the potential project-specific residual effects in order to also understand the relative contribution of the proposed Project to cumulative effects. The cumulative effects assessment is discussed further below.

4.1.4 Cumulative Effects Assessment

If the proposed Project is expected to result in any residual adverse effects on the selected VC, the need for a cumulative effects assessment must be considered. It is important to note that this consideration must be made for all residual adverse effects, not only for those predicted to be significant.

Where there is a residual adverse effect, the assessment of cumulative effects for reviewable projects should consider other past, present and reasonably foreseeable projects and activities, which were identified in the AIR. Any cumulative effects that are likely to result from the proposed Project in combination with other physical activities that have been or will be carried out were considered as part of the assessment, consistent with paragraph 19(1)(a) of CEAA 2012.

The general steps for a cumulative effects assessment are shown in Figure 4-2. The likelihood of a cumulative interaction with other projects and activities, and the proposed Project's contribution to the overall cumulative effect, should together inform the cumulative effects assessment undertaken.

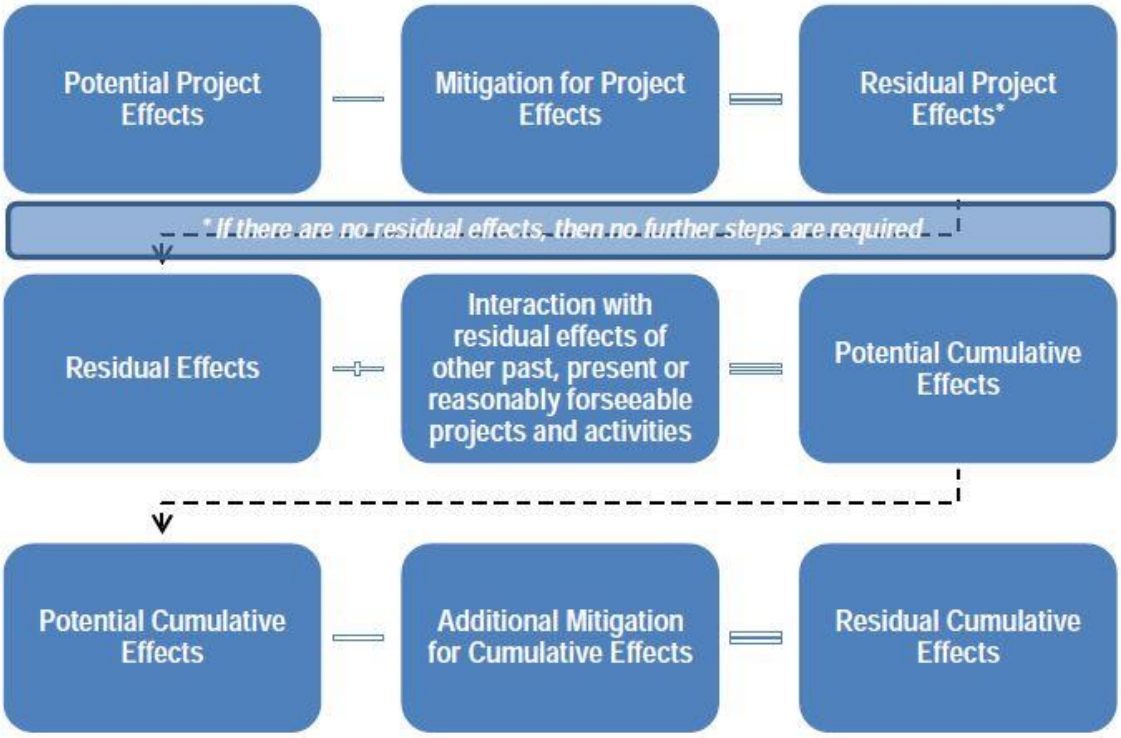


Figure 4-2: Steps to Determine Residual Effects and Cumulative Effects

EAO evaluates cumulative effects by considering how the proposed Project's residual effects interact with the residual effects of other past, present and reasonably foreseeable projects and/or activities included in the Proponent's cumulative effects assessment, as described in Application Table 4.5-1. These projects and activities are discussed where relevant under the cumulative effects section for each VC in this report.

4.1.5 Environmental Assessment Certificate Documentation

If an EA Certificate is issued, it would include a Certified Project Description (CPD) and Table of Conditions (TOC).

The CPD describes what is certified by an EA Certificate. It consists primarily of a description of the infrastructure of the proposed Project, and describes all essential elements of the Project proposed by the Proponent, taking into account any changes to the proposed Project that occurred during the EA. If an EA Certificate is issued for the proposed Project and the Proponent subsequently proposes to vary from the CPD, an

amendment to the EA Certificate would be required.

If the Ministers decide to issue an EA Certificate, they may attach legally binding conditions to it under section 17(3)(c)(i) of the Act. A condition is a legally binding requirement set by Ministers to which a holder of an EA Certificate must adhere. A set of proposed conditions is provided to Ministers as part of the referral package. As part of their decision regarding whether or not to grant an EA Certificate, Ministers determine which conditions would be attached to the EA Certificate.

If the federal Minister of the Environment determines that the carrying out of the proposed Project is unlikely to cause significant adverse environmental effects or the Governor in Council decides that the significant adverse environmental effects are justified in the circumstances, the Minister of the Environment must establish conditions, including mitigation measures and follow-up program requirements, in relation to the environmental effects referred to in subsections 5(1) and 5(2) of CEAA 2012 that would become legally binding on the Proponent and with which the Proponent must comply, consistent with section 53 of CEAA 2012.

4.1.6 Compliance and Enforcement

EAO has a Compliance and Enforcement Program (C&E Program), whose primary responsibility is compliance oversight and enforcement of EA Certificate conditions on all projects subject to the Act in BC.

The C&E Program builds on the expertise and resources of other agencies, including the Compliance and Enforcement Branch of the Ministry of Forests, Lands and Natural Resource Operations (FLNR), Ministry of Energy and Mines (MEM), OGC, Conservation Officer Service, and the Environmental Protection Division of MOE.

EAO conducts extensive planning to ensure effective, risk-based compliance oversight. The two key plans prepared by EAO compliance staff are:

- Compliance Management Plans (CMPs) – After a project has been certified, EAO compliance staff prepare a CMP in collaboration with partner agencies. The CMP outlines the general approach to compliance oversight for the Project and clarifies inter-agency responsibilities for inspecting and enforcing the EA Certificate conditions. This plan is updated as the Project progresses.
- Annual Inspection Plans – Each fiscal year, EAO plans its administrative (e.g., desk-based) and field-based inspections for the year in keeping with risk-based criteria developed by EAO and the targets specified in MOE's Service Plan. Unplanned inspections are also conducted in response to new information received by EAO, public and Aboriginal Group complaints or in follow-up to previous inspections.

When information from an inspection, EA Certificate holder self-report, public or Aboriginal Group complaint or partner agency indicates that a certificate requirement may have been breached, EAO compliance staff conduct an investigation to collect the

evidence necessary to determine if enforcement action is warranted. Investigations vary in effort and length of time depending on the nature and complexity of the non-compliance. Often, partner agencies are involved in the investigations.

Throughout the life of a project, EAO and compliance partners collaborate to ensure the Project is constructed and operated according to the EA Certificate. The Agency would be responsible for compliance and enforcement activities with respect to a decision statement issued under CEAA 2012.

5 Assessment of Environmental Effects

5.1 Air Quality

5.1.1 Background

Air quality was selected as a VC due to its importance to the environment and human health. The results of the air quality assessment were used to inform the human health risk assessment (section 9.1) of this Report.

The assessment considered the potential effects of the proposed Project on air quality in the southern portion of the Sea-to-Sky airshed, and focussed on the following criteria air contaminants (CACs) with applicable air quality criteria: sulphur dioxide (SO_2); nitrogen dioxide (NO_2); carbon monoxide (CO); total suspended particulate (TSP); inhalable particulate matter (PM_{10}); and respirable particulate matter ($PM_{2.5}$).

The CACs were compared to applicable criteria: BC Ambient Air Quality Objectives (BC AAQO); National Ambient Air Quality Objectives (NAAQO); Canadian Ambient Air Quality Standards (CAAQS); and provincial interim air quality objectives for NO_2 and SO_2[9]. The assessment compared the most stringent of these criteria to the ground-level concentrations of CACs predicted from dispersion modelling. The Sea-to-Sky Air Quality Management Plan relies on federal and provincial ambient air quality criteria to assist in determining the health of an airshed.

Air dispersion modelling included potential Project-related emissions of additional 'non-indicator' compounds (i.e., compounds without applicable air quality criteria), such as:

- Hydrogen sulphide (H_2S);
- Volatile organic compounds (VOCs);
- Polycyclic aromatic hydrocarbons (PAHs);
- Hazardous air pollutants (HAPs); and
- Metal compounds (metals).

The potential effects from Project-related emissions of these non-indicator compounds were not considered with respect to air quality; however, the potential effects of non-indicator compounds on human health are summarized in section 9.1 of this Report.

Ozone (O_3) was originally identified as a potential concern because the proposed Project would be expected to generate emissions of O_3 precursor substances such as (NO_2), CO and VOCs that could contribute to the formation of O_3 in the presence of

[9] On October 24, 2014, MOE released Interim AAQO for SO_2 and NO_2, which are similar but not equivalent to the US EPA and WHO guidance.

sunlight. However, O_3 was not assessed given the relatively low ozone pre-cursor emissions compared to other significant sources in the region.

The facility LAA for the air quality assessment included an area measuring 20 km x 20 km centred on the Project area. The LAA represented the area within which the greatest changes to air quality are expected as a result of Project-related effects, including Squamish, Darrell Bay, Britannia Beach and Furry Creek. The RAA for the facility included an area measuring 50 km x 40 km centered on the Project area. The RAA corresponded to an area used for the dispersion modelling domain and where cumulative effects would be potentially expected, including McNab Creek, Port Mellon, Gambier Island, Anvil Island and Porteau (in addition to the localities included in the LAA).

The assessment included detailed air quality dispersion modeling based on the BC Air Quality Monitoring Guidelines[10]. Dispersion modelling of air contaminants from the proposed facility was completed using the CALPUFF air quality modelling system with input from the CALMET meteorological model. For shipping emissions, dispersion modelling was completed using the SCREEN3 model. Dispersion modelling for marine vessel emissions included passenger ferries and water taxies travelling between Squamish/Darrell Bay and the Project site and LNG Carriers running on auxiliary engine power while moored at the FSO during loading.

The proposed Project would require a waste discharge permit under EMA to authorize emissions of CACs. Provincial and federal AAQOs would guide permit development and provide the framework for evaluating observed or predicted air contaminant concentrations.

5.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

The proposed Project would be powered by electricity provided by BC Hydro. The Application states that the selection of electric power would reduce air quality contaminants of concern by up to 90% compared to gas-fired power generation.

The construction, operation and decommissioning of the proposed Project would have the potential to generate air emissions. The primary sources of emissions during construction and decommissioning would be associated with handling and disposal of materials at the landfill, operation of equipment, site preparation, and marine vessel traffic. The primary sources of emissions during normal operating conditions would be associated with pre-treatment of natural gas, process combustion, fugitive emissions, combustion from heating, ventilation and air conditioning systems, materials storage at the landfill, emergency generators and marine vessel exhaust. During upset conditions, process gas would be flared, and emissions from flaring would result from the

[10] British Columbia Ministry of Environment. 2008. Guidelines for Air Quality Dispersion Modelling in British Columbia. Environmental Protection Division Environmental Quality Branch Air Protection Section.

combustion of process gas and the release of CACs and other non-indicator compounds.

Dispersion modelling was used to estimate the concentrations of CACs emitted from the facility and from marine vessels during operations. Marine vessel emissions included exhaust from Project-related vessels moving from Squamish Harbour to the site and maximum daily emissions from the LNG carrier while loading at the FSO over a 24-hour period. The Application stated that the modelling was conservative and that it is likely that the emission rates would not exceed the rates presented. Air dispersion modelling did not include LNG carrier transit or LNG tanker tug boats as these activities would not occur simultaneously with LNG tanker loading; however shipping related emissions were reported in the Application.

Baseline Conditions

Existing meteorological conditions were established using EC stations, Port Mellon and Squamish Airport data. Data from the air monitoring stations located in the Sea-to-Sky Airshed at Langdale Elementary, Squamish, and Horseshoe Bay were used to establish existing air quality conditions for CACs. These monitoring stations were considered to be a conservatively high representation of the air quality in the LAA as data was collected within urban centres. The Application noted that none of the air quality monitoring stations within the RAA measure TSP, so instead TSP was estimated using 24-hour and annual PM_{10}/TSP ratios. The Application stated that the existing concentrations for all indicator CACs were below the most stringent air quality criteria, indicating the proposed Project site is situated in an area of good existing air quality.

Two air quality monitoring stations from the Greater Vancouver area and Vancouver International Airport were used to estimate baseline concentrations of non-indicator compounds such as VOCs, PAH and metals. As these stations are located in areas with both urban and industrial/commercial emission sources the estimated background of non-indicator compounds would be considered conservative. None of the air quality monitoring stations in the Greater Vancouver area monitored for HAPs.

Effects – Emissions

As the potential effects to air quality during operations would be much greater than during construction, the Application's analysis focussed on operational emissions in greater detail. The Application determined that under normal and upset scenarios during operations, ground-level concentrations of NO_2, SO_2, CO, TSP, PM_{10} and $PM_{2.5}$, would remain well below the most stringent applicable objectives, including BC's interim guidance. A summary of the predicted air concentrations for indicator compounds under normal operations including background operations is provided in Table 5-1.

Table 5-1: Predicted Air Concentrations for Indicator Compounds during Normal Operations Including Background Concentrations.

Indicator compound	Averaging period	Ambient Air Quality Criteria (µg/m³)	Normal Operations (µg/m³)	Normal operations including background concentrations (µg/m³)	Normal operations including background concentration percent of air quality criteria
NO_2	1 hour	188	*	53.5	28 %
	24 hour	200	*	38.2	19 %
	Annual	60	*	33.9	57 %
SO_2	1 hour	200	21.1	29	15 %
	24 hour	150	9.1	13.9	9 %
	Annual	30	3.2	5.3	18 %
CO	1 hour	14,300	62.2	531.7	4 %
	8 hour	5,500	25.5	402.2	7 %
TSP	24 hour	120	3.7	58.5	49 %
	Annual	60	1.3	22	37 %
PM_{10}	24 hour	50	3.7	29.9	60 %
$PM_{2.5}$	24 hour	25	3.4	15.1	60 %
	Annual	8	1.2	5.9	74 %

* Project-only effects have not been provided because the addition of background concentration to Project-only effects is non-linear for NO_2 and normal operations.

The design of the facility to be electrically powered is the primary measure that would reduce air quality effects. In addition, the Application proposed the following key measures to mitigate the Project-related potential adverse air quality effects:

- Limiting the use of power generators during operation; and
- Providing shore power for berthing LNG carriers equipped to use shore power.

5.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

The following key issues or concerns were raised during Application Review by members of the Working Group and the public.

General questions and concerns regarding air quality were raised by the public, which included potential health effects to sensitive receptors in the community, such as asthmatics, lack of baseline air quality and meteorology data, potential odour emissions from the facility and shipping activities and potential adverse effects to tourism and recreation from air quality impacts.

The Proponent has proposed to power the LNG facility by using electricity supplied by BC Hydro, which would greatly reduce potential adverse effects on air quality. The Proponent noted that emissions would be highest during normal facility operations and upset conditions, although air dispersion modelling of

normal operations and upset conditions determined that the proposed Project would not be expected to exceed the most stringent air quality criteria.

In response to public comments related to lack of baseline study in the assessment the Proponent provided a response memo, *Baseline Studies – Supplemental Response to Frequently Asked Question (FAQ) #19* (May 2015), which provided a summary of the baseline studies conducted to support the assessment of the proposed Project, including the methods used to characterize existing air quality and meteorological conditions in the LAA and RAA.

Several questions were raised by MOE related to the selection of environmental monitoring stations and model parameters (e.g., winter conditions, land-use categories and pseudo flare stack height and diameter), and validation of the model predictions (e.g., wind predictions for Project site and comparisons with the wind data from the Pam Rocks station).

The Proponent provided rationale for its selection of the monitoring stations and model parameters. The Proponent indicated that the Langdale Ferry Terminal and the Port Mellon stations were considered more representative of the Project area due to a lack of representative meteorological observations within the Project area (e.g., Pam Rocks is outside of the LAA). The Proponent acknowledged that the model output does not match observations at the site or model validations at Squamish, but the output would still be considered reasonable considering the influence of the lower resolution meteorological model data and the lack of observation data. The Proponent also provided additional information in a series of technical memos: *Woodfibre LNG Limited – Response to Information Request #53A* (March 26, 2015); *Woodfibre LNG – Response to Information Request #53A and 53B* (April 9, 2015); and *Woodfibre LNG – Response to Follow-up Requests for Information Request #53A and #53B* (April 20, 2015).

During Application Review, EAO requested additional information specific to the Proponent's air quality assessment, including additional analysis, which considered more appropriate autumn parameters (e.g., no snow cover) for the month of January, detailed calculation of the pseudo flare stack parameters, and specific information related to wind modelling. The additional information did not change the results of the assessment on potential effects on air quality.

EAO proposes a condition requiring the development of an air quality mitigation and monitoring plan, which would include measures to monitor facility air emission and contaminants of concern for sources modelled in the Application, procedures for reporting of the facility air emissions data and an adaptive management plan.

EC requested a comparison between baseline and 'with Project emissions' and additional information on the methods used to estimate vessel emissions. EC also

requested that the assessment of vessel emissions use the National Marine Emissions Inventory Tool (MEIT) and the CARB method.

> The Proponent provided a technical memo, *Woodfibre LNG – Response to Information Request #509* (April 16, 2015). The analysis determined that SO_2 and NO_2 represented a higher percentage of total annual airshed emissions compared to other indicator compounds, although would be relatively small. The Proponent concluded that application of the MEIT method would not be expected to impact the results of the air quality assessment with any significance, mainly because marine vessels would not be expected to contribute a large source of SO_2 from the Project. The Proponent did provide a re-assessment of particulate matter vessel emissions using the CARB method. The re-assessment determined that the estimates of particulate matter using CARB did not change significantly from what was presented in the Application.

5.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effect:

- Emissions of CACs during operations.

Summarized below is EAO's characterization of the residual effects of the proposed Project, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Low sensitivity	Existing ambient air quality data indicates that the air quality in Sea-to-Sky airshed is generally good, such that the sensitivity to disturbance would be considered low. Environmental sensitivity and resilience are considered implicit in the applicable AAQO.
Magnitude	Negligible to moderate	Negligible to moderate within the Sea-to-Sky airshed based on the percentage of air quality criteria for predicted indicator compound emissions from operations and background (ranges from 4 – 74 %), and would not exceed the most stringent applicable AAQOs.
Extent	Local	All indicator compounds for all averaging periods resulting in model predictions (with background) that are less than the ambient air quality criteria resulting in the geographical extent being limited to the LAA.
Duration	Long-term	Would occur over the life of the proposed Project (approximately 25 years).
Reversibility	Reversible	Effects would be reversible when operations ceases.
Frequency	Continuous	Would occur continuously throughout operations.
Likelihood	The likelihood is high that the operation of the proposed Project would result in emissions	

Criteria	Assessment Rating	Rationale
	of CACs and a residual effect on air quality.	
Significance Determination	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), and that the CPD would specify that the proposed Project would be powered by electricity supplied from BC Hydro, EAO is satisfied that the proposed Project would not have significant adverse residual effects on air quality.	
Confidence	There is a high level of confidence in the significance and likelihood determination based on the emission data provided and the conservative analytical techniques used to the support the assessment.	

5.1.5 Cumulative Effects Assessment

There are a number of existing and reasonably foreseeable projects and activities that have the potential to act cumulatively with the proposed Project; however, the potential for cumulative effects from these projects and activities is considered negligible due to their distance from the proposed Project. Indicator compounds that would be emitted from the proposed Project would disperse and dilute by the time these indicator compounds reach the location of other reasonable and foreseeable projects and activities. The assessment considered that proposed Project-related emissions would be estimated to represent less than a 10% increase from background concentrations at the location of reasonable and foreseeable project and activities.

EAO concludes that significant cumulative effects to air quality are not expected as a result of the effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

5.1.6 Conclusions

Considering the above analysis and the air quality Condition in the TOC and the CPD (which would become legally binding under an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on air quality.

5.2 Greenhouse Gas Management

5.2.1 Background

GHG management was selected as a VC because of its importance for the global climate and the regulatory requirements in BC. GHG emissions would be released during the construction, operation, and decommissioning of the proposed Project.

With respect to GHG emissions there are four major gases or groups of gases that are influenced by human activities: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and synthetic (not naturally occurring) fluorinated gases (i.e., sulphur hexafluoride (SF_6), hydro-fluorocarbons (HFCs) and perfluorocarbons (PFCs)). Total GHG emissions are reported in this Report as carbon dioxide equivalents (CO_2e).

The Intergovernmental Panel on Climate Change (IPCC) is an international scientific body under the United Nations whose role is to assess available scientific information related to climate change. The IPCC's scientific consensus is that anthropogenic sources of GHG emissions are altering the global climate, and that concentrations above 450 parts per million (ppm) of CO_2 in the atmosphere would result in a 50% chance of increasing average global temperatures by 2^{o}C over the pre-industrial average.[11] The IPCC has developed scenarios (called Representative Concentration Pathways) to support the development of global policy, mitigation and adaptation measures in response to a changing climate. All scenarios would result in atmospheric concentrations exceeding 450 ppm, although one scenario would only result in a modest, short term exceedance.

Both the federal and provincial governments have indicated a desire to address GHG emissions and have created strategic-level plans. The Government of Canada has set a target of reducing Canada's total GHG emissions by 30 % from 2005 levels by 2030. At present, with respect to GHG emissions reporting, EC requires that any facility emitting more than 50 kt CO_2e report their annual GHG emissions online.

In 2007, the BC Government passed the *Greenhouse Gas Reduction Act*, legislating provincial GHG reduction targets of 33% below 2007 emission levels by 2020 and 80% below by 2050. Interim reduction targets of 6% by 2012 and 18% by 2016 have been set in policy to guide and measure progress. In the Province's most recent Greenhouse Gas Inventory Report, BC's 2012 CO_2e emission levels were reported at 61,500 kt, 4.4% below 2007 levels.

[11] Intergovernmental Panel on Climate Change (IPCC). 2013. Working Group I Contribution to the IPP 5th Assessment Report. *Climate Change 2013: The Physical Science Basis.* IPCC. Geneva, Switzerland.

In order to achieve the legislated GHG reduction goals, BC has designed and implemented a suite of policy, regulatory, and legislative measures to reduce emissions across the province. These measures include:

- A provincial carbon tax, introduced in 2008 through the *Carbon Tax Act*;
- A carbon-neutrality mandate for all public sector operations (Carbon Neutral Government Regulation), largely achieved through the sourcing of province-based offsets; and

In November 2014, BC passed the *GHG Industrial Reporting and Control Act* that puts in place a GHG emissions intensity benchmark for LNG facilities of 0.16 tonnes of CO_2e per tonne of LNG produced (t CO_2e/t LNG). LNG facilities can use offsets and a technology fund to reach the benchmark, and facilities below the benchmark can receive a credit that they can sell.

EAO recognizes that the impacts of GHG emissions must be addressed globally, and that it is not possible to estimate the impacts of an individual project's emissions on global climate change. However, EAO also recognizes that BC's GHG reduction targets were established in the context of the best science about the necessary reductions to global GHG emissions to address impacts on global climate change, and that it is BC's responsibility to contribute to the global reduction. As such, individual projects are considered in relation to their contribution to provincial, national and international GHG emissions, as well as with the industry average of GHG.

In the Application, GHG management considered Project emissions in terms of CO_2, CH_4 and N_2O. The Application stated the proposed Project activities would not contribute emissions of SF_6, O_3, HFCs and PFCs. The Application stated that the proposed Project may use SF_6 insulated breakers, and as such the SF_6 would be contained in sealed systems designed not to leak, and therefore, would have negligible fugitive emissions.

To establish a baseline, the Proponent compared the carbon footprint of a number of LNG facilities, which are either already in operation or are currently under construction. The average GHG intensity for the facilities used as comparison was 0.33 t CO_2e/t LNG.

5.2.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Application estimated that GHG emissions would be low during the construction and operation phase.

During construction, GHG emissions would be generated primarily from mobile equipment, land clearing, site preparation, existing fugitive emissions from the landfill, and marine activities. About 44,700 t CO_2e would be released during the 24 month construction period.

The Application stated that during operations at full build-out, about 129,400 t CO_2e would be released annually mainly from stationary and mobile combustion, flaring, and fugitive sources (Table 5-2). This would increase BC's emissions total by 0.23% and Canada's emissions total by 0.020% over 2012 levels. At peak capacity the proposed Project would be estimated to have a GHG intensity of 0.059 t CO_2e/t LNG.

The proposed Project would minimize the emission of GHGs, most notably emissions associated with fuel combustion through the use of electricity supplied by BC Hydro to power compressors, instead of using natural gas, which is more GHG emission-intensive compared to electric power. The GHG releases associated with electricity use are not attributable to the Project under the *Greenhouse Gas Reduction (Cap and Trade) Act* (GGRCTA) (Government of BC 2008a) as these emissions are reported by the entity generating the electricity – BC Hydro.

Table 5-2: Estimated Direct Emissions During Operations

Source	Annual Emissions [kt/year]				
	CO_2	CH_4	N_2O	CO_2e	% of Phase Total
Stationary Combustion	85.9	<0.1	<0.1	86.7	67.0
Process Fugitives	0.1	0.9	<.0.1	23.7	18.3
Landfill Fugitives	1.6	0.6	<0.1	16.2	12.5
Mobile Combustion	2.8	<0.1	<0.1	2.8	2.2
Total	**90.3**	**1.6**	**0.0**	**129.4**	**100.0**

The in addition to using electricity to power the Project, which would result in a major reduction in GHG emissions, other key mitigation measures in the Application included:

- Develop and implement a leak detection and repair program;
- Minimize the amount of flared and vented gases, and select chemicals that minimize contributions to global warming;

5.2.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, members of the public expressed concerns about the cumulative effects of the proposed Project and other LNG projects on provincial GHG reduction targets.

> EAO acknowledges that the proposed Project and other reasonably foreseeable LNG-related projects could have a substantial impact on BC's total GHG emissions. This is considered in the assessment of effects. The Proponent has also proposed the use of electricity supplied by BC Hydro, rather than conventional gas driven turbines, which would substantially reduce direct GHG emissions when compared with conventional natural gas fueled turbines.

During Application Review, MOE Climate Action Secretariat requested that the Proponent provide additional details on other GHG emission sources associated with the proposed Project.

> The Proponent provided a technical memo, *Woodfibre Application Review: Response to information request 7F* (June 5, 2015), which summarizes the significance assessment of potential other GHG emissions sources, such as indirect emissions from land clearing during construction, other direct sources that would be from operations such as maintenance trucks and the wastewater treatment plant. Operational GHG emissions from other sources were negligible compared to the GHG emissions associated with stationary combustion. The results of the analysis of other GHG emissions sources did not change the conclusions of the assessment.

5.2.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effect:

- GHG emissions during construction and operations.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on the environment from GHG emissions, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate to High Sensitivity	The IPCC has confirmed that GHG emissions are at levels that are impacting the global climate.
Magnitude	Low	The majority of emissions would arise during operations. During operations at full build-out, about 129,400 t CO_2e would be released annually. At full build-out, the proposed Project would increase annual provincial GHG emissions by 0.23%. The proposed Project would also increase national GHG emissions by 0.02%.
Extent	Global	The geographic impact of GHG emissions from the proposed Project is cumulative globally.
Duration	Long-term	CO_2 constitutes the majority of the proposed Project's GHG emissions. CO_2 remains in the atmosphere for 100 years or more.
Reversibility	Irreversible	Given current technology and the persistence of CO_2 in the atmosphere, the effects of the GHG emissions are effectively irreversible.

Criteria	Assessment Rating	Rationale
Frequency	Continuous	GHG emissions would be continuous for the life of the proposed Project.
Likelihood	It is certain that the proposed Project would emit GHGs. However, GHG emissions may be reduced over time due to changes in technology and/or regulatory requirements.	
Significance	Considering the above analysis, and that the CPD would specify that the proposed Project would be powered by electricity supplied from BC Hydro, EAO is satisfied that the proposed Project would not have significant adverse residual effects on GHG emissions.	
Confidence	High level of confidence – EAO is of the view that the estimates presented in the Application are a conservative estimate of potential GHG emissions during construction and operation, and therefore EAO is confident that emissions are likely to be no greater than estimated. The technical approach for estimating GHG emissions has a high level of confidence.	

5.2.5 Cumulative Effects Assessment

GHG emissions are a global issue, and the IPCC has produced several scenarios projecting potential global GHG emissions trajectories and the potential impacts associated with these emissions levels. EAO did not require the Proponent's Application to include a cumulative effects assessment for GHG emissions.

5.2.6 Conclusions

Considering the above assessment and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EA Certificate) EAO is satisfied that the proposed Project would not have significant adverse effects related to GHG emissions.

5.3 Freshwater Fish and Fish Habitat

5.3.1 Background

Freshwater fish and fish habitat was selected as a VC because healthy fish populations are required to support productive commercial, recreational, and Aboriginal fisheries (CRA fisheries). The Application assessed freshwater fish (anadromous and resident species) and freshwater fish habitat that are important for CRA fisheries, as well as fish species of conservation concern (i.e. *Species at Risk Act* (SARA)-listed species and provincially red or blue listed species).

Key potential effects would be direct loss of instream and riparian habitat, fish mortality due to construction of instream works or entrainment and impingement at the water intake, and indirect effects on downstream food and nutrient availability for fish.

The Application assessed the proposed Project's effects on freshwater fish and fish habitat in the LAA, which included the freshwater habitat in Mill Creek and WoodfibreCreek within the proposed Project area and a 30 m buffer zone on either side of each watercourse (~2.5 ha). The RAA consisted of Mill Creek and Woodfibre Creek watersheds and Howe Sound, totaling approximately 145 km^2.

Regulatory Context

Canada's *Fisheries Act* and SARA are the primary federal laws providing protection for fish and fish habitat. Proposed Project activities that would result in serious harm to fish, having localized effect, would require an authorization under paragraph 35(2)(b) of the *Fisheries Act*. An authorization must include an offsetting plan which meets DFO's Fisheries Productivity Investment Policy. Offsetting is defined as "measures to counterbalance serious harm to fish by maintaining or improving fisheries productivity after all feasible measures to avoid and mitigate impacts have been undertaken". If a proponent is unsure if Project components would result in serious harm requiring authorization the proponent may submit a request for review which allows DFO to make a determination of serious harm prior to submission of an Application for Authorization under the *Fisheries Act*.

The BC *Water Act* regulates the allocation and management and use of surface water and establishes protective measures for groundwater and wells. For example, section 8 regulates the withdrawal of water from a surface water source, and section 9 allows for changes in and about a stream in accordance with regulations under the *Water Act*. These regulations include timing windows that represent least risk to fish and fish habitat. EAO notes that the *Water Act* will be repealed when the new *Water Sustainability Act* is brought into force, which is expected in 2016.

The BC *Fish Protection Act* provides legislative authority for water managers to consider impacts on fish and fish habitat before approving new water licenses, amendments to

water licenses or issuing approvals for work in or near streams. The Riparian Area Regulation is enacted under section 12 of the *Fish Protection Act*.

Protection and management of fish habitats and riparian values on Crown land are included in the Environmental Protection and Management Regulation (EPMR) under OGAA.

5.3.2 Potential Project Effects and Proposed Mitigation Described in the Application

In addition to desktop studies on freshwater fish and fish habitat, the Proponent conducted baseline studies over two years. Desktop reviews identified that no federally listed freshwater fish species occur in the RAA. Coastal cutthroat trout, a provincially blue-listed species, is likely to occur in the LAA.

The Proponent noted that challenging terrain limited access to fish habitat upstream of the anadromous section of Mill Creek for fish surveys and habitat measurements.

Two streams constitute the primary freshwater fish habitat in the LAA. Mill Creek is the larger of the two, and bisects the site, flowing southwesterly into Howe Sound. The lower segment of Mill Creek is under tidal-influence and is used by both marine and freshwater species. Woodfibre Creek crosses the southwest corner of the Project area, before flowing into Howe Sound. Both Mill Creek and Woodfibre Creek watersheds have been affected from past logging activities resulting in changes to watershed hydrology and natural stream flows. The lower sections of both creeks and adjacent riparian areas within the proposed Project area have been previously altered from construction and operations of the former Woodfibre Pulp and Paper Mill.

The lower portion of Mill Creek that crosses the proposed Project area has been made into a channel, confining flows to a straight channel with banks armoured with riprap or replaced with concrete walls. The left, lower bank of Woodfibre Creek has been armoured using metal cylinders and concrete. The proposed Project would not require riparian habitat clearing or instream construction or works around or within Woodfibre Creek.

Annual average flows in Mill and Woodfibre Creeks are estimated to be 3.4 m^3/s and 2.0 m^3/s, respectively. The lowest average flows typically occur in August, with monthly average flows of 1.9 m^3/s and 1.1 m^3/s for Mill and Woodfibre Creeks, respectively. The Application assessed potential Project-related effects on surface water quantity based on annual average, dry month average, and extreme low-flow estimates.

A variety of fish passage barriers are located upstream from the mouths of both Mill and Woodfibre Creeks and anadromous fish movement is restricted to lower reaches. Both Mill Creek and Woodfibre Creek are considered to be poor habitat for freshwater fish. Fish habitat within the lower 1.5 km section of Woodfibre Creek has been described as poor quality, due to high gradients and fish passage barriers. The lower reach of Mill Creek, within the cleared portion of the Woodfibre site, has limited riparian cover, little instream cover, low habitat complexity and is tidally influenced within its lower half.

Juvenile coho salmon and rainbow trout, adult pink salmon, gunnels and sculpins were observed in the lower segment of Mill Creek. A large number of spawning pink salmon were observed holding below the falls in Mill Creek; however the distribution of spawning gravels in this area is considered limited. Coho, chum and pink salmon, steelhead, coastal cutthroat trout and Dolly Varden have been previously documented in Mill Creek. Woodfibre Creek provides habitat for pink salmon, rainbow trout, chinook salmon and sculpins and Coastal cutthroat trout have also been observed.

Surface water quality in Mill Creek and Woodfibre Creek has likely been affected by past activities at the former Woodfibre Pulp Mill site which ceased operations in 2006. Baseline water quality information for Mill Creek and Woodfibre Creek was based on samples collected in 2006, 2007, and 2013, and generally meets BC Water Quality Guidelines for Protection of Aquatic Life for most parameters. The majority of exceedances were in surface water samples collected adjacent to existing roads.

The other two unnamed watercourses in the Project area are smaller than Mill Creek and Woodfibre Creek, and flow into culverts beneath the existing access road along the shoreline before being discharged into Howe Sound. These smaller watercourses were not assessed because the proposed Project would not change their flows and they do not provide fish habitat.

Effects – Changes to Water Quality

The Application identified that activities during construction would result in potential effects to surface water quality, which could subsequently affect freshwater fish and fish habitat. There would be no wastewater or stormwater discharges into Mill Creek, Woodfibre Creek or any other watercourses. During operations, process water from the proposed facility, surface runoff collected from the process area, and runoff from the landfill would be treated and discharged into Howe Sound. All discharges into Howe Sound would require compliance with Waste Discharge Authorizations, including potential amendments to existing authorizations, with mitigation and monitoring to ensure the receiving environment meets BC and CCME Water Quality Guidelines for Protection of Aquatic Life. Thermal wastewater from the seawater cooling system would be discharged into Howe Sound via a thermal diffuser.

With implementation of proposed key mitigation measures during construction and operation of the proposed Project (i.e., implementation of environmental management plans, water quality monitoring, best management practices for instream works and sediment and erosion control strategies) the Application concluded there would be no adverse residual effects to surface water quality. Project-related effects to surface water quality during construction and operation phases would be expected to meet BC Water Quality Guidelines, and were not carried forward for assessment of effects on freshwater fish and fish habitat.

Effects – Changes to Fish Habitat from Construction

During construction, approximately 600 m^2 of riparian habitat would be cleared 800 m upstream on Mill Creek to accommodate the installation of the water supply intake, pipeline and water storage tank, although this removal is not anticipated to have a measurable effect on downstream food or nutrient content. Riparian areas along Mill Creek have already been removed (28% to 37% along the south side and < 5% along the north side).

During construction, the amount of vegetation (including riparian) clearing would be reduced to the minimal amount required to accommodate the Project footprint. The Application also specified that in order to help protect the riparian areas of Mill Creek and to re-establish a vegetated area, a green zone area of approximately 23,000 m^2 would be incorporated into the site layout along the lower reaches of Mill Creek. Following construction, the green zone would be re-vegetated with shallow-rooted native plants appropriate for the Project Area.

The installation of the water intake in Mill Creek would also result in a direct loss of instream habitat within the footprint of those works. The water intake would be constructed upstream of the anadromous fish barrier in a reach of Mill Creek that provides habitat for resident rainbow trout (confirmed) and potentially Dolly Varden (unconfirmed). Potential effects and mitigation measures for instream works during construction (e.g., avoidance of instream disturbance, isolation of instream works, conducting works during reduced risk instream work windows, fish salvage prior to works, minimizing the duration of instream activities and establishing riparian setbacks, etc.) and flow diversions are generally well understood and subject to compliance with federal and provincial regulatory requirements.

Effects – Changes to Fish Habitat due to Water Extraction on Mill Creek and Woodfibre Creek

There are active *Water Act* licences for water storage and diversion in Woodfibre Creek and Mill Creek associated with the former Woodfibre Pulp and Paper Mill that would be transferred to the Proponent.

There is a licence to divert approximately 2 m^3/s from Woodfibre Creek. Approximately 0.8 m^3/s is currently diverted from Woodfibre Creek for power generation at the site. The diversion associated with the existing water licence and power generation is considered part of the existing conditions and not a Project-related change. No Project-related water diversions from Woodfibre Creek are anticipated and this activity was not carried forward in the effects assessment for the proposed Project.

There is also an existing water licence to divert up to 1.37 m^3/s from Mill Creek for pulp mill operations and other commercial uses, including power generation. During operations, freshwater would be required to support LNG production processes, infrastructure for employees (domestic and potable water), and firefighting. A new water intake would be constructed on Mill Creek to provide the main water supply for the

proposed Project under the existing water licence (subject to a change in purpose). Water would be diverted from Mill Creek through a buried gravity fed pipe and stored in a tank with a total capacity of approximately 3,800 m^3. Water extraction from Mill Creek during all phases of the Project would result in potential changes to fish habitat and food and nutrient availability (e.g., benthic production, organic litter and terrestrial insect input) in downstream reaches.

Water diversion during construction and decommissioning would be small (i.e., 2.0 %, 3.7 % and 4.1 %) compared to average annual flows and dry-month average and median flows in Mill Creek, respectively. Water extraction during the construction and decommissioning phase (maximum demand of 0.07 m^3/s) would be greater than the operational phases (0.007m^3/s), which would represent 0.2 %, 0.4% and 0.4 % of annual average flows and dry-month average and median flows, respectively, in Mill Creek. If maximum water demand was extracted for construction or decommissioning during an extreme low-flow event, it would represent a diversion rate of 77.2%. Operational water diversions would represent less than 8% during an extreme low-flow event.

A key mitigation measure related to water withdrawal from Mill Creek would be to implement minimum instream flow requirements (IFRs) to support fish and aquatic habitat. These IFRs could be implemented year round and water diversions would be interrupted or reduced during extreme low flows to maintain IFRs to protect fish and aquatic habitat.

Effects – Injury and Mortality to Fish

Direct mortality of fish may occur from the operation of equipment in and around Mill Creek during construction. Potential effects and mitigation measures for instream works during construction (e.g., avoidance of instream disturbance, isolation of instream works, conducting works during reduced risk instream work windows, fish salvage prior to works, minimizing the duration of instream activities and establishing riparian setbacks, etc.) and flow diversions are generally well understood and subject to compliance with federal and provincial regulatory requirements. A key mitigation to reduce potential injury or mortality to fish during construction would be to undertake physical works during reduced risk instream work windows, or otherwise requiring approved by FLNR.

During all phases of the proposed Project, there would be a risk of fish becoming entrained (i.e., when fish are drawn into the intake) or impinged (i.e. when fish are trapped against a screen) at the Mill Creek water intake structure. A key mitigation to reduce the risk of impingement or entrainment of fish at the intake would be to design the Mill Creek water supply infrastructure in accordance to BMPs for instream works and following the standards outlined in DFO's *Freshwater Intake End-of-Pipe Fish Screen Guideline* and *Measures to Avoid Causing Harm to Fish and Fish Habitat*.

Water withdrawal would also have the potential to result in dewatering of eggs and alevins, and the stranding of juvenile fish due to decreases in wetted areas in Mill Creek downstream of the water intake. A key mitigation to reduce potential harm to fish from flow diversions would be to develop and implement a water management plan to support fish and aquatic habitat, which would prescribe the minimum IFRs for Mill Creek and outline the IFR monitoring program, in consultation with FLNR.

Controlled blasting in the vicinity of Mill Creek and the demolition and construction of bridges across Mill Creek during the construction phase may result in disturbances of fish. Artificial lighting would also have the potential to adversely affect fish behaviour and habitat utilization patterns during construction. In order to mitigate potential adverse effects to fish from blasting, a proposed key mitigation would be to ensure blasting activities conform to the *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters.*

The Application concluded that with the implementation of mitigation the proposed Project would not likely require an authorization under subsection 35(2) of the *Fisheries Act*; however, the requirement for an authorization would be determined following permitting applications, which may involve a Request for Review to DFO based on final engineering design and mitigation measures.

5.3.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

The key concerns raised by the public and the Working Group were related to the insufficiency of empirical baseline information and potential effects to freshwater fish habitat due to water withdrawals on Mill Creek during low flow periods. Squamish Nation expressed that the proposed Project should locate other water sources during critical stream flow periods if the necessary water flow amount is not met on Mill Creek.

> The Proponent committed to developing and implementing a water management plan for Mill Creek and a monitoring and follow-up program to confirm the prediction of the Application and to provide additional information on benthic macroinvertebrate community.
>
> EAO proposes a condition that would require the Proponent to prepare an IFR report for Mill Creek prior to construction that proposes an interim IFR regime and a procedure for establishing a long-term IFR regime for Mill Creek (if determined to be required).

FLNR raised concerns that the Application did not contain sufficient information on baseline fish species presence or absence and instantaneous relative abundance. FLNR identified that if the water licences (as currently permitted) were used to capacity during low flow summer months, and a section of the stream may be dried, with both direct and indirect effects on fish populations in the system.

The Proponent committed to developing and implementing a water management plan for Mill Creek in consultation with FLNR. During Application Review, the Proponent met with FLNR to discuss the development and implementation of the water management plan for Mill Creek and agreed on a proposed approach to implementing IFRs under the existing water licences. This approach is reflected in EAO's proposed condition.

MOE requested additional information on the potential effects of landfill waste and contaminant discharges.

In response, the Proponent provided the following technical memos with supplemental information on potential effects, proposed mitigation and monitoring:

- *Wastewater Discharge Supplemental Report* (March 2015) which provided additional information regarding existing Waste Discharge Authorizations for discharges to Howe Sound, including the wastewater treatment effluent and landfill leachate treatment effluent, permitting requirements, proposed mitigation and monitoring plans; and
- *Landfill Wastes and Contaminant Discharges Supplemental Report* (April 2015), which provided supplemental information regarding existing waste discharge permits associated with the landfill onsite and potential permit amendments required for the propose Project activities.

The landfill and leachate treatment system would continue to be used during Project construction and early operation phases until its permitted capacity is reached (300,000 m^3), at which point it would be capped and closed in accordance with EMA.

The existing Waste Discharge Authorization for the discharge of solid waste to the onsite landfill includes conditions related to surface water and groundwater quality, such as semi-annual sampling of the landfill leachate, surface water and groundwater from several locations in and around the landfill site; and monitoring of the leakage detection and collection systems semi-annually for presence of flow.

5.3.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on freshwater fish and fish habitat:

- Change (loss or alteration) in freshwater fish habitat on Mill Creek, including reductions in downstream nutrient availability; and
- Harm to freshwater fish during construction and operations.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on freshwater fish and fish habitat, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	**Fish Habitat:** Low to moderate **Harm to Freshwater Fish:** Low	**Fish Habitat:** Resilience of fish habitat would be considered low due to pre-existing fish habitat disturbances. Resilience to changes in food and nutrient availability in downstream habitats would be considered moderate. **Harm to Freshwater Fish:** Resilience is considered low due to the highly disturbed fish habitat within Mill Creek.
Magnitude	Low	**Fish Habitat:** The magnitude of the potential residual effects on fish habitat is considered low. No critical fish habitat were identified in the LAA, therefore no critical habitat would be impacted. **Harm to Freshwater Fish:** The magnitude of the potential residual effects on fish mortality is considered low based on the successful implementation of the proposed mitigations. Construction and operation of the intake on Mill Creek would be located above the anadromous fish barrier.
Extent	Local	The extent of the residual Project-related effects to fish habitat and fish mortality would be limited to the LAA.
Duration	Short-term to long-term	Residual adverse effects to fish habitat and mortality resulting from construction and decommissioning activities would be considered short-term. Residual adverse effects on fish habitat (i.e., changes to downstream nutrient availability) and mortality resulting from operations (e.g., Mill Creek water withdrawals) would be considered long-term.
Reversibility	Reversible	Residual adverse effects to fish habitat and mortality during construction, operation and decommissioning would be considered reversible once Project-related activities cease.
Frequency	**Fish Habitat:** Single event to continuous **Harm to Freshwater Fish:** Rare	**Fish Habitat:** Residual adverse effects to fish habitat during construction would occur once. Residual adverse effects to fish habitat during operations due to decrease flow in Mill Creek would occur rarely during low flow events. Residual adverse effects to the availability of nutrients and food to downstream fish habitats due to decrease in Mill Creek flows during all phases of the proposed Project would occur continuously. **Harm to Freshwater Fish:** Fish mortality events would occur rarely during all phases of the proposed Project.

Criteria	Assessment Rating	Rationale
Likelihood	The likelihood of residual adverse effects to freshwater fish habitat (including change in downstream nutrient availability) and harm to fish would be low.	
Significance	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse residual effects on freshwater fish and fish habitat.	
Confidence	There is a moderate to high level of confidence in the significance and likelihood determinations of effects on fish and fish habitat based on the effectiveness of the proposed mitigation measures, existing federal and provincial regulatory requirements and compliance with the proposed EA Certificate conditions.	

5.3.5 Cumulative Effects Assessment

Reasonably foreseeable future projects and activities that could contribute to changes in freshwater fish mortality, loss or degradation of freshwater fish habitat, or a reduction in the food and nutrient content for freshwater fish, potentially include BC Hydro's proposed Woodfibre substation, FortisBC's proposed Eagle Mountain-Woodfibre Gas Pipeline Project, and ongoing forestry operations in the RAA all of which occur in the Mill and Woodfibre creek watersheds. However, neither the Woodfibre substation nor the Eagle Mountain-Woodfibre Gas Pipeline Project is expected to affect freshwater fish and fish habitat as they are located outside of the riparian zones for these streams. Forestry activities and their effects to aquatic habitat are managed under the *Forest and Range Practices Act* and logging within riparian areas is restricted to reduce potential effects.

EAO concludes that no significant cumulative effects to freshwater fish and fish habitat are expected as a result of the proposed Project interacting with other past, present and reasonably foreseeable future projects and activities.

5.3.6 Conclusions

Considering the above analysis and the conditions identified in the CPD and TOC (which would become legally binding as a condition of the EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on freshwater fish and fish habitat.

5.4 Marine Water Quality and Benthic Habitat

5.4.1 Background

Marine benthic habitat was identified as a VC because of its ecological importance to marine ecosystem and linkages to marine fish, marine birds, marine mammals and public health. Marine benthic habitat is important to local fisheries and communities and Aboriginal Groups, whose cultures and traditional resource harvesting activities are deeply connected to the marine environment.

Marine water quality and site contamination (two key pathway effects with the potential to interact with marine benthic habitat) were assessed in the Application as ICs. Site investigations on marine sediment quality were also undertaken to assess baseline conditions in areas of historical contamination and to identify potential effects and mitigation strategies for proposed Project activities with the potential to disturb to marine sediment (e.g., dredging, pile driving, etc.).

The LAA included the marine portion within the Project area (67 ha) and the RAA included all of Howe Sound. The RAA in Howe Sound includes DFO Pacific Region Fisheries Management Area 28, which encompasses the administrative boundary for management of recreational fishing activities within Howe Sound.

The assessment of potential effects to marine water quality and benthic habitat were used to inform the assessment of other VCs:

- Marine Fish and Marine Mammals (section 5.5) ;
- Terrestrial Wildlife and Marine Birds (section 5.7);
- Land and Resource Use (section 7.2); and
- Human Health Risk Assessment (section 9.1).

5.4.2 Potential Project Effects and Proposed Mitigation Described in the Application

Baseline Context – Marine Sediment and Water Quality

Historically, water quality in Howe Sound has been influenced by a number of natural and anthropogenic factors. Natural factors include circulation patterns, freshwater inputs (e.g. Squamish River), currents, salinity, and biological activity. Industrial activities include the existing Port Mellon Pulp Mill and the former Woodfibre Pulp and Paper Mill, Britannia Mine and Nexen chloro-alkali site, which have historically discharged wastewater into Howe Sound. Based on 2013-2014 water quality sampling, marine water quality within the LAA and RAA generally met water quality guidelines for the protection of aquatic life, with some exceedances for copper, boron and zinc.

Historically, high concentrations of dioxins and furans have been documented in marine sediments and shellfish in Howe Sound. Fisheries for harvesting all bivalve molluscs (e.g. clams, oysters, mussels) are closed in Howe Sound. However, fisheries for most other benthic invertebrate species (e.g. Dungeness crab, prawn) have remained open

or have re-opened with some restrictions. The Application reported that since 1989, a marked decline in dioxins and furans has been observed in samples collected from marine sediment and crab tissue.

Results of 2014 marine sediment baseline studies were consistent with previous studies in the sediment portions of the Woodfibre property. Sediment samples contained polycyclic aromatic hydrocarbons (PAHs), dioxins and furans in exceedance of CCME and MOE sediment quality guidelines. Concentrations of copper, zinc, arsenic and cadmium in sediments from the LAA also exceeded CCME and MOE sediment quality guidelines. Total toxic equivalencies for dioxins and furans exceeded the CCME Interim Sediment Quality Guideline (ISQG) in each of the five samples analyzed and exceeded the CCME Probable Effects Level in two of the five samples. The PAHs, dioxins and furans in the sediment samples are the result of previous pulp mill operations at the Woodfibre site.

On December 22, 2014, MOE issued two risk-based COCs to the Proponent for the Woodfibre property (land and water lots) based on remediation completed to meet risk-based criteria in accordance with the CSR. The issuance of the COCs demonstrates that:

- Contaminants are not continuing to discharge into the aquatic environment (freshwater or marine);
- Any contaminants remaining onsite have been remediated to risk-based standards and would not be re-mobilized in the future; and
- Remaining contamination can be safely managed in-place and ecological and human health risks would be low.

The upland portion COC includes requirements that any contaminated sediment disturbed by future excavation must be dealt with in accordance with the CSR and implementation of mitigation measures to minimize re-mobilization of historical contaminants, as outlined in the *Performance Verification Plan for Certificate of Compliance at the Former Woodfibre Pulp Mill, Squamish, BC* (Upland Portion) prepared by Keystone Environmental Ltd. dated November 6, 2014.

The sediment portion COC includes requirements to implement and maintain a maritime exclusion zone to prevent access by the public, which would prevent swimming and shellfish harvesting activities within the water lot tenures fronting the Project site(approximately 32 ha). As outlined in Schedule B of the conditions for the COC, by January 1, 2016 the Proponent is required to complete a confirmatory fish and shellfish tissue sampling program at the site to confirm that the risk to ecological and human health would be low.

In addition to marine sediment remediation completed to meet requirements for the COCs, the Proponent also removed wood debris from previous pulp mill operations from the seafloor along the foreshore north of Mill Creek, as requested by EC and DFO, in order to improve benthic habitat conditions. Several areas within the LAA, including

areas with the footprint of proposed marine infrastructure, still contain various amounts of wood debris on the seafloor with degraded benthic habitat.

Additional information related to baseline marine sediment quality, historical contamination and remediation work completed for the COCs is provided in the Application (section 5.7 Site Contamination, section 5.16 Marine Benthic Habitat) and Appendix 5.7-1 (Application for a COC).

Baseline Context – Marine Benthic Habitat and Communities

Marine benthic habitat and species composition of marine benthic communities are largely influenced by the physical and chemical properties of marine sediment such as substrate type (e.g. rock, sand, and silt), particle size composition, and levels of pollutants (e.g. trace metals and hydrocarbons). Marine benthic invertebrates are a major food source for many species of marine fish, birds and mammals. Several benthic invertebrate species (e.g. Dungeness crab, spot prawn) are harvested in CRA fisheries within Howe Sound. Marine plants, especially eelgrass and kelp beds, provide important fish habitat for juvenile salmon and herring.

Compared to reference areas within Howe Sound, the marine benthic community biodiversity and abundance within the LAA is reduced in several areas, primarily due to degraded habitat quality and wood waste debris on the seafloor from the former Woodfibre pulp mill operations.

Benthic invertebrates observed during underwater video surveys included: Dungeness crabs, tanner crabs, shrimps, sea cucumbers, urchins, anemones, and seastars. Northern abalone is not typically found in inlet waters and only small populations have been documented within the Strait of Georgia; no occurrences were documented in the LAA. Glass sponges were not identified within the vicinity of the Project area during underwater video surveys and have not been identified within the LAA. Lower benthic invertebrate density was observed in samples that contained higher proportions of wood debris. Benthic communities in sediments containing silt and sand in shallow subtidal areas had a high number of bivalves (clams and mussels). Samples collected at the mouth of Mill Creek had high proportions of insects that are more common for low-salinity environments due to freshwater discharge.

Marine plants within the intertidal area in the LAA include several macroalgae species, although in general, the subtidal zone contained a low abundance and diversity of macroalgae and a greater abundance and diversity of benthic invertebrates. Marine plants within the subtidal area include trace amounts of kelp. No high-density growth areas of eelgrass or kelp beds were observed within the Project footprint.

Potential Project Effects

The Application assessed the following potential effects related to marine benthic habitat from the proposed Project:

- Change in marine water quality;
- Change in marine sediment quality;
- Harm marine benthic communities; and
- Direct loss or change in marine benthic habitat.

Effects and Mitigation – Changes in Marine Sediment Quality

Marine construction activities (e.g. dredging, removal of creosote-treated piles, pile driving and shoreline modifications) associated with demolition, upgrades and installation of proposed Project infrastructure within the intertidal and subtidal zones would have the potential to cause disturbance to the seafloor, temporary re-suspension of marine sediments and sediment deposition on benthic habitat. Sediment disturbance would temporarily increase total suspended solids (TSS), and potentially increase metal concentrations and the bio-availability of historical contaminants.

Limited pocket dredging of historic wood waste from the seafloor along the foreshore north of Mill Creek may be required to accommodate construction of marine infrastructure, such as the FSO jetty foundations, for example. Any removal of historic wood waste and marine sediment would be conducted in accordance with the requirements and conditions of the COCs. The maximum amount of wood waste material that would be removed is estimated to be 60,000 to 80,000 m^2 and would be disposed of at the existing on-site landfill or a permitted off-site landfill.

During construction, demolition of the existing dock and marine infrastructure would involve removal of approximately 3,000 creosote-treated wood pilings resulting in an estimated maximum area of disturbance of 1.47 ha. Creosote-treated piles that are considered salvageable or are required to be removed to accommodate for marine infrastructure, would be removed using a vibratory hammer or cable. Other creosote-treated piles would be broken off at the mud line, which is considered to have fewer environmental effects and would provide stabilization in areas where slope stability may be an issue. Creosote-treated pilings that would not be salvaged would be disposed in an appropriate waste management facility offsite; or salvaged and transported offsite to be sold for reuse elsewhere. The removal of the piles may result in the release of creosote into the water. Creosote in the sediment surrounding the pilings may also be suspended into the water column during piling removal and new pile driving activities. The removal of the creosote-treated piles would follow best management practices to reduce sediment disturbance and effects on marine water quality.

In consideration of existing site conditions with degraded benthic habitat and the existing wood pilings slowly leaching creosote into the water, it is expected that removal of the pilings would eliminate further leaching of creosote into the water and would therefore result in an overall long-term positive effect and improvement in marine water quality, sediment quality and benthic habitat quality compared to existing conditions.

The Application examined the potential for marine sediment disturbance associated with propeller wash from LNG carriers maneuvering to and from the shipping terminal. It

concluded that because of the water depths of 50 -100 m and current conditions LNG carriers would not disturb marine sediments.

Key measures that would mitigate potential adverse effects to marine sediment quality would include:

- Construction activities would be monitored by a qualified Environmental Monitor;
- Marine works would be conducted during the least risk fisheries work window specified by DFO for the region;
- BC water quality guidelines would be adhered to, with regard to discharge or introduction of sediment or sediment-laden water in the marine environment;
- Adhere to the *Best Management Practices for Pile Driving and Related Operations*;
- Where required, turbidity monitoring would be implemented during all pile drilling/driving activities, to determine that turbidity levels do not exceed established water quality regulatory criteria; and,
- Implement measures to minimize effects from creosote pile removal and dredging activities, including the use of silt curtains.

Effects and Mitigation – Changes in Marine Water Quality

During operations, the seawater cooling system is proposed to discharge treated thermal seawater into Howe Sound via a diffuser discharging at a rate of 17,000 m^3 per hour, through 24 diffuser ports spaced at 5 m distances with the diffuser ports starting at a water depth of 40 m. The treated thermal seawater discharges would result in a localized increase in water temperature within an initial dilution zone. Modeling estimated the area of the plume to a minimum temperature change of 0.02 ºC above ambient marine water temperature. The summer mid-layer scenario would have the largest predicted plume, which would extend approximately 150 m offshore from the mouth of Mill Creek. An anti-fouling agent (i.e., sodium hypochlorite) would be added to the seawater to prevent biofouling (i.e., growth of mussels and barnacles) within the seawater cooling system. The seawater cooling water diffuser would be designed to meet CCME and BC Water Quality Guidelines for the Protection of Aquatic Life. Prior to discharge, the seawater cooling water would pass through a de-aeration tank, and if required, a de-chlorination agent would be added to remove residual chlorine before the seawater is discharged to Howe Sound.

All discharges into Howe Sound would require compliance with Waste Discharge Authorizations, including mitigation and monitoring to ensure the receiving environment meets BC and CCME Water Quality Guidelines for Protection of Aquatic Life.

Key measures that would mitigate potential adverse effects to marine water quality would include:

- The effluent diffuser and outfall pipes would be installed within low-productivity benthic habitat;

- All diffusers would be designed and operated to meet discharge criteria in accordance with conditions of Waste Discharge Authorizations and would meet CCME and BC Water Quality Guidelines for the Protection of Aquatic Life; and
- Monitoring of seawater cooling discharge to assess the effectiveness of mitigation and confirm the results of the assessment.

Effects and Mitigation – Direct Loss or Change in Marine Benthic Habitat

Loss and alteration of benthic habitat would include direct effects from demolition of existing marine infrastructure, installation of new Project-related marine infrastructure (e.g. new pilings, FSO, seawater cooling system intake and diffuser, etc.) and effects from shading on the seafloor which can have negative effects on the benthic community, including loss of intertidal and subtidal marine vegetation. The proposed marine structures would occupy a total of 3,856 m^2 on the seafloor within low-productivity benthic habitat. The total area estimated to be affected by shading would be approximately 31,013 m^2

The marine footprint of the proposed Project would be restricted to the nearshore marine facilities. In addition, submerged pipes would be placed on the seafloor for the seawater cooling water intake and outfall diffuser pipes. The effluent diffuser and the structures themselves may be supported by pilings to minimize habitat loss and would be designed to protect infrastructure from seismic activity on the seafloor.

The Application stated that because the marine footprint would be located within low-productivity benthic habitat, loss of marine habitat productivity is considered unlikely, and an authorization under the *Fisheries Act* for serious harm to fish is not anticipated.

Key measures that would mitigate potential adverse effects to marine benthic habitat would include:

- Placement of structures in marine areas of low habitat quality;
- Use of piles to support marine structures, reducing the marine footprint and creating hard substrate for sessile organisms; and
- Implement measures to minimize marine sediment disturbance during construction activities, including implementation of turbidity monitoring during pile driving activities.

Effects and Mitigation – Harm to Marine Benthic Communities

Both juvenile and adult benthic invertebrates are susceptible to impingement and entrainment at water intakes, thereby causing direct or indirect mortality. Impingement is when an organism is trapped against an intake screen and entrainment is the capture of small organisms within water that is drawn into the intake. Local benthic communities are supplied by regional larval pools and are therefore highly resilient to stresses that affect local larval mortality.

A key mitigation measure that would minimize effects to marine benthic invertebrate mortality is that the seawater cooling system intake would be designed to meet DFO BMPs for approach velocity and screen size, as outlined in *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia* (DFO 1991). This includes that the intake would be located at a depth of greater than 25 m, 2 m above the sea floor, and that with a mesh size no larger than 4.75 mm.

5.4.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

Potential Effects from Dredging and Marine Sediment Disturbance

Concerns were raised by Working Group members during Application Review regarding potential effects to water quality from dredging, including the release of historical contaminants in marine sediment. EC noted that the Proponent has not confirmed if dredging would be required and if the proposed Project would require a Disposal at Sea Permit. MOE also raised concerns that the Application did not identify specific dredge locations or volumes and did not include modelling for sediment re-suspension, or site-specific marine sediment chemistry data to assess potential effects of dredging.

> The Proponent responded that limited pocket dredging (up to 60,000 to 80,000 m^3 total dredge volume) of primarily historic wood waste may be required to facilitate the installation of the foundations for marine infrastructure and/or the marine protection berm and that dredging activities would be conducted in accordance with the requirements and conditions of the COC. Key mitigation measures (i.e., development and implementation of a marine water quality management and monitoring plan and implementation of best management practices to minimize sediment dispersion) and water quality monitoring would be implemented during dredging works to ensure water quality guidelines are met and to enable construction management decisions to be made in the event that performance criteria are not met. The proposed Project would not be anticipated to require a Disposal at Sea Permit, as the material to be removed would be disposed of on land in the Woodfibre landfill, or other approved landfill facility.

Potential Effects to Glass Sponge Reefs

Local governments and the public raised concerns that the assessment did not consider potential impacts to glass sponge reefs due to propeller wash and marine vessels.

> The Proponent noted that the proposed shipping route would maintain a minimum of 1300 m (and typically more than 1500 m) from the known locations of sponge reefs (Halkett Point and Lost Reef between Pam Rocks and Christie Islets). Glass sponge reefs are associated with depths ranging between 20 m and 40 m, and at this depth the Proponent has assessed that the velocity

produced by a propeller wash is considered negligible due to dissipation of the propeller-wash with distance from sailing line.

Potential Effects from Seawater Cooling Water System Discharge

Working Group members, including MOE, raised concerns about the seawater cooling system and requested additional information to show that seawater cooling water discharge would be within water quality guidelines. MOE enquired regarding the lack of assessment of other compounds potentially used in the de-chlorination process.

In response the Proponent provided a technical memo *Response to Seawater Cooling Discharges Information Request* (April 2015). The Proponent also provided a technical memo *Landfill Wastes and Contaminant Discharges Supplemental Report to the Application* (April 2015) which included additional information regarding discharges from the seawater cooling system. If certified, the final design of the outlet pipes and diffuser (to be completed during detailed design) would be evaluated using detailed modelling as part of the *EMA* permitting process for the seawater cooling system discharge. The modelling would examine the fate of both thermal and chlorine discharges to verify that the temperature and chlorine concentration meet or exceed the water quality guidelines and the level of effect documented in the Application.

Chlorine is expected to be the only contaminant in the cooling system discharge water. The final design for the seawater diffuser, the specifics of sodium hypochlorite dosing in the seawater cooling system and the application of a dechlorination agent would ensure that the regulatory requirements around residual chlorine concentration are met. A key consideration in the final choice of a dechlorination agent would be ensuring the compound does not become a contaminant in the discharge water. The compounds and dosing would be determined during detailed design, and provided to MOE as part of the permitting process.

Potential Effects from Creosote Pile Removal

Concerns were raised by MOE regarding limited info on potential effects to water quality and mitigation for removal of old creosote-treated pilings and pile driving of new pilings, barge landing upgrades, materials offloading facility dock construction and effluent diffuser.

In response to issues related to the seawater cooling system, the Proponent provided a technical memo, *Removal Creosote Treated Timber Piles* (April 2015), with additional information regarding proposed removal methods and mitigation measures following best management practices to mitigate potential effects to marine water quality and marine sediment quality. The Proponent noted that they had committed to prepare a Construction Environmental Monitoring Plan (CEMP) that would include a creosote piling removal plan with

proposed mitigation and monitoring plans. The memo recommended breaking the creosote piles off below the mud line, rather than cutting them off at the mud line, in order to minimize adverse environmental effects for piles that would not salvageable or in areas where sediment stability would be an issue.

EAO proposes a condition that would require the Proponent to develop and implement a marine water quality management and monitoring plan for construction, which would include requirements to mitigate and monitor sediment dispersion and water quality.

Potential Effects from Landfill Leachate and Wastewater Discharges

Concerns were raised by Working Group members during Application Review regarding effects to marine water quality from discharge of landfill leachate treatment plant. MOE also requested that monitoring plans include activities from wastewater treatment plants and any other activity that could cause pollution to the marine environment.

In response, the Proponent provided a technical memo, *Landfill Wastes and Contaminant Discharges Supplemental Report to the Application* (April 2015), with additional information on the landfill leachate collection systems and treatment plant and existing Waste Discharge Authorization under EMA. The Application also referenced monitoring and follow-up programs, including monitoring marine water quality, sediment quality and fish species for effects during construction, operations and five years post-construction. Monitoring data would be assessed against Project-specific guidelines and baseline data. The existing Waste Discharge Authorization for the discharge of treated landfill leachate to marine water in Howe Sound also includes conditions for discharge limits and monitoring and reporting requirements.

EAO proposes a condition that would require the Proponent to develop and implement a marine water quality management and monitoring plan for operations, which would set out the mitigation measures to ensure that any marine effluent discharges would meet applicable water quality guidelines and a monitoring and follow-up program with respect to marine water quality during operations.

During Application Review, EAO required supplemental information on the seawater cooling system treated thermal water discharges, and a review of currently operational industrial seawater cooling systems that have used similar or proven technology and engineering design, with effectiveness monitoring and validation of modelling results.

In response, the Proponent submitted two technical memos: *Woodfibre LNG – Response to Seawater Cooling System Discharges Information Request* (April 2015) and *Assessment of Alternative Cooling Methods – Response to EAO Supplemental Information Request* (April 2015).

The seawater cooling system discharges memo concluded that overall, regardless of season or current speed, thermal plume contours reaching the shoreline would be generally less than 0.1ºC above ambient water temperature and that no zones of cumulative thermal accumulation were predicted. The initial dilution zone would extend about 10 m from the discharge point. The memo identified that long-term monitoring of large power plant seawater discharges have provided little evidence of adverse effects to fish and fish habitat.

Potential Effects from Discharge of Ship Ballast water

Concerns were raised by members of the public regarding discharge of ship ballast water and potential effects on marine benthic habitat in Howe Sound from introduction of invasive species transported in ship ballast water from international waters.

The Application proposed the development of a ballast water management plan for the proposed Project to mitigate potential effects and comply with all legislated shipping requirements related to the management of ballast water. In accordance with the *Canada Shipping Act*'s Ballast Water Control and Management Regulations, a ship cannot discharge ballast water that is taken on board the ship outside of waters under Canadian jurisdiction in waters under Canadian jurisdiction unless the ship conducts an exchange before entering Canadian waters in an area situated at least 200 nautical miles from shore where the water depth is at least 2000 m. In consideration of the legislated requirements and proposed mitigation, a discharge of ship ballast water within the RAA is unlikely to impact marine benthic habitat.

5.4.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on marine water quality and benthic habitat:

- Direct loss or change of benthic habitat;
- Harm to benthic communities; and
- Changes in marine water quality from localized sediment disturbance and re-mobilization of historical contaminants.

Residual effects to marine water quality are not considered likely, apart from localized changes in the immediate vicinity of the treated wastewater diffusers, and therefore were not carried forward in the Application's assessment of effects on marine benthic habitat or other marine VCs.

In consideration of remediation work completed for the COCs, including removal of wood waste debris from the seafloor and historically contaminated marine sediment from previous pulp mill operations, along with the proposed removal of approximately 3,000 creosote-treated pilings and mitigation measures identified in the marine works

management plan, the proposed Project would be anticipated to result in an overall positive effect and long-term improvement in marine benthic habitat quality compared to pre-existing conditions.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on marine water quality and benthic habitat, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	**Benthic Habitat:** Low resilience	**Benthic Habitat:** Benthic habitat quality has been impacted from discharges of pulp mill effluent and wood debris on the seafloor from previous operations at the Woodfibre Pulp Mill. Due to the disturbed nature, the resilience to future changes would be considered low. There are no high density areas of eelgrass, kelp beds or other sensitive habitat features.
	Harm to Benthic Communities: Moderate to high resilience	**Harm to Benthic Communities:** Benthic communities have a high resilience and are expected to re-colonize disturbed areas following construction. Benthic invertebrate communities are also highly resilient to stresses that affect larval mortality.
	Marine Water Quality: High resilience	**Marine Water Quality:** Marine water quality is considered highly resilient because infrequent and short-term disturbance of marine sediments during construction would be expected to result only in temporary changes in marine water quality.
Magnitude	**Benthic Habitat:** Low	**Benthic Habitat:** Marine construction would result in temporary and permanent alteration of marine habitat (3,856 m^2). Marine vegetation in the areas where the marine facilities would be constructed is sparse, and installation of gangways and ramps above high-water mark, and increase in height of pile-supported structures, would decrease shaded areas. The benthic habitat in this area is of relatively low quality. With the implementation of proposed mitigation, residual effects to benthic habitat would be of low magnitude.
	Harm to Benthic Communities: Low	**Harm to Benthic Communities:** Pile driving and dredging can potentially kill or injure benthic species. Entrainment or impingement at the seawater cooling system intake may result in mortality to benthic fish and invertebrates, however siting of the intake and design criteria to limit screen size and flow-through velocity of the intake would minimize the number of organisms that may become entrained. Considering the small proportion of invertebrate adults and larvae that may be affected, and the proposed mitigation measures, residual effects would be of low magnitude.
	Marine Water Quality: Low	**Marine Water Quality:** Sediment disturbance and the mobilization of legacy contaminants into the water column would

Criteria	Assessment Rating	Rationale
		be minimized with mitigation and would result in low magnitude effects to marine water quality. In consideration of remediation work, including removal of wood waste debris, historically contaminated marine sediment, and creosote-piles, an overall positive effect and long-term improvement in marine benthic habitat quality is anticipated.
Extent	Local	All effects would be localized to specific marine areas where demolition, upgrading and installation of marine infrastructure would occur (i.e., woodchip removal, removal of existing creosote-treated piles, new pile driving and installation of marine infrastructure). Total area of direct seafloor disturbance would be 3,856 m^2.
Duration	**Benthic Habitat:** Short term to long term **Harm to Benthic Communities:** Short term to long term **Marine Water Quality:** Short term	**Benthic Habitat:** Temporary alteration of habitat is expected to recover in 2 years. Loss of habitat within the footprint of marine infrastructure is expected to be long-term, although may result in positive effects over time once structures are colonized by invertebrates. **Harm to Benthic Communities:** Potential risk of increased harm to benthic communities would be considered to be short term in duration during marine construction. Potential risk of increased harm to benthic communities would be considered long term during operations due to potential mortality of benthic species from entrainment or impingement at the seawater cooling system intake. **Marine Water Quality:** The potential temporary effects to marine water quality would be considered short term during pocket dredging, removal of creosote piles and installation of marine infrastructure.
Reversibility	Reversible	**Benthic Habitat:** Direct effects would be reversible after marine construction is complete and indirect effects from shading would be reversible after the facility is decommissioned. **Harm to Benthic Communities:** Reversible after marine construction is complete and reversible after facility and vessel operations ceases. **Marine Water Quality:** Reversible after marine construction is complete.
Frequency	**Benthic Habitat:** Multiple infrequent events during construction; Continuous during operations. **Harm to Benthic Communities:** Multiple infrequent events during	**Benthic Habitat:** Loss and alteration of benthic habitat would occur at multiple times throughout the construction phase. Impacts to benthic habitat from shading effects would occur continuously during the operations phase. **Harm to Benthic Communities:** Potential direct and indirect harm to benthic communities would occur during multiple events during construction of marine infrastructure. Potential harm to

Criteria	Assessment Rating	Rationale
	construction; Continuous during operations. **Marine Water Quality:** Multiple infrequent events during construction.	benthic communities from the seawater cooling system marine water intake would occur continuously during facility operations. **Marine Water Quality:** Changes to marine water quality during construction of marine infrastructure would occur at multiple times throughout the construction phase.
Likelihood	There is a high likelihood of residual effects from loss and alteration of marine benthic habitat and changes in marine water quality, however there would be a low likelihood of mortality or injury of benthic communities.	
Significance	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse residual effects on marine water quality and benthic habitat.	
Confidence	There is a moderate to high level of confidence in the likelihood and significance determinations based on the effectiveness of mitigation measures, existing federal and provincial regulatory requirements, and compliance with the proposed EA Certificate conditions.	

5.4.5 Cumulative Effects Assessment

Reasonably foreseeable future projects and activities that could contribute to changes in marine water quality, marine sediments and marine benthic communities, include BC Hydro's proposed Woodfibre substation and associated transmission lines, FortisBC's proposed Eagle Mountain-Woodfibre Gas Pipeline Project, the proposed BURNCO Aggregate Project, and ongoing forestry operations in the RAA. However, neither the Woodfibre substation nor the Eagle Mountain-Woodfibre Gas Pipeline Project is expected to affect freshwater quality (or marine water quality indirectly) as they are located outside of the riparian zones for these streams. Forestry activities and their effects to aquatic habitat are managed under the *Forest and Range Practices Act* and logging within riparian areas is restricted to reduce potential effects to freshwater quality (and marine water quality indirectly).

Direct Project-related effects to marine water quality and benthic habitat would be limited to the proposed Project area. All future or reasonably foreseeable projects or activities or located outside of the Project area and would therefore not be likely to cumulate with the proposed Project's effects on marine water quality and benthic habitat.

EAO concludes that no significant cumulative effects to marine water quality and benthic habitat are expected as a result of effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

5.4.6 Conclusions

Considering the above analysis, and having regard to the conditions identified in the CPD and TOC (which would become legally binding as a condition of the EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on marine water quality and benthic habitat.

5.5 Marine Fish and Marine Mammals

5.5.1 Background

Marine fish[12] and mammals were identified as VCs because of their ecological importance and their importance to local fisheries and communities and Aboriginal Groups, whose cultures and traditional resource harvesting activities are deeply connected to the marine environment. Howe Sound provides habitats supporting many species that contribute to the ecological, cultural and economic well-being of the region.

The LAA for marine fish and marine mammals included the marine portion of the Project area (67 ha), as well as a 1 km area on either side of the LNG carrier route, and the worker ferry and water taxi route between the Project site and Darrel Bay and Squamish Harbour. The RAA included all of Howe Sound.

Regulatory Context

The *Fisheries Act* is the main statute related to the conservation and protection of marine fish, fish habitat and marine mammals. Fish and fish habitat protection measures include a prohibition, if unauthorized, against serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery; and a prohibition against the deposit of deleterious substances in water frequented by fish.

DFO is responsible for administering all aspects of the *Species at Risk Act* (SARA) related to aquatic species at risk. SARA contains specific requirements for when project reviews are being undertaken under CEAA 2012. It requires assessment of the adverse effects of a project on any species listed in Schedule 1, for measures to be taken to avoid or lessen those effects, and to monitor those measures. All measures must be consistent with any recovery strategies or action plans in place for the species.

Waste Discharge Authorizations under EMA would be required for the proposed LNG facility seawater cooling water system and wastewater treatment plant effluent discharges to the marine environment. Waste Discharge Authorizations under EMA would be administered by OGC and would include permit conditions with discharge limits, mitigation measures and marine water quality monitoring requirements.

[12] This section reports on the potential effects from the proposed Project on forage fish and other marine fish (e.g., herring, salmon). Information related to the potential effects on marine benthic communities, including benthic invertebrates and benthic fish, is considered in Section 5.4 of this Report.

5.5.2 Potential Project Effects and Proposed Mitigation Described in the Application

Baseline Context – Marine Fish and Marine Mammals

The marine habitat within the proposed Project's marine foreshore, subtidal area and surrounding areas has been frequently disturbed, influencing the extent and quality of habitats. The recent rise in whale, dolphin and porpoise sightings in Howe Sound since 2009 and the return in prey fish numbers, including herring and salmonids, has been attributed to improved water quality. The Application states that 696 marine species have been documented in Howe Sound, and several important marine areas are in the RAA, such as Whytecliff Marine Park, Porteau Cove Provincial Park and nine rockfish conservation areas.

Three forage fish species, being Pacific herring, surf smelt and Pacific sand lance, are known to spawn on the beaches in Howe Sound. At the time of Application submission the closest documented herring spawning location to the proposed Project location was off the northern reach of Watts Point, approximately 3.5 km southeast of the Project area. Herring spawn surveys conducted during Application Review identified herring spawning along the shoreline of the Project area. The closest Pacific sand lance and surf smelt spawning areas within Howe Sound are located approximately 30 km from the proposed Project area.

Seven anadromous fish species, including coho salmon, chinook salmon, chum salmon, pink salmon, steelhead, sea-run coastal cutthroat trout and sea-run Dolly Varden spawn in rivers and streams that drain into Howe Sound. The LAA provides migratory and juvenile rearing habitat for anadromous salmonid species. Subtidal and intertidal marine habitat within the LAA also serve as feeding, migratory, and spawning habitat for other marine fish species such as Pacific herring, gunnel, sculpin, perch, greenling, eelpout and several species of flatfish.

At least eleven species of marine mammal are known to occur within Howe Sound, including killer whales (southern resident, northern resident, transient and offshore), Pacific white-sided dolphin, false killer whale, Dall's porpoise, harbour porpoise, humpback whale, grey whale, minke whale, steller sea lion, California sea lion and harbour seal. Harbour seals are year-round residents in Howe Sound, while sea lions and porpoises are considered occasional visitors. Occurrences of Pacific white-sided dolphins, killer whales, grey whales and humpback whales have increased since 2009.

The most common marine mammal species reported in the upper reaches of Howe Sound near the Project area are harbour seals, Pacific white-sided dolphins and killer whales. Critical killer whale habitat does not occur in Howe Sound and there were no established pinniped haul-out sites or rookeries identified in the upper reaches of Howe Sound near the Project area.

Marine mammal species at risk listed on Schedule 1 of SARA potentially occurring in the LAA and RAA are: stellar sea lion, killer whale (all ecotypes), harbour porpoise,

humpback whale and grey whale. Sea-run coastal cutthroat trout, a provincially blue listed species, also has the potential to occur in the LAA and RAA.

Potential harm to marine mammals due to accidental vessel strikes and proposed mitigation measures are discussed in Section 10 of this Report. In consideration of the proposed mitigation (primarily, reduced speed of LNG carriers along the shipping route within Howe Sound), the likelihood of a fatality or injury of a marine mammal from an accidental vessel strike would be rare and the long-term viability of marine mammal populations in Howe Sound would unlikely be affected. Therefore, potential harm to marine mammals from accidental vessel strikes was not carried forward as a residual effect in this section.

Effects and Mitigation – Changes to Marine Fish Habitat

Project construction of marine facilities has the potential to result in the loss or alteration of marine fish habitat. The total estimated area of the seafloor disturbance would be 3,856 m^2. Installation of the marine facilities along the foreshore has the potential to create some shading effect in the marine environment, primarily over marine benthic habitat that do not support vegetation, resulting in potential loss of marine fish habitat. The total area estimated to be affected by shading would be approximately 31,013 m^2.

Construction and decommissioning activities in the marine environment have the potential to result in an adverse change to marine fish habitat quality due to seabed disturbances and re-suspension of sediment in the marine environment. The potential effects to water quality are summarized in Section 5.4 of this Report.

The Application stated that because the marine footprint would be located within low-productivity benthic habitat, loss of marine habitat productivity is considered unlikely.

Key measures that would mitigate potential adverse effects to marine fish habitat would include:

- Structures would be placed in marine areas of low habitat quality;
- Use of piles to support marine structures, reducing the marine footprint and creating hard substrate for sessile organisms;
- Construction activities would be monitored by a qualified Environmental Monitor;
- Marine works would be conducted during the least risk fisheries work window specified by DFO for the region (August 16 – January 13 for Howe Sound), unless otherwise authorized by DFO;
- BC water quality guidelines would be adhered to, with regard to discharge or introduction of sediment or sediment-laden water in the marine environment;
- Adhere to *Best Management Practices for Pile Driving and Related Operations*; and
- Where required, turbidity monitoring and mitigation measures would be implemented during marine activities, to ensure that turbidity levels do not exceed established water quality criteria.

Effects and Mitigation – Harm to Marine Fish from Entrainment and Impingement

The operation of the seawater cooling system has the potential to result in direct and indirect mortality of marine fish. Fish, especially larval and juvenile life stages, are susceptible to impingement and entrainment at the seawater cooling system intake. Impingement occurs when an organism is trapped against an intake screen, while entrainment occurs when small organisms, mostly larvae, are captured within water that is drawn into the seawater cooling system.

Mortality rates due to impingement and entrainment vary by species and are difficult to quantify. Larval fish are particularly susceptible to impingement because they have limited swimming capability that would otherwise allow them to avoid the disturbance. Juvenile and adult fish are less susceptible, as they are more mobile than earlier life stages. The magnitude of fish mortality due to impingement and entrainment depends upon a number of key factors: flow-through velocity of the intake; proximity of the intake to spawning grounds and other sensitive habitat; distance between the intake and the seafloor; screen size of the intake; and abundance and life history stage of fish and larvae in the vicinity of the intake. The Application notes that juvenile herring were found to be more susceptible to impingement stresses than salmonids.

A key mitigation measure that would minimize effects to marine fish morality due to impingement and entrainment from the seawater cooling system is that the seawater cooling system intake would be designed to meet DFO BMPs for approach velocity and screen size, as outlined in DFO's *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia*. This includes that the intake would be located at a depth of greater than 25 m and 2 m above the sea floor, would contain a screen with a mesh size no larger than 4.75 mm to prevent the entrainment of small organisms; would have an approaching velocity of 3 cm/s for a stationary screen and 12 cm/s for self-cleaning screens, would be located away from the mouth of Mill Creek (i.e., salmonid spawning habitat) and away from subtidal rock reefs containing nursery habitat for juvenile fish.

Effects and Mitigation – Underwater Noise Impacts on Marine Fish and Marine Mammals

Construction of the proposed FSO jetty and associated marine infrastructure would involve approximately five to six months of intermittent pile-driving activity, which would result in increased underwater noise. Increased underwater noise has the potential to cause behavioural changes, injury or mortality to marine fish and marine mammals. The assessment included underwater noise modelling, specifically for pile driving and drilling activities and determined at what distance from the source the sound level would reach injury and behavioural threshold values for marine mammals and fish.

The Application reported underwater sound levels as a measure of relative sound pressure level to assess underwater noise impacts on marine animals as a result of

anthropogenic activities in the marine environment. The baseline ambient underwater noise levels ranged from 112.0 to 126.8 dB re 1 μPa rms ("dB rms") near the Project area. The Application identified an underwater noise threshold for injury to whales and dolphins of 180 dB rms and 190 dB rms for seals and sea lions. The underwater noise threshold for behavioural disturbance of marine mammals was defined at 160 dB rms for construction activities and 120 dB rms for vessel noise.

The model predicted that the distance to injury threshold for marine mammals from pile driving activities would be 73 m and 340 m for peak and average underwater noise disturbances, respectively. As such, marine mammals within those distances from pile driving activities, during peak or average noise disturbances, could suffer injury. The model also predicted that a distance to behavioural response for marine mammals from impact pile driving activities would be 7,322 m. Behavioural responses may include temporary stress-induced physiological changes, altered sound perception, habituation to vessel sounds, impaired communication, and avoidance behaviours that may disrupt migration or foraging patterns

Noise produced during pile driving would be expected to exceed injury threshold for fish (210 dB rms)[13]. Noise produced during pile driving would also be expected to exceed the behavioural threshold for disturbance to fish. The Application indicated that the behavioural effects (i.e., startle response or increase susceptibility to predation) would be localized to the area where the activity is taking place and would occur intermittently over a period of five to six months during construction. The behavioural threshold for fish may be exceeded during operations and vessel noise may affect fish behaviour in the direct vicinity of the Project area during construction.

During the life of the proposed Project, marine vessel traffic in the proposed LNG carrier route, as well as other Project vessels operating between Squamish Harbour and the Project area would create underwater noise in the marine environment that would have the potential to adversely affect marine mammal behaviour. Vessels approaching or leaving the marine facilities would have a maximum sound pressure level of 175 dB rms, which is below the injury threshold for marine mammals, but above the behavioural threshold. The model predicted the distance to behavioural response would be 4,642 m from the vessel location. The Application stated that behavioural responses would not necessarily be predictable from the sound-source level and may vary depending on factors such as age and status of the animal, type of activity, and social context. It would be expected that vessel noise may produce a localized behavioural response, including avoidance of the area around vessels and the terminal. Marine mammals in the LAA have been exposed to vessels and associated underwater noise from existing traffic, given the volume of shipping that presently occurs in the area.

[13] BC Marine Pile Drivers Contractors Association (BCMPDCA) and DFO. 2003. DFO Best Management Practices for Pile Driving and Related Operations

Key measures that would mitigate effects on marine fish and mammals from underwater noise are:

- An underwater noise management plan would be prepared and implemented;
- Works in the marine environment would be conducted during the least-risk fisheries work window;
- Vibrational pile driving would be used were practical and feasible;
- Sound from pile driving would not exceed 30 kPa at a distance of 1 m to 2 m from pilings. If the sound exceeds this threshold, measures would be taken to reduce the intensity of the sound or the level of sound propagation;
- An Environmental Monitor would be responsible for monitoring noise and potential effects to wildlife, and implementing correction mitigation measures (including stopping the activity if required);
- A marine mammal management plan would be prepared and implemented and would include the requirement for a qualified marine mammal observer to monitor during impact pile driving activities; and
- LNG carrier speed would be restricted along the proposed shipping route in Howe Sound.

5.5.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, several concerns were raised by the Working Group and the public in relation to marine fish and marine mammals, primarily related to potential effects on marine organisms (especially Pacific herring and salmonids) and effects on the marine ecosystem from the seawater cooling system.

Seawater Cooling System

During Application Review, EAO required supplemental information on the seawater cooling system marine water intake, including a review of currently operational industrial seawater cooling systems that have used similar or proven technology and engineering design, with effectiveness monitoring and validation of modelling results.

> In response, the Proponent submitted a technical memo: *Woodfibre LNG – Response to Seawater Cooling Intake Information Request* (April 2015). The memo reported the velocity at the coarse intake screen would be approximately 0.084 m/s and would decrease to 0.006 m/s and 0.0 m/s at 6 m and 40 m horizontally from the intake screen, respectively. For comparison, one week old larval Pacific herring have been shown to swim at speeds of 0.005 m/s to 0.02 m/s, while 28 day old herring have a maximum swimming speed of 0.06 m/s. The memo identified that long-term monitoring of large power plant marine water intakes have provided little evidence of adverse effects to fish populations.

During Application Review the public, Aboriginal Groups, and local governments raised concerns that the Proponent did not complete a sufficient evaluation of alternative

cooling systems. Squamish Nation also requested that further studies be conducted on the proposed sea-water cooling method to prove that the method has lower overall environmental impact than alternative technologies. During the EA, EAO required a more detailed description of the evaluation of alternative cooling methods.

> In response the Proponent submitted a technical memo: *Assessment of Alternative Cooling Methods – Response to EAO Supplemental Information Request* (April 2015). The memo determined that based on the environmental effects associated with the technically and economically feasible cooling alternative (e.g., Air Cooling and Evaporative Cooling - Cooling Towers or Wetted Surface Air Coolers) the seawater cooling system was identified as the preferred cooling option. Seawater cooling would require the smallest footprint, lowest energy requirements, avoid effects to freshwater fish and fish habitat, reduce atmospheric noise and visual quality effects and, despite having the highest capital costs, have the lowest operating costs compared to the other systems evaluated.

All of the supplemental information provided from the Proponent on the proposed seawater cooling system was made available to the Working Group during Application Review. DFO requested that the Proponent update their conclusions of serious harm to fish resulting from the seawater cooling intake system and appropriateness of mitigation measures taking into consideration discovered and potential herring spawn locations.

> The Proponent provided a revised version of *Woodfibre LNG – Response to Seawater Cooling Intake Information Request (updated May 2015)*, which included additional rationale to support the conclusions that serious harm to fish would be unlikely, including evidence and references supporting the vertical separation of larval Pacific herring and the location of the proposed marine water intake.
>
> Based on the information provided in the intake memo and the Herring Survey Summary Report (see below), DFO anticipates that the marine water intake would have the potential to kill herring larvae; however, insufficient information was provided in order to determine the exact number of larvae that may be entrained. DFO identified that based on the proposed location of the intake, herring spawning locations and anticipated larvae movement, entrainment of juvenile herring is unlikely to result in population level impacts, and advised EAO that sufficient information was provided for the purpose of the EA and that opportunities are available to offset potential impacts on herring at the Woodfibre site. DFO recommended that a condition of the EA Certificate be to monitor the effectiveness of the mitigation measures used for the intake, including pre-construction evaluation and post-construction monitoring to evaluate the fate and behaviour of fish species near the intake screen.
>
> EAO proposes a condition requiring the Proponent, in consultation with DFO, to establish a marine fish and fish habitat management and monitoring plan, which

would set out the means by which the mitigation measures in the Application and the Herring Survey Summary Report would be implemented; would identify reduced work windows and the work that would occur within these windows; and measures to monitor the effectiveness of the mitigation measures used for the intake, which would include a pre-construction evaluation of fish species and a post-construction monitoring program to evaluate the fate and behaviour of fish species near the intake screen.

Marine Fish Baseline – Utilization of the Project Area

DFO, Squamish Nation, local governments, and the general public raised questions about the completeness of the baseline data and requested additional information on marine fish species utilization (timing and life history dependency) on habitats within the facility LAA.

The Proponent provided a memo, *Woodfibre LNG – Response to Information Request #583A – Marine Resources* (April 2015), which summarised the baseline fish sampling work conducted to support the Application. The baseline data indicated that Pacific herring and several species of salmonids (chum salmon, pink salmon, chinook salmon) and Dolly Varden likely utilize the LAA as migratory and rearing habitat.

To assess whether Pacific herring use the near shore habitat within the Project area for spawning, a series of one to two-day intertidal and subtidal surveys were conducted during the spawning window. The herring spawn survey was conducted following the DFO Herring Spawn Protocol (modified due to the narrow width of spawn). The Proponent provided the results of the first two surveys in a technical memo, *Interim Summary Report of Herring Spawn Surveys 1 (February 17 and 20) and 2 (March 5)* to EAO on March 12, 2015. The interim herring spawn survey memo identified that Pacific herring spawn was observed within the Project area. Herring spawn was observed from southwest of Woodfibre Creek to just northeast of the active dock, mainly associated with rockweed growing on the riprap habitats. The second survey confirmed that a large proportion of the eggs had successfully hatched. In additional to herring spawn, three lingcod egg mass were identified within the Project area.

The Proponent provided the final results of the herring spawn survey to EAO and DFO in a summary report, *Woodfibre LNG Project – Herring Survey Summary Report (May 2015)*, on May 22, 2015. Herring were observed to be actively spawning along the shoreline throughout the Project site with schools of herring observed throughout the entire survey area. Herring eggs were attached to rockweed growing on riprap and herring were observed spawning in intertidal and subtidal areas on creosote piles of the deep sea berth and warehouse and documented on the piles under the timber wharf to a depth of 7 m.

Based on the results of the herring spawn survey, the Proponent provided the following additional key mitigation measures in the Herring Survey Summary Report:

- Herring surveys would be continued from January to April 2016 to document the inter-annual variability in spawning locations, timing and habitat use;
- All works or operations taking place around marine waters within the marine and estuarine timing windows for Howe Sound (February 1 to August 15) would require ongoing environmental monitoring;
- Monitoring would begin at the start of the expected spawn timing window and continue for the duration of the spawning season;
- Monitoring would be informed by the herring survey data and collect independent data by documenting signs of herring schools and shoreline observations;
- Herring spawning season would be considered a high risk period and associated mitigation described in the Application would apply to this time period; and
- Future planning for the proposed Project area should include components that are likely to promote herring productivity in the area, such as the addition of shallow rocky reefs.

EAO proposes a condition requiring the Proponent to develop and implement a marine fish and fish habitat management and monitoring plan, which would describe measures to avoid or mitigate impacts to fish and fish habitat and include the means by which the mitigation measures in the Application and the recommendations in the Herring Summary Report would be implemented.

Marine Mammal Baseline – Utilization of the Project Area & Underwater Noise

DFO identified that the baseline data on marine mammals presented in the Application did not include marine mammal surveys. DFO requested additional information on the location of marine mammal haul-outs and peak seasonal timing for species occurrences and abundance in order for DFO to understand the potential for Project interactions and potential impacts on marine mammals.

The Proponent indicated that the Project area would not overlap with established marine mammal critical habitat, designated critical habitat, or DFO-recognized important habitat for marine mammals. In addition, the RAA is not known to support important migratory pathways or foraging/ breeding grounds for SARA-listed (endangered or threatened) marine mammal species. Baseline information relied on 13 years of sighting records from the BC Cetacean Sightings Network, and was further supported by information available in scientific literature.

Members of the Working Group, including DFO, Tsleil-Waututh Nation and Squamish Nation, and the public also raised questions regarding the limited extent of the underwater noise baseline survey (nine hours at one location).

> The Proponent clarified that potential effects of underwater noise from the proposed Project on marine fish and marine mammals were assessed by comparing estimated underwater noise levels (or suitable proxies) against established acoustic thresholds for marine mammals and fish, and not in direct comparison to ambient noise levels (as with other disciplines such as atmospheric noise or water quality), so providing a longer time series of ambient noise data would have no bearing on the conclusions of the assessment. The Proponent has committed to monitor underwater noise to confirm effectiveness of mitigation and effects to marine mammals.
>
> EAO proposes a condition requiring the Proponent to develop and implement a marine mammal management plan for construction, which would identify the geographic areas and times when construction could cause injury or behavioural change to marine mammals; identify time periods when elevated marine mammal occupancy is anticipated; specify the role of a Qualified Professional in observing and reporting marine mammals in the area; and specify the construction activities that must stop or not start if a marine mammal is sighted in the area.

Impacts of Artificial Night Lighting on Marine Fish

Squamish Nation and FLNR identified that the Application failed to address the potential changes to marine fish behaviour and predation risk due to artificial night lighting.

> The Proponent committed that, where possible and subject to safety requirements, lights on marine infrastructure at night would be shielded and/or directed away from adjacent marine areas with the exception of mandatory navigational lighting, and that infrastructure night-time lighting would be angled to minimize direct illumination and reflection off the sea surface. The Proponent also stated that due to normally-occurring elevated turbidity, light from marine infrastructure would not be expected to penetrate to great depths, and impacts would be considered negligible.

5.5.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on marine fish and mammals:

- Change in marine fish habitat;
- Harm to marine fish and marine mammals during construction and operation; and
- Change in behaviour of marine fish or marine mammals due to underwater noise during construction and operation.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on marine fish and mammals, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	**Fish Habitat:** Low	**Fish Habitat:** The marine habitat within the proposed Project foreshore, subtidal area and surrounding areas are characterized as having experienced frequent anthropogenic disturbance, influencing the extent and quality of habitat. Due to the disturbed nature, the resilience to future changes would be considered low.
	Harm to Fish and Marine Mammals: Low (fish); Low to High (mammals)	**Harm to Fish and Marine Mammals:** Low or uncertain population numbers for some fish species likely to occur in the LAA may result in a low level of resilience. Moderate resilience for listed marine mammal species and high for other marine mammals that frequently occur within the LAA due to their prior exposure with underwater noise from existing vessel traffic. Listed transient marine mammals may have lower resilience if they have not been previously exposed to vessel traffic.
	Fish and Marine Mammal Behaviour: Low (fish); Low to High (mammals)	**Fish and Marine Mammal Behaviour:** The context for residual effects on marine fish behaviour is low because some marine fish species are highly sensitive to underwater noise, such as Pacific herring, and the construction activities would also be occurring in a highly disturbed habitat with reduced resilience to anthropogenic impacts. Marine mammals located in the LAA would likely have had previous exposure with vessel presence and associated underwater noise from exiting traffic, given the volume of shipping that presently occurs in the area. In 2013 there were a total of 12,909 large vessel movements in Howe Sound. Large commercial vessels currently transit through Howe Sound to Squamish Terminals along the established shipping route. The Project related vessel traffic represents a very small percentage increase in the overall vessel traffic in Howe Sound. Listed marine mammals would be less resilient against adverse effects of underwater noise, especially if they have not had previous experience with vessel traffic.
Magnitude	**Fish Habitat:** Low to Moderate	**Fish Habitat:** Construction of marine facilities and operation of the seawater cooling system intake and diffuser and the treated process water diffuser discharge would result in direct and indirect loss of marine habitat.

Criteria	Assessment Rating	Rationale
		Generally, the marine footprint would be in the area of degraded benthic habitat with low species diversity and abundance; however, lingcod eggs and herring spawn were identified within the immediate vicinity of the proposed location of the seawater cooling system outlet.
	Harm to Fish and Marine Mammals: Low to Moderate (fish); Low (mammals)	**Harm to Marine Fish and Mammals:** Marine infrastructure would be located in marine areas with low habitat quality (i.e., low species diversity and abundance). Direct mortality of marine fish from construction and dismantling marine infrastructure would be of low magnitude after the implementation of mitigation measures. Operation of the seawater cooling system intake would have the potential to cause impingement or entrainment of marine fish, especially juvenile and larval life stages. The seawater cooling system intake would be installed away from important fish habitats, in deep-water below the photic zone and 2 m above the seafloor to reduce potential marine fish mortality. The seawater cooling system intake would employ a travelling screen mechanism to further reduce potential harm to marine fish. Based on the location of the seawater cooling system intake, herring spawning locations and anticipated larvae movement, entrainment of juvenile herring is unlikely to result in population level impacts resulting in a residual adverse effect of low to moderate magnitude. Underwater noise from pile driving activities during construction would be expected to exceed the injury threshold for marine fish resulting in a low magnitude effect. The injury threshold for marine mammals would not be exceeded at a distance of 340 m from the source of noise. The magnitude of potential harm to marine mammals as a result of Project-generated underwater noise is considered low because injury or death to marine mammal species would not be expected with the implementation of mitigation measures and evidence of limited marine mammal haul-outs near the Project area.
	Marine Fish and Mammal Behaviour: Low (fish); Low -	**Marine Fish Behaviour:** Underwater noise generated by vessel operations would be expected to exceed the behavioural threshold for marine fish in the direct vicinity of

Criteria	Assessment Rating	Rationale
	Moderate (mammals)	the Project area during construction resulting in a low magnitude residual adverse effect (e.g., startle response and increased susceptibility to predation). **Marine Mammal Behaviour:** Impact pile driving and vessel operations would be expected to exceed established behavioural response criteria for marine mammals. Behavioural responses may include temporary stress-induced physiological changes, altered sound perception, habituation to vessel sounds, impaired communication, and avoidance behaviours that my disrupt migration or foraging patterns. The magnitude of the potential for underwater noise to affect marine mammal behaviour is considered low to moderate because of the localized and transient nature of the underwater noise and the absence of Southern resident killer whale critical habitat within Howe Sound.
Extent	**Fish Habitat:** Local	**Marine Fish Habitat:** Direct habitat effects would be from the construction of marine facilities at the foreshore, operation of the seawater cooling system intake and diffuser and the treated process water diffuser. Indirect habitat effects would be from shading created by the marine facilities and the diffusers. Impacts to marine fish habitat from thermal water discharges are considered localized as an increase to marine water temperature greater than 1 ^{0}C would not be anticipated outside of the initial dilution zone (10 m from the discharge point).
	Harm to Fish and Marine Mammals: Local	**Harm to Fish and Marine Mammals:** Harm to marine fish and mammals from underwater noise during construction would be localized to the Project area and the LAA.
	Marine Fish and Marine Mammal Behaviour: Local (fish); Local to Regional (mammals)	**Marine Fish and Marine Mammal Behaviour:** Behavioural responses to underwater noise generated from impact pile driving would be localized to the Project area for marine mammals. The distance to behavioural threshold for marine mammals would extend beyond the LAA boundaries for shipping activities (4,642 m from the source) so the adverse effect would be considered regional. During construction activities, underwater noise would be expected to exceed behavioural thresholds for marine fish within the vicinity of the Project area, so the extent would be considered local.

Criteria	Assessment Rating	Rationale
Duration	**Fish Habitat:** Short to long term	**Fish Habitat:** Direct and indirect impacts due to construction and demolition of marine infrastructure would be short term in duration. Indirect shading impacts would occur throughout operations and would be considered long term.
	Harm to Fish and Marine Mammals: Short- to long term (fish); Short term (Mammals)	**Harm to Fish and Marine Mammals:** Potential for marine fish mortality and injury during construction and demolition of marine infrastructure would be short term in duration. Potential for marine fish mortality from seawater cooling system (impingement/ entrainment, temperature and residual chlorine) would be during operations and considered long term. Potential for injury or mortality to marine mammals due to underwater noise would be short term during impact pile driving activities associated with installation of marine infrastructure.
	Fish and Marine Mammal Behaviour: Short term (fish): Short term and temporary (mammals)	**Fish and Marine Mammal Behaviour:** Behavioural responses to underwater noise generated from impact pile driving would be short term during the construction phase for marine mammals and marine fish. Behavioural responses to underwater noise generated from vessel operations would be temporary over the life of the Project.
Reversibility	Reversible	**Fish Habitat:** Effects on marine habitat would be considered reversible after marine construction is complete and reversible after facility operations ceases. Indirect effects on fish habitat from shading would be considered reversible after the facility is decommissioned. **Harm to Fish and Marine Mammals:** Harm from underwater noise is reversible after marine construction is complete and harm to marine fish from marine water intake is reversible after operations cease. **Fish and Marine Mammal Behaviour:** Potential impacts to marine fish and marine mammal behaviour due to underwater noise from pile driving and vessel traffic would be reversible after marine construction is complete. Potential impacts to marine mammal behaviour due to underwater vessel noise related to shipping would be reversible once operations ceases.
Frequency	**Fish Habitat:** Multiple events during construction;	**Fish Habitat:** Loss of marine fish habitat would occur during construction and demolition of marine infrastructure within specific timing windows for fish. Impacts to marine

Criteria	Assessment Rating	Rationale
	Continuous during operations.	fish habitat from shading effects and discharges to the marine environment would occur continuously during the operations phase.
	Harm to Fish and Marine Mammals: Multiple events during construction; Continuous during operations.	**Harm to Fish and Marine Mammals:** Potential direct and indirect harm to marine fish would occur during multiple irregular events during construction and demolition of marine infrastructure within specific timing windows for fish. Potential marine fish mortality from the seawater cooling system (impingement/ entrainment, temperature and residual chlorine) would occur continuously during facility operations. Potential harm to marine mammals from underwater noise generated from impact pile driving activities would occur during multiple irregular events during construction of marine infrastructure.
	Fish and Marine Mammal Behaviour: Multiple events during construction; Continuous during operations (fish); Regular during operations (mammals).	**Fish and Marine Mammal Behaviour**: Multiple irregular events during construction and demolition of marine infrastructure within specific timing windows for fish. Potential impacts to marine fish behaviour due to thermal water discharges would be continuous throughout operations. Potential impacts to marine mammal behaviour would occur on a regular basis at regular intervals with a maximum of 40 ship transits per year along the shipping route.
Likelihood	There is a high likelihood of residual effects of change in marine fish habitat, marine fish mortality or injury, and disturbance to marine fish and mammals.	
Significance	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse residual effects on marine fish and mammals.	
Confidence	There is a moderate to high level of confidence in the likelihood and significance determinations based on the effectiveness of mitigation, existing federal and provincial regulatory requirements, and compliance with the proposed EA Certificate conditions.	

5.5.5 Cumulative Effects Assessment

Reasonably foreseeable future projects and activities that would contribute to effects to marine fish and mammal include the proposed BURNCO Aggregate Project.

Direct Project-related effects to marine fish and marine mammals during construction would be limited to the Project area. Underwater noise from the construction of the proposed BURNCO Aggregate Project, which would have similar types of effects to marine fish and marine mammals, is not anticipated to overlap spatially or temporally with the proposed Project and thus cumulative effects related to injury of marine fish and marine mammals would not be expected.

In 2013 there were a total of 12,909 large vessel movements in Howe Sound. The proposed Project would add an additional 40 large vessel transits (80 movements roundtrip) to the already occurring marine traffic in the area and the proposed BURNCO Aggregate Project would contribute an additional 320 vessel movements per year (tug, barges, and crew transport vessels). The proposed BURNCO Aggregate Project would have the potential to interact in a cumulative fashion with respect to changes in marine mammal behaviour as the vessel routes and terminal locations for the project overlap with the proposed Project's RAA and would therefore be likely to interact with the same marine mammal populations that are potentially affected by the proposed Project. However, the BURNCO barge-shipping route would only interact with the proposed Project marine traffic in Queen Charlotte Channel between Bowyer Island and Passage Island. With the additional barging traffic from the proposed BURNCO Aggregate Project, combined with the Project's relatively small contribution of LNG carrier movements, larger vessel traffic in Howe Sound would increase by an estimated 3 % per year. This small increase is unlikely to result in significant cumulative effects to marine mammal behaviour and would be unlikely to result in effects at the population level. In addition, mitigation measures proposed to avoid or minimize potential adverse effects on marine mammals, including the development and implementation of a marine mammal management plan and an underwater noise management plan, would be considered relevant to the mitigation of cumulative effects.

EAO proposes a condition that would require the Proponent to develop and implement a marine mammal management and monitoring plan for construction, that would specify the geographic areas where, and the periods of time when, construction could cause behaviour change to marine mammals, and identify time periods when elevated marine mammal occupancy is anticipated within the area of potential injury to marine mammals or areas of potential behavioural change.

The primary mitigation to reduce adverse effects to marine mammal behaviour as a result of underwater vessel noise during operations is to limit the speed that LNG carriers transit the shipping route within Howe sound to 8 to 10 knots. As changes in behaviour as a result of cumulative increases in underwater noise from vessels during operations would be considered temporary in nature and fully reversible with no effects at the population level anticipated, no additional mitigation measures were proposed.

EAO concludes that no significant cumulative effects to marine mammals are expected as a result of effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

5.5.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on marine fish and marine mammals.

5.6 Vegetation Communities

5.6.1 Background

Vegetation communities were assessed as a VC due to the potential for the proposed Project to affect native plant communities, including sensitive and important or unique communities such as wetland and riparian areas. The assessment used two indicators for vegetation communities: change in extent and composition of vegetation communities and change in extent and distribution of invasive plants.

The vegetation LAA included the Project area plus a 500 m buffer (282 ha in size). The RAA included the watersheds of Mill creek and Woodfibre creek and the majority of the Foulger Creek watershed west of the proposed Project area.

5.6.2 Potential Project Effects and Proposed Mitigation Described in the Application

Approximately 74% (27 ha) of the proposed Project footprint is disturbed and is covered by old concrete and compact fill. The remaining 10 ha consists of vegetation in various stages of regeneration. Vegetation in the Project area is generally dominated by invasive Himalayan blackberry. A total of 13 species of invasive plants were observed on the site. Three small patches of mature western hemlock and western red cedar forest, and two patches of young forest exist in the Project area. The riparian area along Mill Creek is considered a sensitive ecosystem and the mature forest adjacent to the portions of the creek is considered an important ecosystem.

No historical occurrences of provincially or federally designated plant species have been reported within the LAA or RAA, and the Application states that none are likely to occur within the LAA. The Application also states that listed ecosystems are not expected to occur within the proposed Project area, but may occur in vegetated areas of the LAA. Focused rare plant surveys have not yet been conducted for the Project footprint, pending completion of final design.

Site clearing and associated construction would result in the direct reduction to the extent of vegetation communities. Up to two hectares of mature forest would be lost. During final Project design the 50 m wide corridor for the water pipeline, partly included in the riparian and mature forest area, would be reduced to approximately 15 m wide and the proposed water and gas pipelines may be realigned to reduce the area of mature forest to be removed.

Four hectares of young pole/sapling forest and less than 1 ha of shrub/herb vegetation would be lost. These areas also contain dense invasive plant growth and clearing may have a positive effect to adjacent vegetation communities.

The proposed Project would require the removal of less than 1 ha of riparian forest associated with Mill Creek (<0.01% of the vegetation riparian community in the RAA).

An area around the lower reaches of Mill Creek that is mostly paved would be vegetated post-construction with appropriate native vegetation to help offset adverse effects to habitat from the proposed Project. This is an area where no production, management, or storage facilities would be located.

The transportation of equipment and material from offsite may result in the introduction of new invasive plant species to the proposed Project area and LAA. Project construction activities that disturb soil and vegetation could contribute to the spread of invasive species. Fugitive dust from various activities such as upgrades and construction of roads could adversely affect the health of vegetation communities. Dust may have a detrimental effect on the health, growth, and development of affected vegetation, and may cause shifts in community structure. The primary effects of dust are generally confined to the immediate area next to roadways. Spills of deleterious substances such as hydrocarbons during the construction, operation, and decommissioning phases could affect plants through soil contamination. The potential for spills is assessed in section 10 of this Report.

Key measures to mitigate potential adverse effects to vegetation would include:

- An invasive species management plan would be prepared and implemented for construction, operation and decommissioning activities;
- A dust control plan would be prepared and implemented for construction, operation and decommissioning activities;
- Minimizing vegetation clearing; and
- Conduct pre-construction rare plant surveys and salvage.

5.6.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

No material concerns or issues were raised by the Working Group or members of the public with regards to vegetation communities during Application Review.

5.6.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on vegetation resources:

- Direct reduction in the extent of vegetation communities.

Summarized below is EAO's characterization of the expected residual effects of the proposed Project on vegetation communities, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate resilience	The Project Area is a site used for previous industrial activity and is already highly disturbed. Vegetation communities within the LAA and RAA are expected to have moderate resilience to imposed stresses.
Magnitude	Low	The magnitude of effects on vegetation is low because of the small amount of directly impacted vegetation communities (0.6% of mature forest and <0.01% of riparian area in the RAA).
Extent	Site specific to local	The direct effects of loss of vegetation would be confined to the Project footprint.
Duration	Long-term	The effect on vegetation would be long-term, occurring for the life of the proposed Project.
Reversibility	Reversible	The effects to vegetation are reversible if vegetation is replaced at the end of life of the proposed Project.
Frequency	Single event	Vegetation clearing would be a single event.
Likelihood	The likelihood of residual effects to vegetation is high from the construction of the proposed Project.	
Significance	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse residual effects on vegetation communities.	
Confidence	There is a high level of confidence in the likelihood and significance determination of effects to vegetation communities.	

5.6.5 Cumulative Effects Assessment

The proposed Project has the potential to interact with other past, present and reasonably foreseeable projects to result in cumulative effects to vegetation communities. Identified projects that may interact with the proposed project include the Woodfibre substation and associated transmission lines proposed by BC Hydro to deliver electricity to the proposed Project and the proposed Eagle Mountain-Woodfibre Gas Pipeline Project to deliver natural gas to the proposed Project, as well as forestry activities. These activities would remove vegetation communities.

Logging is the most prevalent industry within the RAA. Recent logging (the past 30 years) has disturbed approximately 3% (966 ha) of the RAA and future logging until 2018 is predicted to affect approximately 2% (139 ha) of the RAA, 1% of which overlaps with historical logging. The Application states that forest harvest would be restricted within the areas behind the proposed Project site; however, discussion would be ongoing between the Proponent and forest tenure holders to clarify any potential access arrangements for longer term forest harvesting. For more information on potential Project-related effects to forestry access see Section 7.2 (Land and Resource Use) of this Report. Anthropogenic disturbance currently compromises approximately 16% of the RAA and reasonably foreseeable future developments are predicted to result in clearing of an additional 2.2%.

EAO has determined that the proposed Project's residual effects acting cumulatively with other current and proposed projects in the area would most likely not threaten the regional sustainability of the vegetation communities identified in this assessment.

5.6.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding as a condition of the EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on vegetation communities.

5.7 Terrestrial Wildlife and Marine Birds

5.7.1 Background

Terrestrial wildlife and marine birds were selected as a VC because of their ecological, aesthetic, recreational, economic, and cultural importance. The assessment considered terrestrial wildlife, marine birds and their habitats under four separate VCs (i.e., avifauna, at-risk bats, amphibians and marine birds). Key species identified for the assessment are listed in Table 5-3.

Table 5-3: Key Assessed Wildlife Species

Terrestrial and Marine Birds	Terrestrial Wildlife
Platform and cavity nesting birds	***Bats***
Bald eagle	Keen's myotis
Osprey	Little brown myotis
Western screech-owl	***Amphibians***
Passerines and Columbiformes birds	Coastal tailed frog
Barn Swallow	Western toad
Band-tailed pigeon	Northern red-legged frog
Olive-sided flycatcher	
Marine birds (generally)	

The Project footprint included all land and water areas that are subject to disturbance from the proposed Project. The LAA for terrestrial birds and amphibians included the terrestrial portion of the Project area and a 500 m buffer and the RAA encompassed Mill Creek, Woodfibre Creek, and Foulger Creek Watersheds. The LAA for marine birds encompassed the marine portion of the Project area and the RAA included Howe Sound. The LAA and RAA for bats were the same as for terrestrial birds, with an additional 100 m foreshore buffer.

Federal and provincial Acts and policies relevant to wildlife and marine birds include:

- The federal *Species at Risk Act* (SARA) prohibits killing, harming, or taking of federally-listed species;
- The federal *Migratory Birds Convention Act* (MBCA), regulates and restricts the harvest of individuals and the disturbance of habitat, prohibits destruction or possession of migratory birds, their nests, or eggs; and
- The BC *Wildlife Act* prohibits disturbance or destruction of any bird or its eggs, or its nest (while occupied by a bird or its eggs), and protects nests of eagles, peregrine falcon, gyrfalcon, osprey, heron, or burrowing owl year-round.

5.7.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Application assessed the following potential effects on terrestrial wildlife and marine birds from the proposed Project:

- Direct loss or change in habitat from vegetation clearing or indirect changes to habitat quality from light or noise disturbances during construction and operation of the proposed Project;
- Sensory disturbance or behavioral alterations in response to noise disturbance during construction and operations;
- Risk of injury or mortality from interactions with the proposed Project resulting in changes in abundance of terrestrial wildlife or marine bird species.

The maximum land disturbance associated with the proposed Project would be 41 ha, the majority of which would be in areas that are currently non-vegetated. 10 ha (or 28%) of the Project footprint includes vegetation in various stages of re-generation that would be cleared. The operational Project footprint would be 38 ha.

Baseline information on marine birds relied primarily on desktop reviews with field surveys related to marbled murrelet habitat. In addition to desktop studies, the Proponent conducted the following field surveys for terrestrial wildlife and birds: breeding bird surveys, bat acoustic baseline surveys, pond-breeding amphibian surveys, general wildlife surveys, and an aerial assessment of potential marbled murrelet nesting habitat. In addition, incidental observations on all wildlife species groups were collected during general wildlife surveys.

Terrestrial wildlife and marine bird species at risk listed on Schedule 1 of SARA known or with the potential to occur in the LAA are: coastal tailed frog, western toad, northern red-legged frog, marbled murrelet, great blue heron *fannini* subspecies, olive-sided flycatcher, common nighthawk, western screech-owl, band-tailed pigeon, and little brown myotis.

The Application provided information related to the assessment of migratory birds: 29 terrestrial migratory bird species were observed during the breeding bird surveys and 55 marine migratory bird species were observed during baseline studies or identified as having the potential to occur in the LAA or RAA.

Further descriptions of the potential effects on migratory birds was provided by the Proponent in a supplementary memo, *Potential Project Related Effects on Migratory Birds, as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994, Supplemental Information to the Application for an Environmental Assessment Certificate* (March 2015), during Application Review, which described that potential Project-related effects to migratory birds species were considered within two VCs: terrestrial and marine birds. The supplementary memo indicated that the habitat requirements of the cavity and platform nesting birds subcomponent overlap with those of certain families of migratory birds, although the three indicator species (western screech owl, bald eagle and osprey) are not protected under the MBCA. All of the key indicator species selected for the assessment of passerines and columbiformes subcomponent are considered migratory birds under MBCA. The memo identified that the marine birds VC includes species within migratory game and nongame bird families, as identified in Article 1 of the *Migratory Birds Convention.* The memo summarized

migratory bird families with habitat requirements overlapping with those key-indicator species (including terrestrial birds, at-risk bats and amphibians) or marine birds, which were assessed in the Application.

Thirty-five marine bird colonies are located within the RAA, which may be utilized by colonial nesting species such as, black oystercatcher, double-crested cormorant, glaucous-winged gull, pelagic cormorant, pigeon guillemot, and great blue heron, *fannini* subspecies.

Terrestrial Birds

The Application assessed the potential Project-related effects using two terrestrial bird community types (platform/cavity nesters and perching birds/pigeons) and four species of concern. Barn swallows nest and forage in the Project area. A bald eagle nest was identified in the LAA, olive-sided flycatcher and band-tailed pigeon have been observed in the LAA, and osprey and western screech-owl have the potential to occur in the LAA.

Construction and operation of the proposed Project would result in the potential alteration of terrestrial bird habitat including direct loss of foraging and nesting habitat and destruction of nests during clearing activities, indirect loss of foraging and nesting habitat during construction and operation due to sensory disturbance (e.g., noise and light) and fragmentation of habitat. Other potential effects of the proposed Project would be the creation of barriers to movement of terrestrial birds, direct mortality due to clearing activities during construction, and indirect mortality due to interactions with the proposed Project components during construction and operation.

The proposed Project would result in a loss of 2 ha of mature forest, which represents a reduction of approximately 4% and less than 0.1% of the mature and old-growth forest available within the LAA and RAA, respectively. Mature forest may provide potential nesting habitat for bald eagle and osprey and potential foraging and nesting habitat for western screech-owl. Band-tailed pigeon nests in mature forest; however the clearing would create additional forest edge habitat, used by band-tailed pigeon and olive-sided flycatcher for foraging. The proposed Project would result in a loss of 1 ha of shrub habitat, which represents a total of 0.1% of total available in the RAA. Shrub habitat provides foraging habitat for band-tailed pigeon and edge-foraging habitat for olive-sided fly catcher.

Barn swallow nesting habitat would be lost during demolition of buildings within the Project area. Following the completion of Project construction, barn swallow nesting structures would be installed at suitable locations in the LAA (e.g., with noise levels <50 dBA). Potential osprey nesting habitat atop wharf posts would be temporarily lost during construction. The bald eagle nest located within the LAA would not be directly affected by the proposed Project.

Noise, artificial light, and other human and equipment activities may cause sensory disturbance to birds and wildlife primarily during construction and to a lesser degree during operation. Indirect effects to foraging and nesting habitat may occur from

changes in ambient noise and artificial light, resulting in disturbance to terrestrial bird nesting and foraging behaviour. The thresholds for behavioural impacts are 50 dBA for perching birds and pigeons, 80-85 dBA for raptors.

Noise exceedances within the Project area are anticipated to affect potential barn swallow nesting and foraging habitat during construction and operation, resulting in a potential reduction of habitat suitability. It is estimated that 15 ha of the Project area would experience noise levels of 70 dBA and 2 ha would experience noise levels greater than 80 dBA (likely beyond the disturbance threshold for most birds) during construction. During operations, noise levels of 70 dBA and 80 dBA are predicted to effect 5 ha and >1 ha of developed area within the Project area, respectively. Intermittent loud noises, from pile-driving and blasting during construction, may also disturb terrestrial birds, particularly during nesting season.

Site clearing could result in direct mortality of less mobile animals, such as early nesting fledgling birds, if clearing activities were to occur during the nesting season. Terrestrial birds may experience interactions with infrastructure through collisions with vehicles, as well as strikes with towers, poles, wires and buildings resulting in injury or mortality.

Flaring can cause potential injury or mortality to terrestrial birds. Flaring would primarily occur during unanticipated instances (e.g. train upset or shutdown), but would also occur during planned events, such as Project commissioning and planned maintenance activities. The potential impact on wildlife and birds related to unanticipated instances is discussed in section 10 (Accidents and Malfunctions) of this Report.

The Application stated that areas of mature forest that would be cleared are already fragmented, and that vegetation clearing during construction would not contribute to additional indirect effects to terrestrial bird habitat due to fragmentation. As the proposed Project would be constructed on a brownfield site, changes to barriers to terrestrial bird movement from baseline conditions would not anticipated.

At-risk Bats

The Application assessed the potential Project-related affects to at-risk bat species. Two key indicator species, little brown myotis (federally listed as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and on Schedule 1 of SARA) and Keen's myotis (provincially blue listed and federally listed by *SARA* as Special Concern under Schedule 3 and designated by COSEWIC) were considered likely to occur in the LAA.

Construction and operation of the proposed Project would result in the potential alteration of bat habitat, including the direct loss of < 2 ha suitable roosting (4.2% of total in LAA), 10 ha of terrestrial foraging (3.9% of total in LAA), and 4 ha of foreshore foraging habitats (12% of total in LAA). There is potential for injury and mortality of at-risk bat species from clearing of suitable roosting habitat and increased vehicle traffic during construction.

The Application identified a noise threshold of 70 dBA, which represents the level of background noise that would begin to interfere with bat foraging abilities within the study area. The loudest activities during construction would occur along the marine foreshore and are predicted to reach 80 dBA, but not predicted to exceed 50 dBA outside of the immediate construction area. During operation, noise is predicted to reach a maximum of 80 dBA at the LNG facility but is not expected to exceed 50 dBA within the terrestrial portion of the LAA outside of the Project footprint. Based on the noise threshold, indirect loss of potential terrestrial and foreshore bat foraging habitat due to sensory disturbance from increased ambient noise would be 2% and less than 1% of total available foraging habitats in the LAA, respectively.

The Application identified that Project-related lighting would not result in potential alterations of foraging behaviour by bats; however, mitigation of potential indirect impacts to at-risk bats from Project lighting was considered.

As the proposed Project would be constructed on a brownfield site, changes to barriers to bat-movement from baseline condition (i.e. increases to the number of buildings or structures and increase of empty space with hard surfaces or vehicle traffic) were not anticipated.

Amphibians

The Application assessed the potential Project-related effects on three key-indicator amphibian species: coastal tailed frog, western toad and northern red-legged frog. All three species are provincially blue listed and listed federally as Special Concern by COSEWIC and on Schedule 1 as Special Concern under SARA.

Naturally occurring breeding habitat was not identified within the LAA for western toad or red-legged frog; however, pools formed in depressions and ditches within disturbed areas may be used for breeding. The headwaters of Mill Creek and Woodfibre Creek are expected to provide suitable breeding habitat for coastal tailed frog. The proposed Project would result in the potential alteration of amphibian habitat including direct loss of < 2 ha of mature forest that could potentially provide suitable terrestrial non-breeding habitat, which is less than 0.6% of total mature and old growth forest in the RAA.

As coastal tailed frog are not present in the lower reaches of Mill Creek construction of new water intake infrastructure would not be expected to directly impact coastal tailed frog breeding habitat.

Sensory disturbance of amphibians due to Project-related noise would not be anticipated within the LAA because no exceedances of the 90 dBA threshold would be expected during construction and operation. Following mitigation, surface water quality would remain within the water quality guidelines for aquatic life, so changes to surface water quality would not be expected to result in potential indirect effects to amphibians.

Water withdrawal on Mill Creek during operations would have the potential to divert a high percentage of flow during extreme low flow events, which would have potential

indirect effects on amphibian habitat. Similar to the Freshwater Fish and Fish habitat section, the development and implementation of a minimum instream flow release regime was considered a sufficient mitigation measure to reduce the potential for indirect effects on amphibian habitat due to changes in surface water quantity.

There is potential for direct mortality of amphibians during construction, especially if clearing activities would be conducted in the winter when amphibians may be hibernating in the soil. The Application also identified that increased road traffic during the construction phase would create potential barriers to amphibian movement between upland habitats and changes to mortality risk.

Marine Birds

The Application assessed potential Project-related for marine birds as a whole. Fifteen provincially and/or federally designated marine bird species have the potential to occur, or are known to occur in the LAA and/ or the RAA. Great blue heron, *fannini* subspecies, was the only at-risk marine bird with confirmed presence in the LAA during the marine resource baseline studies.

Construction of the proposed Project would require clearing of near-shore vegetation and removal and alternation of shoreline habitat, resulting in direct losses of breeding, nesting, foraging and staging habitat for marine birds. Construction and operation of the proposed Project would result in a direct loss of 8.6 ha of marine foreshore and near-shore habitat, representing 13% and 0.02% of total available marine habitat within the LAA and RAA, respectively.

A total of 1.7 ha of critical habitat (two small isolated stands of old-growth forested habitat), as identified by the federal Recovery Strategy for the Marbled Murrelet, potentially occurs within the Project area. Consideration of additional nesting habitat requirements suggests that these two stands are likely too small and too isolated to provide any value as marbled murrelet nesting habitat. Forest edge/interior ratios and stand size (1.37 and 0.35 ha) are both below the threshold values recommended for habitat conservation for marbles marbled murrelet. The Proponent conducted a field-based aerial assessment within the Project area which determined the marbled murrelet nesting habitat potential was low to nil in these areas due to the lack of suitable habitat characteristics. Therefore, the Application noted that direct clearing of confirmed critical nesting habitat for marbled murrelet would not be required during construction of the proposed Project and suitable nesting habitat would not be anticipated to be present in the Project area or affected by the proposed Project.

Noise and underwater vibrations due to construction activities would result in potential disturbances to marine birds leading to avoidance behaviour, barriers to movement and reductions to habitat quality. The Application identified a noise threshold for disturbance of birds at 80 to 85 dBA and a flight response to noises at 95 dBA. Potential noise exceedances for disturbance to birds would occur along the foreshore during construction (predicted to be up to 80 dBA with some activities reaching 85 dBA within the direct proximity of the works). Additionally, intermittent noise from blasting and pile

driving activities would result in potential indirect impacts to riparian and shoreline nesting birds, especially during nesting season. During construction, the maximum nighttime noise levels outside of the LAA would be 65 dBA. Maximum daytime and nighttime noise level would intermittently reach up to 55 dBA immediately surrounding moving vessels.

During operations, noise levels exceeding the disturbance threshold for birds would be expected within the immediate vicinity of the LNG facility (maximum 85 dBA). Operational noise levels would not be expected to exceed 60 dBA beyond the LAA, with the exception of intermittent vessel noise of 60 dBA along the shipping route.

The Application identified that direct mortality from underwater blasting would be considered a minor effect following the implementation of proposed mitigation and best management practices. Potential direct mortality of marine birds would be caused by construction of infrastructure along the marine foreshore, clearing of nesting habitat and by direct collision with marine vessels. The risk of direct collisions with vessels is greater at nighttime, as birds may become disorientated due to light or during adverse weather conditions. Migrating waterfowl that fly low over the water may also be more susceptible to direct mortality from vessel collisions.

Potential indirect effects on marine bird mortality during construction and operation would be caused by artificial lighting and sensory disturbance. Marine birds may be attracted to, and disorientated by, sources of artificial light, which would potentially lead to depleted energy reserves. Shipping-related sensory disturbance could also result in indirect mortality of marine birds due to potential nest abandonment, resulting in increased risk of predation and decreased offspring survival. The proposed shipping route would pass within 600 m to 3,900 m of 29 of the 35 seabird nesting colonies identified within the RAA.

Flaring can cause potential injury or mortality to birds. Flaring could occur during unanticipated instances (e.g., train upset or emergency shutdown), although this is considered unlikely to occur during the life of the proposed Project. The potential impact on wildlife and birds related to unanticipated instances is discussed in section 10 (Accidents and Malfunctions) of this Report. Planned flaring would occur during Project commissioning and planned maintenance activities requiring facility shut-down. Flaring would also occur during loading of LNG carriers. The longest period of planned flaring would occur during Project commissioning with intermittent flaring of up to 4 days over the 4 week period. Some species may be attracted to the light source generated from flaring during low light, inclement weather, or at night. The risk of bird mortalities associated with exposure to flaring is likely to be higher during seasonal migrations, or associated with juveniles.

Migratory Birds

The residual effects to terrestrial and marine birds protected under the MBCA, are expected to be the same as the assessment above, and were summarized in the *Potential Project-related Effects on Migratory Birds, as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994, Supplemental Information to the Application for an Environmental Assessment Certificate*, (March 2015). With mitigation, the reduction in habitat due to construction of the proposed Project would represent less than 0.1% of the mature and old-growth forest available in the RAA. The mitigation measures proposed to reduce Project-related terrestrial and marine bird mortality would be expected to be effective and the magnitude of the residual effect would be expected to be low and localized within the Project area. Bird mortality due to flaring would not be likely to influence the sustainability of regional or migratory bird population. The key mitigation measures related to migratory birds are provided in section 12 (CEAA 2012 requirements) of this Report.

Mitigation Measures

Key measures proposed in the Application to mitigate potential adverse effects from the proposed Project on terrestrial wildlife and marine birds included the following:

- A wildlife management plan (including a marine bird management plan) will be developed and implemented as part of the CEMP;
- Minimum instream flow releases would be maintained on Mill Creek;
- A venting and flaring plan and noise and light control plan will be developed and implemented as part of the Operational Environmental Management Plan (OEMP);
- Minimize clearing of sensitive and important ecosystems by avoiding or limiting possible riparian area along Mill Creek and the mature forest adjacent to the creek, including high-value nesting habitat for western screech-owl;
- Develop and implement a blasting management plan as part of the CEMP to mitigate effects of blasting on freshwater and marine aquatic life and marine birds;
- Avoid vegetation clearing during terrestrial and marine bird breeding season if possible or conduct pre-clearing surveys for nesting birds, allowing for species-specific setback buffers around confirmed or suspected active nests to reduce potential mortality;
- Establish and maintain bird nest setbacks and retain vegetation buffers around raptor nests;
- Minimize the duration of construction activities within the intertidal zone to the extent possible, to reduce the disturbance to marine birds and marine bird habitat, and scheduling activities during low tide;
- An Environmental Monitor would be responsible for monitoring noise and potential effects to wildlife, and implementing corrective mitigation measures (e.g., establishing safety zones in the event underwater noise levels exceed injury thresholds);
- Minimize the amount of ultraviolet, red or white lighting, where possible;

- Design and install powerlines and conductor layout to reduce potential bird strikes;
- Controlled flaring, initial cool down and loading of LNG carriers would be done when practicable during daylight hours; and
- Should bird mortalities occur, facility staff would regularly monitor site conditions and report mortalities or incidents to the environmental manager and management, who would include the information in the wildlife management plan reporting.

5.7.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During the Application Review, the Working Group and the public raised concerns about the potential effects of the proposed Project on wildlife and wildlife habitat.

TC, EC, FLNR and Squamish Nation raised concerns about potential bird mortality or obstruction to bird movement due to flaring and requested further information. One of Squamish Nation's conditions also requested that the Proponent partner with Squamish Nation to co-manage the environmental management and monitoring programs outlined in the proposed environmental management plans, including impacts from the flare tower and wildlife management.

In response, the Proponent submitted a technical memo (*Planned and Emergency Flaring – Supplemental Report on the Application for an Environmental Assessment Certificate,* March 2015), which reported on the potential adverse interaction for terrestrial birds, marine birds and at-risk bats during flaring events from the flare stack and flare related to lighting and the flare itself. Passerines, waterfowl, diving birds and owl species known to occur within the LAA and migrate or be active at night would be the most at risk for mortality events due to the direct injury or mortality from the flare or sensory disturbance to due light from the flare. The memo identified that flaring could directly or indirectly affect the bird and bat species of conservation concern in the LAA. There would be increased risks of direct or indirect effects from flaring events during nighttime, seasonal migration events and inclement weather, such as rain, fog or overcast conditions, when nocturnally migrating birds are more likely to adjust flight patterns. At-risk bat species may be drawn closer to the flare if concentrations of prey are attracted to the flare, increasing the risk for mortality or injury if bats get too close to the flare.

The memo identified several proposed mitigations to avoid or reduce potential effects on birds and bats due to flaring events, such as having planned flaring events occur during daylight hours, when practicable and reporting bird mortalities and monitoring of site conditions during mortality events. The memo concluded that the potential residual adverse effects on terrestrial and marine birds and at-risk bat species from flaring would not be significant.

EAO proposes a condition requiring the Proponent to consult with Aboriginal Groups in establishing wildlife management plans for both construction and operation, which would set out the means by which the mitigation measures in the Application would be implemented; would specify mitigation measures to avoid or reduce human-wildlife conflicts and to avoid or reduce direct and indirect wildlife mortality; would specify mitigation measures and migratory bird timing windows, to reduce the risk of mortality and injury to birds during planning flaring events during operations and include monitoring and follow-up programs with respect to impacts to wildlife.

EC recommended that the Proponent evaluate the efficacy of carcass searches and searchable areas as part of monitoring potential impacts of flaring events on birds and bats and recommended the use of marine radar to assist with field searches.

The Proponent confirmed that in the development of the proposed wildlife management plan, the need to factor in searcher efficiency and searchable area would be considered. Since the area under and surrounding the flare stack is required to be cleared for safety reasons in accordance with OGC regulations, it may not be necessary to conduct searcher efficiency assessment. The Proponent would also consider the use of marine radar in consultation with key agencies in the development of the wildlife management plan; however, the Proponent considers that the use of radar may be of limited value as most flaring would be unplanned and of very short duration so there would not be time to implement radar monitoring. EC would be consulted in the development of the plan.

EC and FLNR raised concerns that northern goshawk, marbled murrelet and great blue heron were not assessed as key-indicator species in the Application. The Working Group and Métis Nation BC raised concerns that the use of proxy species, such as olive-sided flycatcher for sooty grouse and barn swallow for common nighthawk, were not appropriate as there were notable differences in habitat requirements and behaviour between the proxies.

A number of candidate terrestrial bird species of concern were considered and subsequently excluded during the VC selection process, including marbled murrelet, northern goshawk, northern spotted owl, great blue heron *fannini* ssp., sooty grouse, green heron, common nighthawk, black swift, peregrine falcon and short-eared owl. A number of technical memos were submitted during pre-Application, which provided rationale for the exclusion species of concern.

During Application Review, additional field work was completed to ground-truth the predictions of critical marbled murrelet habitat within the LAA/ RAA and noted that suitable marbled murrelet critical habitat was not found in the Project area. Proposed mitigation measures to reduce effects to marbled murrelet would be incorporated into the Project design, including locating the flare-stack away from Mill Creek, fully shielding lighting fixtures for the majority of the site to minimize

uplight and controlling lighting from the control room to ensure only the required amount of lighting for the tasks being performed would be used.

The Proponent provided a technical memo, *Assessment of Potential Effects to Sooty Grouse at the Woodfibre LNG Project site* (April 9, 2015) to address any information gaps which may have occurred because olive-sided flycatcher was used as a proxy species. Habitat that would be cleared during construction would not be anticipated to provide high quality nesting or foraging habitat for sooty grouse. The memo identified that indirect habitat effects from changes in lighting and fragmentation would likely be negligible for sooty grouse. The memo did not result in a change in the conclusion on the potential for significant adverse effects to terrestrial wildlife. The Proponent also provided additional rationale to support the utilization of barn swallow for common nighthawk.

5.7.4 Characterization of Residual Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on terrestrial wildlife and marine birds:

- Loss or change in habitat for terrestrial and marine birds, bats, and amphibians;
- Sensory disturbance or behavioral alterations for terrestrial and marine birds and bats; and
- Increased risk of injury or mortality for terrestrial and marine birds and amphibians.

Summarized below is EAO's characterization of the residual effects of the proposed Project, as well as EAO's level of confidence in the effects determination (including their likelihood and significance). In the discussion and characterization below all three residual effects are considered for each species grouping.

Criteria	Assessment Rating	Rationale
Context	**Terrestrial Birds:** Low to high resilience **Amphibians, At-risk Bats and Marine Birds:** Moderate resilience	The proposed Project would occur in a brownfield area with a history of anthropogenic disturbances, including past habitat loss and sensory disturbance. Representative terrestrial bird species such as bald eagle and osprey would have a high resilience to imposed stresses, while listed species (western screech-owl, band-tailed pigeon, barn swallow and olive-sided flycatcher) would have low resilience to imposed stresses. As provincially and federally listed species of marine birds occur in Howe Sound, marine bird populations would have a moderate resilience to imposed stresses. Resilience of amphibians and bats would be moderate to imposed stresses as there is no evidence that populations within the RAA are not self-sustaining.

Criteria	Assessment Rating	Rationale
Magnitude	Low	The proposed Project footprint would be primarily located on a brownfield site and construction of the proposed Project would result in a maximum of 10 ha habitat loss due to clearing. No old-growth forest (important nesting/roosting habitat) would be lost as a result of the proposed Project. Residual effects on terrestrial bird habitat, mortality and sensory disturbance would be considered low and the potential residual effects would be limited to the Project area. Residual effects to marine bird habitat mortality and sensory disturbance would be considered low. Marine habitat loss would be primarily site-specific. Residual effects on amphibian habitat, mortality and sensory disturbance would be considered low as breeding habitat of listed species was not identified within the Project area and effects would be limited to the Project area. Residual effects on at-risk bat species habitat, mortality and sensory disturbance would be considered low as the effects would be limited to the Project area.
Extent	**Terrestrial Birds, Amphibians and At-risk Bats:** Project area **Marine Birds:** Regional	Residual effects to terrestrial bird, amphibians and at-risk bat habitat, mortality and sensory disturbance would be limited to the Project area. Direct marine bird habitat loss would be limited to the Project area. Residual effects to marine bird mortality and sensory disturbance would be within the RAA.
Duration	Long term	Construction of the proposed Project would result in the long term direct loss of habitat for terrestrial wildlife and marine birds. Residual effects on sensory disturbance would occur for the lifetime of the proposed Project through decommissioning for terrestrial wildlife and marine birds. Residual effects on mortality risk would occur for the lifetime of the proposed Project through decommissioning for terrestrial wildlife and marine birds.
Reversibility	Reversible	Residual effects on terrestrial wildlife and marine birds would be considered reversible once construction, operation and decommissioning cease.

Criteria	Assessment Rating	Rationale
Frequency	**Terrestrial Birds and At-risk Bats:** Single event (habitat loss), multiple irregular events (sensory disturbance) and multiple irregular and regular events (mortality risk). **Marine Birds:** Single event (habitat loss), multiple irregular and regular events (sensory disturbance and mortality risk). **Amphibians:** Single event (habitat loss) and multiple regular and irregular events (mortality risk).	Direct habitat loss during construction would occur once for terrestrial wildlife and marine birds. Effects to movement and sensory disturbance would occur in multiple irregular events during construction due to noise and activity from construction for terrestrial wildlife and marine birds. Effects to movement and sensory disturbance would occur in multiple regular events during operation from marine vessel activity for marine birds. Bird collisions due to artificial lighting would occur in multiple regular and irregular events during construction and operations due to construction activities (terrestrial and marine birds) and regular marine vessel activities (marine birds only). Changes in mortality or injury risks for birds and bats due to flaring would occur in multiple regular and irregular events during planned and unplanned flaring events. Mortality or injury to terrestrial wildlife and marine birds from vehicles or site clearing activities would occur in multiple regular and irregular events during construction and operations.
Likelihood	The likelihood is high that some degree of adverse effects would occur, particularly during Project construction due to direct habitat loss and sensory disturbance. The likelihood of mortality is moderate for terrestrial wildlife during clearing activities and is low during operations and decommissioning, and low for marine birds in all Project stages.	
Significance Determination	Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse residual effects on terrestrial wildlife and marine birds.	
Confidence	There is a moderate to high level of confidence in the likelihood and significance determination of effects on terrestrial wildlife and marine birds based on the effectiveness of mitigation, and the quality and quantity of baseline data used to support the assessment.	

5.7.5 Cumulative Effects Assessment

Reasonably foreseeable future projects and activities that would contribute to the loss or change of habitat for terrestrial birds and bats, in particular those projects that would lead to further loss or alteration of nesting, roosting and foraging habitat in mature forest stands, included BC Hydro's proposed Woodfibre sub-station, FortisBC's proposed Eagle Mountain-Woodfibre Gas Pipeline Project and ongoing forestry operations in the RAA.

The Proponent has proposed to meet with BC Hydro and FortisBC to identify further measures to minimize potential adverse cumulative effects on wildlife, such as BC

Hydro or FortisBC utilizing previously cleared areas at the Project site for laydown areas and existing roads for access to the transmission line and gas pipeline.

The anticipated cumulative effects on bald eagle and osprey are not likely to exceed ecological thresholds and would not compromise the resilience of the regional populations of these species. The clearing of mature forest may contribute to the factors limiting the western screech-owl population by removing potential nesting habitat; however with mitigation (installation of nesting boxes and avoiding high-value nesting habitat on the northeast side of Mill Creek) Project-related effects to nesting habitat would not be likely. The assessment indicated that residual adverse cumulative effects likely do not contribute to the factors limiting the populations of band-tailed pigeon, barn swallow and olive-sided flycatcher populations in the RAA.

Reasonably foreseeable future projects and activities that involve shipping activities, such as the proposed BURNCO Aggregate Project and the proposed Eagle Mountain – Woodfibre Gas Pipeline Project would contribute to increase risk of injury mortality risk and potential loss of foraging habitat for marine birds. The proposed BURNCO Project would contribute an additional 320 vessel movements within Howe Sound a year. Combined with the LNG carrier movements, larger vessel traffic in Howe Sound would increase by an estimated 3% per year. In areas where the proposed shipping routes of BURNCO and the proposed Project would overlap (in Queen Charlotte Channel between Bowyer Island and Passage Island), the cumulative impacts are anticipated to be somewhat less as the additional effects from both projects compared to existing vessel traffic within established shipping routes would be relatively small. In northern areas of Howe Sound, where the two projects would have separate shipping routes, larger increases in vessel movements are anticipated relative to existing levels, potentially resulting in greater cumulative effects on marine birds at the landscape level.

The Proponent provided additional mitigations to mitigate cumulative effects on marine birds, which includes: coordinating with BURNCO to mutually share results of marine bird monitoring studies to contribute to the knowledge base for marine bird interactions.

EAO concludes that no significant cumulative effects to terrestrial wildlife and marine birds are expected as a result of the proposed Project interacting with other past, present and reasonably foreseeable future projects and activities.

5.7.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding as a condition of the EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on terrestrial wildlife and marine birds.

6 Assessment of Economic Effects

6.1 Labour Market and Sustainable Economy

6.1.1 Background

Labour market was selected as a VC because of the potential interactions between the proposed Project and the local and regional labour markets, and the Application considered change in the following key indicators: employment, change in labour market balance, change in labour income and change in industrial training opportunities.

Sustainable economy was selected as a VC and the Application considers potential effects on the following key indicators: regional economy, commercial marine use and local government and finances.

The LAA for economic effects generally encompassed the DOS, the Resort Municipality of Whistler (RMOW), the Squamish-Lillooet Regional District (SLRD) Electoral Area D, the Squamish Nation communities and Metro Vancouver. The RAA included all of BC.

6.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

Historically, the economy in the LAA was primarily industry and resource-based, with an emphasis on mineral extraction and forestry. Over the past decade, however, the region has become a tourism and recreation destination. Construction and tourism-based businesses play increasingly significant economic roles in the DOS and the coastal communities in SLRD Electoral Area D.

Labour Market

In 2011, the labour force in the DOS was comprised of 10,270 individuals, and in 2013, Metro Vancouver's labour force was approximately 1.3 million.

The total direct Project labour demand is estimated at 1,715 PYs over the planned 24-month construction period. The majority of the demand would be for construction workers (1,000 PYs) and liquefied natural gas facility module integration workers (650 PYs).The Application states that labour would be drawn from residents of the Squamish-Whistler area (5 %), Metro Vancouver (55 %), as well as from elsewhere in BC (7 %), Canada (15 %) and internationally (18 %).

The labour requirements for the proposed Project for the first two years of operations would be 130 FTEs annually (90 FTEs of these workers would be sourced from the LAA). The long-term operations phase is anticipated to directly create approximately 100 FTE jobs per annum.

In addition to direct employment effects, both construction and operations are expected to generate indirect and induced employment. These effects are described in section 2.3.2 of this Report.

Due to the relatively limited labour requirements and the location of the proposed Project near major population centres and large labour supplies, Project-related labour requirements are not expected to adversely affect local or regional labour conditions.

Key measures identified in the Application to enhance potential benefits to the labour market included:

- Undertaking a local hiring strategy and a local training strategy, to enhance the likelihood that LAA residents would be well-positioned to secure employment opportunities;
- Monitoring the progress of the local hiring strategy and the local training strategy; and
- Issuing an annual report on hiring and training results for the construction and operation phases of the proposed Project.

Sustainable Economy

Price pressures that are seen in some smaller communities that host major industrial construction projects would not be anticipated with the proposed Project because of its proximity to a major economic centre.

Incremental outlays by local governments for either direct service to the proposed Project or in connection with Project-associated in-migration of workers would be expected to be nominal and direct capital outlays would not be anticipated.

Potential effects to tourism resulting from increased demand for temporary housing are discussed in section 7.1 of this Report. Potential effects to commercial marine users, including commercial fishing, marine based tourism, and marine transport are assessed in sections 7.2 and 7.3 of this Report. Potential effects to tourism resulting from changes in visual quality are discussed in section 7.4 of this Report.

6.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, the Working Group and the general public raised questions and concerns regarding the potential economic effects of the proposed Project.

SLRD, the District of West Vancouver, the DOS, Bowen Island Municipality, Coastal Health Authority and the public expressed concern that a disproportionate amount of the negative economic Project effects would be experienced locally while benefits would accrue regionally, provincially and federally. Of particular concern to those commentators were the number of jobs that would be secured locally and the potential for the proposed Project to place a strain on the labour supply available to tourism

operators. Vancouver Coastal Health also asked if the Proponent would be monitoring the ongoing economic impacts and benefits of the proposed Project.

> The Proponent responded that it has committed to a local hiring policy and that it would develop local hiring, training, and procurement strategies to ensure the local labour force is well-positioned to seek Project employment based on individual capacities to supply needed skills. It would also help maximize employment opportunities for residents in the DOS, Whistler, and Metro Vancouver, and ensure that local and regional businesses can access the increased demand for goods and services from the proposed Project. The Proponent also indicated that it would continue to document all of its financial contributions to the local community (e.g., sponsorships, contracts, etc.) and would track all practicable data sources (e.g., use of shuttle bus, employment metrics) throughout the construction and operation phases. To address ongoing concerns related to the potential effects of the proposed Project on the local economy, the Proponent committed to undertake a socio-economic impact study that would be coordinated with the DOS.

The general public and several local government Working Group members raised concerns that the proposed Project and Project-related shipping could negatively impact property values near the facility and along the proposed shipping route.

> In response, the Proponent stated that it is unlikely the proposed Project would affect property values because there are no permanent residences or private properties within several kilometres of the proposed Project site, which is already zoned for industrial use. The proposed Project would be designed to minimize potential visual impacts. The Proponent further responded that the proposed Project would result in an annual increase in shipping traffic in Howe Sound of less than 1 % during operations, consisting of 3 or 4 LNG carriers transiting per month.

SLRD requested a commitment from the Proponent regarding the formal establishment of a community development and grant program.

> The Proponent responded that it would develop a structured community development and grant program whereby community groups would have the opportunity to apply for funding requests that meet the funding criteria goals and objectives.

DOS raised concerns regarding the potential cumulative socio-economic effects resulting from construction workforces for the proposed Project and FortisBC's proposed Eagle Mountain – Woodfibre Gas Pipeline Project.

> The Proponent responded that the potential for cumulative effects would be mitigated by planning the construction schedule to avoid overlap whenever possible. Although some overlap is anticipated, according to preliminary

construction schedules, the peak construction period for the LNG facility and the pipeline are not expected to occur at the same time.

In addition to coordinating construction activities to minimize the overlap, the Proponent has proposed to provide information packages to prospective workers, and to hire a local housing and accommodation advisor to assist with finding suitable housing and accommodation options. The Proponent has committed to work with FortisBC and the DOS to minimize potential cumulative socio-economic effects from the construction workforce through the development of a community services and infrastructure management plan.

EAO proposes a condition that would require the Proponent to develop and implement a plan to adaptively manage potential socio-economic effects on services and infrastructure delivered by provincial agencies and local governments. The plan would outline an approach for monitoring and reporting on the effectiveness of the mitigation measures set out in the plan.

EAO proposes a condition that would require the Proponent to design and deliver programs to support local and Aboriginal employment and contracting opportunities, skills training and education. The Proponent would be required to provide information related to job opportunities and subcontracting business opportunities to communities and must hold at least one job fair in the DOS prior to construction.

6.1.4 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of the EA Certificate), EAO is satisfied that the adverse residual effects of the proposed Project on the labour market and sustainable economy would be negligible.

7 Assessment of Social Effects

7.1 Infrastructure and Community Services

7.1.1 Background

Proposed Project effects on infrastructure and community services were examined through the following key indicators: housing and accommodation; community infrastructure and services; and emergency services.

The LAA for community infrastructure and services includes the DOS, RMOW, and the SLRD Electoral Area D. The LAA for housing and accommodation also includes Metro Vancouver. The LAA for emergency services is the Project area and its marine corridors.

The Application reported that there has been substantial population growth in the DOS and other areas in the LAA in recent years. Table 7-1 shows population growth between 2001 and 2011. As a result there is a high demand for housing in the area and real estate prices are increasing. Increasing population in the area has also put additional pressure on community infrastructure and emergency services.

Table 7-1: Population Characteristics of the LAA and RAA (2001 – 2011).

	Squamish	Whistler	SLRD Electoral Area D	SLRD	Metro Vancouver	British Columbia
2011	17,158	9,824	836	38,171	2,313,328	4,400,057
2001	14,247	8,896	750	33,011	1,986,965	3,907,738
% Change	14.8	6.2	11.5	8.4	9.3	7.0

7.1.2 Potential Project Effects and Proposed Mitigation Identified in the Application

Potential effects of the proposed Project on infrastructure and community services are driven primarily by the anticipated influx of workers and associated activity during the construction of the proposed Project and, to a lesser extent, during operations.

Housing and Accommodation

The Application indicated that the supply of affordable and accessible housing continues to be a key concern for the communities in the LAA. The Application also indicated that rental accommodation is limited and in high demand in Whistler and Squamish, resulting in high rental costs. In Whistler and the SLRD Electoral Area D, the majority of residences are seasonal vacation homes. In Squamish, more than 90 % of the housing is occupied by permanent residents. Squamish has become a bedroom community of Whistler and Metro Vancouver. Squamish also has a number of housing developments that are either proposed or currently under development. The Application noted that in April 2014, the overall vacancy rate for private townhouses and apartment buildings in Squamish was only 0.3 %. Whistler has the largest number of temporary

accommodations (e.g. hotels and motels) in the LAA at approximately 100 facilities. Squamish has approximately 20 temporary accommodation facilities, while the SLRD Area D has two.

The Application stated that during construction, workers sourced from outside of the LAA (approximately 40 % of the required labour force) would require temporary accommodation within the LAA.

The proposed Project would not include provisions for temporary accommodation such as construction work camps for non-local construction workers. Instead, the Proponent expects that workers would rely on available rental housing and temporary accommodation in Metro Vancouver, Whistler and Squamish. This could increase the demand for rental housing and temporary accommodation, further increasing pressures on housing availability and costs in these areas.

The temporary increase in population during the initial two years of operations would amount to approximately 130 persons, the majority of whom would be permanent residents of the LAA. A smaller portion of these workers would be temporary residents for approximately two years, responsible for training resident local staff.

Key proposed measures to mitigate the potential adverse effects to housing and accommodation include:

- A local hiring strategy to minimize the number of non-local workers requiring temporary housing and accommodation; and
- A housing and accommodation advisor during construction and the initial operations stage to serve as a resource for non-local workers seeking accommodation in the LAA.

Community Infrastructure and Services

Transportation

The Application considered potential effects of the proposed Project on road infrastructure and marine infrastructure. In 2009, Ministry of Transportation and Infrastructure (MOTI) completed substantial improvements to the Sea-to-Sky Highway 99 to support the Vancouver 2010 Winter Olympic Games and to accommodate population growth and economic development until 2025. The proposed Project would use a worker ferry to transport staff between the existing ferry terminal at Darrell Bay and the Woodfibre site. Local water taxi service is also available from Squamish Harbour.

The stretch of highway between Horseshoe Bay and Squamish has an annual average daily traffic volume of 10,800 vehicles, with peak traffic volumes on Friday afternoons/evenings and Sunday afternoons.

Approximately 400-800 additional vehicles per day would travel on the Sea-to-Sky Highway 99 at the peak of the construction phase, which would be within the safe

highway operational volumes. During operations, the number of additional vehicles on the road due to the commuting workforce is anticipated to be approximately 35-70 per day for two years. Additionally, workers living in the Squamish and Whistler areas would commute to designated parking facilities near the Darrell Bay ferry terminal.

The key mitigation measure proposed in the Application is the development and implementation of a traffic management plan in consultation with the DOS and MOTI to guide the management of Project-related traffic. The plan would include an analysis of parking options, carpooling initiatives, and consideration of a commuter bus service.

Potential Project effects to municipal utilities, local emergency services, and recreation, health, social and education services are not expected to occur.

7.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

This section summarizes the key concerns raised by Working Group members and the public during Application Review regarding potential adverse effects on infrastructure and community services.

During Application Review, the DOS indicated that there is a current lack of rental housing in the Squamish area and that additional pressures on the rental housing market could potentially affect temporary accommodation rates which could, in turn, affect Squamish's growing tourism sector. The SLRD also suggested that commuting costs and lifestyle options may encourage workers to relocate to the Squamish area.

> The Proponent indicated that a large percentage of construction workers would likely reside in Metro Vancouver, since a majority of construction workers would be from this area and there are more temporary housing options available. The Proponent further indicated that most construction workers would only work a portion of the 24-month construction schedule.
>
> Proposed mitigation measures are designed to support non-local workers in finding accommodation include providing information packages on housing options in the Metro Vancouver and Squamish areas. The Proponent also committed to the development and implementation of a local hiring, training, and procurement strategies to reduce the pressures on housing and accommodation in the area.
>
> EAO proposes a condition requiring the Proponent to develop a plan to adaptively manage potential effects during the Project construction phase on services and infrastructure delivered by provincial agencies and local governments.

Several members of the public, including Tourism Squamish, My Sea to Sky and various organizations and public interest groups, as well as members of the Working

Group, including MOTI, the DOS, the Village of Lions Bay and the SLRD, raised concern about increased traffic on local roads and highways, especially the Sea to Sky Highway 99.

> The Proponent indicated that Project-related increases in traffic and associated effects would be mitigated through the implementation of a traffic management plan. The plan would be developed in consultation with the DOS and the SLRD and would include car-pooling and commuter bus service initiatives to reduce the number of cars on the road. An emergency response plan would also be developed and implemented which would include input from local, regional and provincial emergency service providers such as the Squamish Fire Department, Lions Bay Fire Rescue, Squamish RCMP, Vancouver Coastal Health and BC Ambulance Service.
>
> EAO proposes a condition that would require the Proponent to develop a traffic control management plan.

TC raised a concern about a potential effect on aeronautical transportation in the area, specifically during any flaring events at the facility. TC also requested more information on the predicted thermal radiation effects after each flaring event and whether this would have the potential to affect commercial and private air operations near the Project site, requiring mitigation. TC also noted that active outreach to local aviation operators would be required.

> In response, the Proponent provided information in the *Planned and Emergency Flaring Supplemental Report* submitted to EAO (May 2015). The Proponent responded that they would apply for permits for the flare stack and helicopter pad as required by TC and provided further information regarding the characteristics and effects from flaring, including thermal radiation. The closest airport to the Project site is Squamish Airport, located approximately 14 km to the north. There are various commercial and private aviation activities that occur in Howe Sound, including sightseeing tours, chartered flights, emergency services, utilities services, film services and general aviation. With respect to the potential for impacts from flaring activities on air operators, the Proponent committed to initiating communication with NAV Canada. In addition to working with the appropriate federal agencies, the Proponent committed to engage in active outreach with the local aircraft operators and the Squamish Airport aimed at promoting safe air navigation around the proposed Project area. This outreach was initiated by letter in July 2015.

Several members of the Working Group and members of the public raised concerns regarding accidents and malfunctions and the Proponent's ability to respond to on-site emergencies. The DOS also noted the Proponent's intention to be self-sufficient in responding to emergencies at the Project site.

The Proponent confirmed the intention to be self-sufficient for all possible emergency situations and indicated that an ERP would be developed and implemented for the proposed Project. The Proponent would communicate and coordinate with local emergency service providers to ensure appropriate communication and support procedures are in place in the event that third party support is required. Further details on the ERP and an assessment of potential accidents and malfunctions are provided in section 10 of this Report.

7.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effect on infrastructure and community services:

- Increased demand for housing and accommodation, with an associated decrease in affordability and availability.

Potential residual effects related to increased demand on road infrastructure and traffic services would be negligible. Potential residual adverse effects related to altered access patterns are discussed in section 7.2 of this Report. Potential effects on emergency services as a result of accidents and malfunctions are discussed in section 10 of this Report.

Summarized below is EAO's assessment of the anticipated residual effects of the proposed Project on infrastructure and community services, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate sensitivity and moderate resilience	The proposed Project would interact with infrastructure and services in the region that historically supported resource development but have transitioned to more tourism-based economies. The communities considered in this assessment have previously accommodated the needs of visitors and temporary industrial workforces. The large population centre of Metro Vancouver is within commuting distance for the proposed Project. Several new housing developments are proposed and underway in the area which would increase capacity for housing.
Magnitude	Low	There would be increased demand for accommodation during construction, which may impact the availability of short-term accommodation and may increase housing costs in the region. The potential effect is expected to be low during construction.
Extent	Local	The potential effects on housing and accommodation would be felt in the DOS, the RMOW, the SLRD Electoral Area D.

Criteria	Assessment Rating	Rationale
Duration	Short- to medium-term	The potential effects would generally be limited to the construction phase of the proposed Project.
Reversibility	Reversible	The potential effects would be largely confined to the construction phase and would be expected to lessen once local and regional communities have adapted; however, housing and accommodation costs could stabilize at a higher point than before.
Frequency	Continuous	The potential effects would be continuous during construction, with peaks during construction at times when more workers are required.
Likelihood	The likelihood is moderate that the potential adverse effects on infrastructure and community services discussed above would occur during Project construction.	
Significance	After considering all factors above, EAO concludes that the proposed Project would not likely result in significant adverse effects to infrastructure and community services.	
Confidence	There is a moderate level of confidence in the likelihood and significance determination, given that there is uncertainty regarding the indirect and induced population change, economic conditions and the effectiveness of the proposed mitigation measures.	

7.1.5 Cumulative Effects Assessment

Effects from existing projects were considered in the baseline against which proposed Project effects were assessed. However, there are a number of reasonably foreseeable future projects or activities in the area that could potentially interact with the proposed Project, including:

- The proposed Eagle Mountain-Woodfibre Gas Pipeline Project: a proposed natural gas pipeline that would supply the proposed Project;
- Eaglewind Community Development: a 25 acre new master planned community in downtown Squamish;
- Garibaldi at Squamish: a proposed all-season destination ski resort, approximately 22 km north of the proposed Project; and
- Porteau Cove: a proposed residential development of 1,100 homes located 12.3 km south of the proposed Project.

There are uncertainties relating to the geographical and temporal overlap of effects from potential future projects given the lack of information about the precise location, schedule and design of many of the reasonably foreseeable future developments. This increases the challenge of forecasting potential cumulative effects with other projects, particularly projects with similar short-term peaks in construction activity levels.

While the identified mitigation measures would reduce the proposed Project's contribution to cumulative effects, EAO also proposes a condition that would require the Proponent to develop a plan to adaptively manage and monitor effects on services and infrastructure delivered by provincial agencies and local governments. The plan would require communication with local governments, provincial government infrastructure and

service providers regarding proposed Project activities, issues and actions related to the implementation of mitigation measures.

With the implementation of the mitigation described and the proposed condition, cumulative adverse effects on infrastructure and community services is considered to be of low magnitude, short term in duration, reversible in the short to medium-term and not significant.

7.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on infrastructure and community services.

7.2 Land and Resource Use

7.2.1 Background

Potential effects on land and resource use were examined through the following key indicators: trapping and guide outfitting; forestry; recreational hunting and fishing; and other outdoor recreation activities.

The LAA for includes the Project area and a 500 m terrestrial buffer. For marine use, the LAA includes the marine portion of the Project area and a 2 km buffer, plus a 1 km band centered on the marine routes for the worker ferry and water taxi.

The RAA for forestry is the Soo Timber Supply Area. For all other terrestrial land and resource use, the RAA includes the Project area, the Mill Creek and Woodfibre Creek watersheds, and portions of the adjacent sub-watershed areas. For marine use, the RAA consists of Howe Sound.

7.2.2 Potential Project Effects and Proposed Mitigation Identified in the Application

There are no federal, provincial or municipal parks or protected areas located within the LAA or RAA. The *Skwelwil'em* Squamish Estuary Wildlife Management Area is located approximately 4 km from the Project area, at the head of Howe Sound. The proposed Project would be visible from provincial parks, but is expected to have little to no effect on the quality of experience. Visual quality is assessed in section 7.4 of this Report.

Trapping and Guide Outfitting

The Project area would overlap with one registered trapline and one guide outfitting tenure. Between 1990 and 2002, the recorded harvest for the trapline was 36 animals; however, no harvest data has been recorded since then.

The guide outfitting tenure is held by Coastal Inlet Adventures, which focuses on hunts for black bear and elk, but also provides hunts for black-tailed deer, mountain goat and cougar, as well as freshwater and saltwater fishing excursions. Wildlife Management Unit (WMU) 2-5 within the guiding territory of Coastal Inlet Adventures overlaps with the RAA. From 2002 to 2012, the annual harvest was between 10 and 15 animals within WMU 2-5. Historically, Coastal Inlet Adventures had permission from Western Forest Products (WFP) to traverse the Project area to access hunting areas via forest roads up the Woodfibre Creek valley. Since the closure of the Woodfibre pulp and paper mill in 2006, access has not been permitted. The proposed Project would restrict access for safety and security reasons in the future, which would affect Coastal Inlet Adventures' ability to access its guide outfitting tenure area. Additionally, the Crown land portion of the Project area would overlap slightly with the trapline and guide outfitting tenures by 0.43% and 0.01%, respectively. Both the trapline and guide outfitting tenures could also potentially be affected if the proposed Project resulted in changes to wildlife productivity.

The Application proposed mitigation in the form of an access management plan which would aim to investigate the potential to provide access to Crown lands beyond the Project area, while ensuring public safety and the safety of Project personnel and Project facilities. The Proponent noted that access to the public (with the exception of the forestry tenure holders) has been restricted since the Woodfibre Pulp and Paper Mill closed in 2006. The Proponent indicated that discussions would be on-going with Coastal Inlet Adventures regarding access to the surrounding Crown lands.

There is not expected to be any potential adverse effects to energy and mineral development.

Forestry

The Soo Timber Supply Area (TSA) is approximately 910,000 ha and overlaps the LAA. The timber harvesting land base (THLB) of the Soo TSA is 93,152 ha and the allowable annual cut (AAC) is 480,000 m^3. The Application reported that commercially harvestable areas within the Woodfibre Creek and Mill Creek watersheds and on the western slopes above Howe Sound, as well as to the east of the Project area, are currently estimated to have a THLB of 1,709 ha, or 1.8% of the Soo TSA's total THLB.

The proposed Project has the potential to affect forestry enterprises that are currently harvesting (or have plans to harvest) timber on the Crown lands that surround the Project area. Currently, access to these Crown lands is provided through private roads on the proposed Project fee simple property that connect to forestry roads on the nearby Crown lands. Forestry enterprises have historically accessed log dumps on the north and south portions of the property through the foreshore lease area. These areas would be required for the proposed Project and would no longer be available for use by forestry enterprises. The Application stated that for safety reasons and, in consideration of the LNG standards set by the Canadian Standards Association (CSA) standard Z276, forestry enterprises would no longer be permitted to use the private roads through the Project area to access Crown lands and timber harvesting areas beyond. The CSA standard and the LNG Facility Regulation have exclusion zones for siting certain project components and requirements for facility safety and security; however, they do not necessarily prevent access. The Proponent would be required to ensure safety and security of the proposed Project. The Application also indicated that a foreshore lease in the marine portion of the Project area, formerly held by WFP, was transferred to the Proponent upon purchase of the property and repurposed.

The Application indicated that Black Mount Logging Inc. holds two forestry tenures in the Soo TSA and has held cutting permits for harvesting timber in the Crown land portions of the Project area. Black Mount Logging Inc. harvested in the LAA in 2014 and currently has silvicultural obligations in the area. The Application also indicated that Black Mount Logging Inc. intends to harvest in the area again in approximately 10 years. The licensee also uses the log dumps on the north and south ends of the Woodfibre property for water-based log handling activities. An access agreement between Black Mount Logging Inc. and WFP for use of the foreshore area and the private roads on the property expired in December 2014 and has not been renewed.

In 2008, Northwest Squamish Forestry Ltd. harvested an area located immediately to the north of the LAA. The Application indicated that Northwest Squamish Forestry Ltd. accessed these areas through the Mill Creek, Woodfibre Main Line, and South Main roads and also used the log dumps located at the north and south ends of the Woodfibre property. Northwest Squamish Forestry Ltd. currently holds the road permit for Mill Creek road. The company has silvicultural obligations in the area and is considering a second growth harvest in the Mill Creek watershed.

BC Timber Sales is currently planning cut blocks to the north of the Project area, to be finalized in 2015. These are expected to represent a total area of 1,162 ha and a potential harvest volume of 44,893 m^3. Access restriction associated with the proposed Project would affect the planning being undertaken by BC Timber Sales.

Outdoor Recreation

Recreational marine fishing occurs in Howe Sound throughout the year, but is generally highest between April and October. The LAA falls within DFO recreational Fishing Management Area 28 sub-area C. The nearest popular fishing location is the Defence Islands, approximately 10 km south of the Project area. Within the LAA and near Squamish, low levels of recreational marine fishing for salmon, crab and prawn are reported to occur.

Harvesting of marine resources is an important part of traditional life for most coastal Aboriginal Groups. Information about the potential impacts of the proposed Project on Aboriginal fishing and marine harvesting is available in Part C of this Report.

Recreational marine fishing would be displaced from the marine portion of the Project area, and there may be intermittent displacement of recreational fishing by Project-related vessel traffic including water taxis, ferries and/or barges and LNG carriers. Project-related shipping traffic is not expected to generate wake waves that are substantially larger than what occurs naturally in Howe Sound. Therefore, this is not expected to pose a safety risk to typical fishing vessels operating in the area. Section 7.3 of this Report discusses the potential effects of the proposed Project, including the proposed LNG carriers, on marine navigation, fisheries, recreational use and marine tourism.

Land-based recreation such as hiking, camping and fishing in the Crown lands surrounding the Project area have been limited since 2006 due to access restrictions with the closure of the Woodfibre pulp and paper mill. The Application indicated that access to these areas would remain restricted to the general public for security and safety reasons and therefore new potential effects on land-based recreational activities are not anticipated.

7.2.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, concerns were raised by members of the Working Group and the public about potential effects on land and resource use. A summary of the key concerns raised are discussed below.

Forestry

FLNR raised the concern that restricting access to the harvesting areas surrounding the Project area could affect the Soo TSA timber supply and requested an in-depth review of the potential impacts, and further analysis of mitigation options and management alternatives. FLNR also noted that *Forest Act* licensees have made substantial investments into the development of transportation infrastructure (roads, bridges, etc.). FLNR conducted an internal review and determined that the potential loss of THLB amounted to a larger contribution to AAC (about 3 %) than what was reported in the Application. FLNR's analysis also determined that the potential impacts to each of the affected forest licensee chart areas would vary, with the highest impacts felt by Northwest Squamish Forestry Ltd., with 24 % of its chart area affected. The other two licensees would each lose access to approximately 4 % of their chart areas.

FLNR and the potentially affected forest licensees have indicated that while alternate access may be determined through ongoing discussions, options for access around the Project area would require investment in new infrastructure, increasing hauling costs, and affecting these businesses. FLNR clarified that the implications of not achieving a viable option for alternate access would be the loss of the available timber in those areas for the duration of the proposed Project, and potential impacts to forestry jobs. There may also be economic implications for licensees and government if a licensee is unable to attain its AAC and/or if silvicultural obligations are not able to be fulfilled.

> The Proponent indicated that the Woodfibre fee simple property has been private property for a century and that access through the site has only ever been allowed through commercial agreements with the property owner. The Proponent indicated that it is working with forestry licensees to address their concerns related to access. The Proponent suggested that change of access due to new development at the Woodfibre site should not shift existing liabilities for the transportation infrastructures surrounding the site. However, the Proponent committed to continued discussions with licensees and FLNR to determine access options for forestry operations through the property, while maintaining the safety and security of the site. Potential alternate access routes to Crown land have been identified by the tenure holders, and the Proponent has been meeting monthly with all three tenure holders, FLNR and OGC since May 2015 in order to discuss the feasibility of alternate access.
>
> EAO proposes a condition that would require the Proponent to continue to engage with tenure holders prior to construction, to seek opportunities for future

ongoing access for forestry operations, while ensuring the safety and security of the site.

Other Outdoor Recreation Activities

Members of the public and the Working Group, including the DOS, the Village of Lions Bay, and the SLRD raised the concern that the proposed Project would displace marine-based tourism and recreation activities in Howe Sound, and could have negative impacts on Squamish's economy. The DOS indicated that a District-led socio-economic impact assessment should be completed and should specifically include an assessment of the proposed Project's impacts on the community's wilderness tourism values. Members of the public noted that West Vancouver, Howe Sound, Squamish and Whistler represent an important tourism corridor and that the proposed Project has the potential to affect the values that visitors find attractive, including the quality of recreational activities in Howe Sound. Tourism Squamish indicated that there are potential impacts to the visitor experience, as well as the community's sense of place and the Squamish brand.

The Proponent acknowledged the importance of tourism and recreation to Howe Sound and indicated that it is committed to carrying out a socio-economic impact study that would be coordinated with the DOS and would further assess potential effects and opportunities. The Proponent also indicated that it is committed to continued consultation with recreational stakeholder groups in Howe Sound to minimize the potential effects to local tourism and recreation.

7.2.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on land and resource use:

- Change in access and alteration of forestry operations; and
- Loss of long-term timber supply.

Summarized below is the EAO's assessment of the expected residual effects of the proposed Project on land and resource uses, as well as the EAO's level of confidence in the effects determination (including their likelihood and significance). Potential effects to marine-based recreational activities are assessed in section 7.3.

Criteria	Assessment Rating	Rationale
Context	Low sensitivity and moderate resiliency	There is currently limited access to the terrestrial areas surrounding the Project area. In the past, forest tenures with chart areas in the Lower Squamish Development Unit of the Soo Timber Supply Area accessed harvesting areas through the Woodfibre site to the Woodfibre Creek watershed, Mill

Criteria	Assessment Rating	Rationale
		Creek watershed and along the western slopes above Howe Sound and to the east of the Project area. These licensees also used log dumps on the north and south ends of the private property for water-based log handling activities, through (expired) agreements with WFP. Due to safety and security concerns, access would not be permitted through the Project area. Most of the land and resource uses in the study areas, including forestry, are considered to have a moderate level of resiliency.
Magnitude	Low-Moderate	The potential Project effects on alteration of forestry operations in tenured areas are considered to be moderate in magnitude due to access restrictions and reduction of timber harvesting if alternative access cannot be provided. The effects on timber supply within the Soo TSA are considered low; however, the effects to an individual affected licensee's chart area would be greater. There would also be increased costs for affected licensees as a result of new infrastructure associated with alternate access.
Extent	Local	The geographic extent of effects would be local, since access restrictions and loss of timber harvesting could affect forestry tenures in the Crown lands surrounding the proposed Project site.
Duration	Long-term	The duration of potential effects would be long-term, as access would be restricted to the forest tenure areas for the life of the proposed Project. It is noted that forest management occurs over long timeframes and that the duration of the potential effects would be less than a typical forestry rotation.
Reversibility	Reversible	Effects are expected to be reversible following decommissioning.
Frequency	Continuous	Access restrictions through the Project area would be continuous throughout both the construction and operation phases.
Likelihood	The likelihood is low to moderate that the adverse effects on land and resource use discussed above would occur during Project construction and operations as alternative access options and potential solutions are being discussed as part of EAO's proposed condition.	
Significance	Considering the above analysis and having regard to the CPD and the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse residual effects on land and resource use.	

Criteria	Assessment Rating	Rationale
Confidence	There is a high level of confidence in the likelihood and significance determination.	

7.2.5 Cumulative Effects Assessment

The cumulative effects assessment in the Application identified that forestry operations have the potential to interact with the proposed Project, resulting in potential effects on land and resources, specifically with regards to forestry. The Application indicated that elimination of access to the Crown lands that surround the Project area would restrict commercially-viable forestry activities in these areas, reduce their ability to meet the AAC, and place pressure on the THLB in other parts of the Soo TSA. However, the presence of other forestry activities and tenures already operating in other areas of the Soo TSA, as well as new constraints on the land base (i.e. creation of parks and protected areas), would decrease the amount of land available to replace the lost THLB areas that would no longer be accessible. FLNR notes that the affected licensees' AACs would be impacted. FLNR is beginning a process to review the allocation of chart areas in the Soo TSA, which could address these impacts, if no alternate access can be determined. It was also noted that the potentially impacted tenure holders have other chart areas they can harvest from, although they would not likely be able to replace the lost AAC from these areas.

Additional mitigation measures related to the potential cumulative effects on forestry are not proposed. The residual cumulative effect is considered to be low in magnitude as while a harvesting area near the proposed Project would potentially be inaccessible for the life of the proposed Project, current forestry users have other chart areas in the Soo TSA that can be harvested and a significant effect to the Soo TSA is not anticipated. The effect would be reversible following decommissioning of the Project.

EAO proposes a condition that would require the Proponent to engage with timber tenure holders about future ongoing access for forestry operations, and to provide a report to EAO on this engagement prior to construction. If an alternative access arrangement can be achieved while ensuring safety and security of the proposed Project area, the potential effect on forest tenures would be negligible.

With the implementation of the mitigation described and the conditions identified in the TOC, EAO believes that the cumulative adverse effects on land and resource use is considered to be of low magnitude, reversible in the long-term and not significant.

7.2.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on land and resource use.

7.3 Marine Transport

7.3.1 Background

Marine transport was selected as a VC because the proposed Project marine activities such as shipping could conflict with existing marine uses.

The LAA includes the marine portion of the proposed Project area, a 500 m-wide area extending from the shoreline at the facility location, a 1 km area on either side of the proposed shipping route, and a 0.5 km area on either side of the proposed worker ferry direct route and water taxi direct route. The LAA is inclusive of all current and proposed marine infrastructure, a control zone, and the preliminary vessel turning circles. The RAA includes all of Howe Sound.

LNG carriers would transit along an established shipping route within Howe Sound. All channels along the route exceed the Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL) guidelines for two-way vessel operation, which state that the navigable width of a channel should be a minimum of at least seven times that of a ship's beam width.

The Proponent is currently undertaking a TERMPOL for the proposed Project and is anticipating submission of its applications in September 2015. TERMPOL is a voluntary review process that may be requested by proponents involved in building and operating a marine terminal system for bulk handling of oil, chemicals and liquefied gases. It focuses on the marine transportation components of a project and examines the safety of tankers entering Canadian waters, navigating through channels, approaching berthing at a marine terminal and loading or unloading oil or gas. The review is led by TC and can involve other federal departments and other stakeholder representatives. The review may consider any safety measures above and beyond existing regulations to address any site-specific circumstances.

Acts and regulations concerning commercial shipping and construction activities in navigable waters include:

- *Navigation Protection Act* (NPA);
- *Canada Shipping Act, 2001* and regulations, including the Ballast Water Control and Management Regulations;
- *Transportation of Dangerous Goods Act* and regulations; and
- *Canada Marine Act*.

The NPA protects the public's right to navigate and regulates activities that might affect this right. The NPA is administered by TC and applies to scheduled waterways in Canada. TC would only authorize major works upon satisfactory review of the final design and development plan for the works.

Under the *Pilotage Act*, international vessels of 350 gross tonnes or larger travelling in Canadian waters are required to use the services of a Canadian marine pilot, a licensed

professional mariner whose role it is to take the bridge and advise the captain of the safest route to bring a vessel to its port of call. The Proponent has committed to having two BC Coast Pilots on board the vessel from Victoria to the Project marine terminal.

Howe Sound is not within the navigational jurisdiction of Port Metro Vancouver and there is no Port Authority in Howe Sound, including at Squamish Harbour.

7.3.2 Potential Project Effects and Proposed Mitigation Described in the Application

The waterways in Howe Sound are currently shared by a wide range of vessels. Commercial and government vessels identified in Howe Sound include passenger ferries, tugs and barges, deep sea cargo ships, Royal Canadian Navy and other government ships, fishing boats, and water taxis. Recreational vessels include yachts, pleasure boats, and self-propelled craft. Associated marine recreational activities identified in Howe Sound include fishing, diving, waterskiing, wakeboarding, windsports (kiteboarding and windsurfing), kayaking, and paddle-boarding. Six marinas, six yacht clubs, and two anchorages were identified near the established shipping route to Squamish Harbour.

The Application reports that in 2013 there were a total of 12,909 large vessel movements in Howe Sound, with BC Ferries accounting for the majority of movements (73 %), followed by tugs and barges (22 %). Occasionally, cruise ships will also travel into Howe Sound. The active deep sea port facilities within Howe Sound are located at Squamish and Port Mellon. Squamish Terminals, located within Squamish Harbour approximately 5.8 km east of the Project area, provides deep sea berthing loading and unloading facilities for pulp mills in the BC Interior, inbound steel, and other cargo products. Squamish Terminals handles approximately 100 vessel calls per year. Small vessels that frequent Howe Sound include commercial fishing vessels, water taxis for passenger access to various destinations throughout Howe Sound, and recreational vessels.

Several commercial fisheries for harvesting prawns, shrimp and crab occur in Howe Sound, with the highest concentration of commercial fishing vessels located in Montagu Channel. Other commercial fishing locations also include Watts Point, Darrell Bay, and Britannia Beach. Harvesting marine resources is also an important part of traditional life for most coastal Aboriginal Groups and is discussed in Part C of this Report.

Squamish Harbour is a popular area for sea kayaking and paddle-boarding as far south as the Project area, although these activities do not generally occur in the immediate Project area. The majority of windsport activity is concentrated in the waters adjacent to Squamish Spit and Nexen Beach. The waters in front of the Project area are not conducive to windsports as it is in a wind shadow. No dive sites were identified within the immediate Project area.

Table 7-2 summarizes the anticipated Project vessel traffic during construction and operations.

Table 7-2: Expected Vessel Movements (one way)

Vessel Type	Activity	Construction	Operation
LNG carriers	Movements per year	0	80
Deep Sea Vessels	Movements per year	12	0
Passenger ferry (from Darrell Bay)	Movements per day	6	6
Water taxi	Movements per week	20	20
Equipment Barges	Movements per week	4	<2
Fuel barges	Movements per month	8	4

During construction and operations, a passenger ferry for workers would transit between the Project site and Darrell Bay (or Squamish Harbour) several times a day. There is some potential for Project-related traffic to temporarily interfere with small vessels navigating the same route at the same time; however, access through Howe Sound would not be restricted. The change in deep-sea vessel and barge traffic during construction is considered incremental when compared to existing large vessel traffic in the study area. Loaded barges would typically travel at a speed of 5 knots, taking approximately 4 hours to transit Howe Sound. During construction, deep sea vessels would typically travel at a speed of 12 knots, taking them less than 2 hours to transit Howe Sound. Deep sea vessels associated with the proposed Project would be moored at existing dock infrastructure at the Project site for the period required to unload the equipment on to the land and no additional moorage in Howe Sound would be required.

The maximum Project-related increase to shipping traffic volume during operations is approximately 40 LNG carrier vessel visits to the terminal per year (80 vessel movements) or less than 1 % of current volume of large vessel traffic in Howe Sound. This activity would result in a 10 % increase in large vessel traffic specific to Montagu and Ramillies Channels and a 47 % increase in deep sea vessel traffic in the LAA (between the Project site and Watts Point). A transiting LNG carrier would take approximately 2.5 hours to travel the length of the shipping route within Howe Sound at speeds of 8 to 10 knots.

Marine vessel traffic would be slightly less during operations than during construction. During operations, personnel would be transported to the Project site via passenger ferry or water taxi from Darrell Bay or Squamish Harbour. The preferred worker ferry route option with a departure point from Darrell Bay would avoid a higher proportion of vessel traffic than if a ferry departure point in Squamish Harbour was used.

During operations, the LNG carriers could interfere with Aboriginal, recreational, and commercial fishing although interference from LNG carriers would be intermittent in nature and not expected to prevent or restrict activities or access to routes or destinations including fishing areas.

Any interference by LNG carriers to recreational boating or tourism in the LAA would likely be highest in Queen Charlotte Channel, during the peak summer boating months of July and August. The Project related vessel traffic represents a very small percentage increase in the overall vessel traffic in Howe Sound. Given the width of channels,

recreational users are expected to be able to continue to access popular destinations and routes, and would only experience interference when required to alter direction or speed when navigating in the same route at the same time as LNG carriers, ferries, or barges.

Under the Collision Regulations (Government of Canada 2008a) smaller vessel operators (such as sailing vessels and fishing boats) are expected to yield to larger vessels. The Proponent would develop a management plan to manage the interaction of Project vessel traffic with other marine users.

The Application stated that a control zone of approximately 70 ha extending up to 550 m from the shoreline would be established at the start of construction and would remain in place for the life of the proposed Project for security and safety purposes (see Figure 7-1). The Proponent anticipates that access by other marine users, including Aboriginal Groups and recreational boaters and fishers would be restricted in the area of the control zone in front of the facility for safety and security reasons for the life of the Project. The control zone would be demarked by buoys, include signage, and be patrolled by staff employed by the Proponent at higher-risk times to ensure security of the site and educate any other marine users of the potential dangers and to avoid the area. All Project construction activities would be confined to the immediate Project area and the control zone, and navigation in the existing channel to access Squamish Harbour would not be affected. Details relating to the requirements for the control zone would be determined by TC during permitting. The potential impacts from the control zone would be limited due to the small area affected within Howe Sound. Marine users would not be prevented from accessing other harvesting and recreational areas.

During operations, docked LNG carriers and the FSO would extend approximately 200 m from the shore into the channel, but would be located fully within the control zone. The LNG carrier would turn with tug assistance to dock at the FSO within a designated 600 m turning circle adjacent to the berth that extends 750 m into the channel between the proposed Project site and Watts Point. The space required for turning would occupy 27 % of the channel width at this location and is not expected to disrupt other marine traffic in the area.

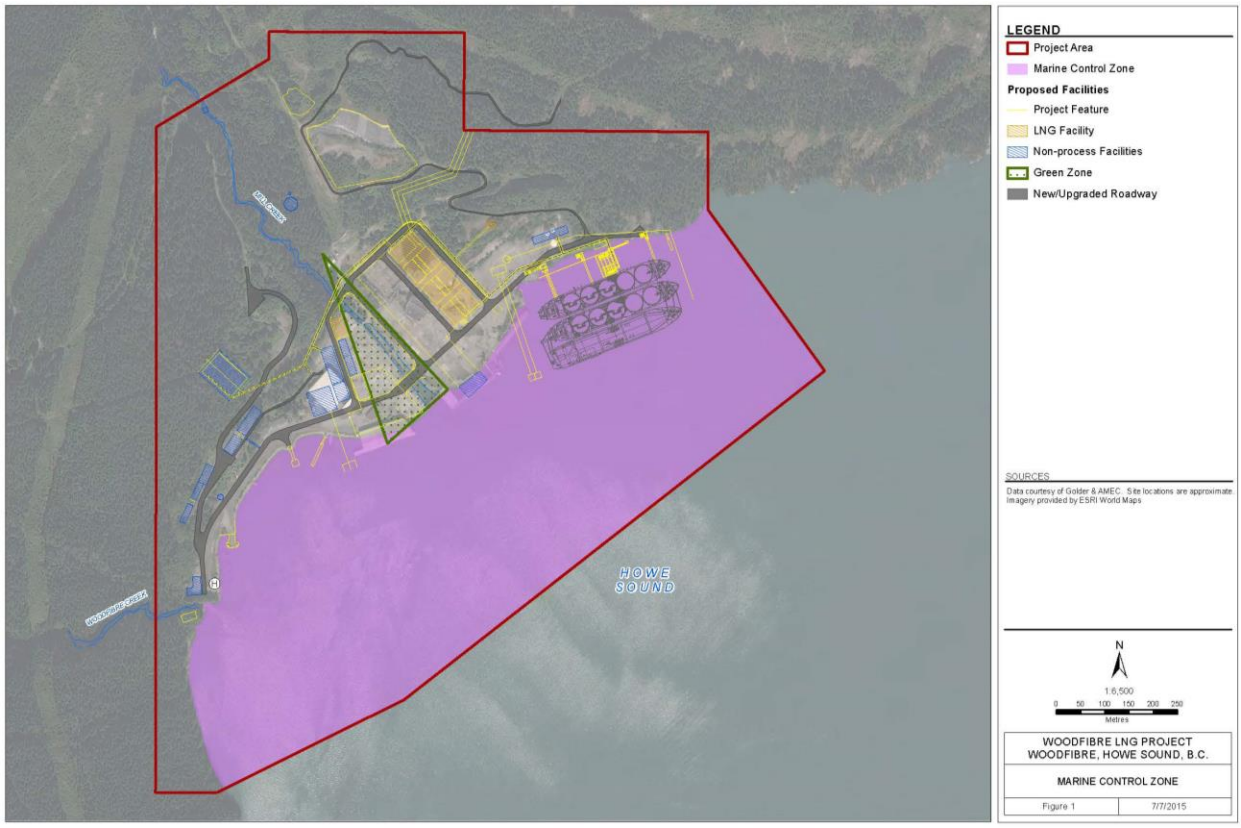


Figure 7-1: Marine Control Zone

There would be no moorages or additional anchorages of LNG carriers or other deep sea vessels within Howe Sound.

The Application included an assessment of the potential for wake effects from LNG carrier movements. The study identified that any wake generated by an LNG carrier along the shipping route would diminish in size the further it traveled away from an LNG carrier, and would be unnoticeable at the shoreline, given the natural occurrence of typical wind-generated waves in Howe Sound. As a result, the effects from wake were found to not pose a safety risk to typical commercial, recreational, Aboriginal or charter fishing vessels and not disrupt access to fishing locations.

Following is a summary of the proposed mitigations included in the Proponent's Application:

- Prepare and implement a marine transport management plan prior to construction activities, which would include communication measures to ensure all vessel traffic is aware of Project activities, and further consultation with key stakeholders to identify areas of concerns and to identify additional mitigation;
- Develop and implement a Squamish harbour vessel traffic plan that would include strategies, best management practices and guidelines to avoid and

minimize Project-related disruption of marine-based recreational activities in the Squamish Harbour area during construction and operation;
- Ensure that two BC Coast Pilots are on board transiting LNG carriers at all times, from Victoria throughout the passage in Howe Sound;
- Ensure that LNG carriers in Howe Sound are assisted by a minimum of three tugboats;
- Publishing of the daily worker ferry schedule times during construction and operations; and
- Prohibit mooring or anchoring of LNG carriers anywhere in Howe Sound.

7.3.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

During Application Review, several issues and potential Project effects related to marine transport were raised by Working Group members and the general public.

Exclusion Zones
Members of the public and local government raised concerns that Howe Sound is very active with marine users and that LNG carriers could potentially displace marine recreational traffic. The public identified numerous marine activities and recreational and commercial organizations in Howe Sound, including yacht clubs, marinas, dive sites and sport fishing. Local governments and members of the public requested additional information on whether an 'exclusion zone' would be implemented around a transiting LNG carrier. The DOS requested that a plan be put in place to manage the potential effects of the proposed Project on recreational boating in Howe Sound, particularly to minimize the displacement of marine-based tourism and to act as a monitoring and follow-up program.

> The Proponent clarified that currently there is no regulation which stipulates an exclusion zone around LNG carriers in transit in Canada. The Proponent does not anticipate that an exclusion zone would be required around LNG carriers. Access of marine users could be temporarily disrupted for short durations while an LNG carrier is in transit. To ensure safety, the Proponent committed to three escort tugs to accompany an LNG carrier in Howe Sound including one preceding the vessel to provide information or assistance to other vessels that may be in the path of the carrier.
>
> EAO proposes a condition requiring the development, in consultation with TC and DFO, of a marine transport management plan for construction and operations with the objective of mitigating and monitoring impacts to marine users.

Control Zone
TC raised questions about the proposed control zone offshore of the facility, the enforceability of this commitment, and impacts to the public's right to navigation.

The Proponent clarified that due to requirements by OGC related to safety and security of the site, they would seek to implement a control zone by the use of buoys, signage, and patrol boats to educate and discourage the public from accessing the area. OGC's requirements include: defining the area and periods of time (e.g. while loading vessels) around the facility where there is an increased risk; defining a plan for controlling public access; defining a plan for mitigating risks to public safety in cases where the public is in this control zone; and providing a security plan for the facility.

TC agreed with this proposed approach and determined that further requirements associated with the control zone would be considered in permitting. TC noted that they would need to approve the site's marine security facility plan and that TC anticipates the facility's operations to be captured by the Marine Security Regulations (*Marine Security Transportation Act* and Regulations).

Marine Safety

Local government and the public raised concerns about public safety associated with marine shipping. The District of West Vancouver, the Municipality of Bowen Island and SCRD adopted a resolution to ban the passage of LNG carriers in the waters of Howe Sound.

EAO required the Proponent to provide a supplemental memo (*Supplemental Report on Accidents and Malfunctions*, April 2015) during Application Review, which included assessment of additional accidents and malfunctions scenarios involving LNG carriers. EAO's assessment of accidents and malfunctions is provided in section 10 of this Report. The Proponent provided additional information confirming responsibility and liability for marine safety. In addition to the legal requirements for safe navigation, the Proponent committed to ensuring that two BC Coast Pilots would be on board LNG carriers at all times in Howe Sound, and to employing a minimum of three escort tugboats, which would also help create a safety awareness zone and assist in alerting other marine users of the approaching vessel. The Proponent committed to developing a marine transport management plan and a Squamish harbour vessel traffic plan to minimize impacts, reduce risk, and assist with communication with other marine users including Aboriginal Groups. Aboriginal Groups and key stakeholder groups, including private operators and recreational groups would be engaged in the plan development.

In response to general concerns about safety and vessel speeds, the Proponent confirmed that LNG carriers would travel at a maximum of 10 knots within Howe Sound. Upon reaching the immediate vicinity of the Project area, speed would be reduced to 6 knots. The proposed slow speeds while within Howe Sound were identified as a key mitigation to prevent collisions between an LNG carrier and other marine vessels in the area.

Concerns were raised by the District of West Vancouver, the Village of Lions Bay, and the general public regarding the siting of the proposed facility and whether the site would be located in a 'narrow waterway' that would be unsafe for an LNG carrier. Many comments from the local governments and general public cited the Society of International Gas Tanker & Terminal Operators Ltd's (SIGTTO) guidance and TERMPOL for guidance in siting an LNG facility.

EAO requested additional information from the Proponent to demonstrate how the SIGTTO siting criteria would be met by the proposed Project. The Proponent prepared a memo (*Woodfibre LNG Limited Response to SIGTTO LNG Ports and Risk Reduction Options*, August 2015) in response. TC reviewed the memo and expressed no major concerns with the material. The Proponent stated that the information referenced in the memo is also part of the studies which will be submitted to TC, Pacific Pilotage Authority, and BC Coast Pilots under TERMPOL.

The Proponent clarified that the location of the site is not within a narrow waterway as defined by SIGTTO or TERMPOL and that they are committed to SIGTTO membership and best practices, which would require compliance with SIGTTO guidance. Full membership in SIGTTO can only be attained with the operation of an LNG terminal or an LNG carrier; however, in June 2015, the Proponent announced that it had been granted an associate membership in SIGTTO as a first step to becoming a full member. The Proponent also committed to promoting best practices and initiating vessel inspections as required by the Oil Companies International Marine Forum (OCIMF) for LNG carriers calling at the facility. The Proponent provided information to demonstrate that the proposed facility would comply with the SIGTTO guidance.

TERMPOL specifies a body of navigable water of width four times the vessel's beam to be a one-way narrow channel, and seven times the beam to be a two-way narrow channel. SIGTTO specifies a body of navigable water of width five times the vessel's beam to be a one-way narrow channel. For a characteristic 45 m beam LNG carrier calling at the proposed terminal, this would imply a width of 180 m for a one-way narrow channel and 315 m for a two-way narrow channel. The width of Howe Sound at the proposed Woodfibre LNG terminal is 5200 m. The narrowest point along the shipping route in Howe Sound is 1400 m. *SIGTTO's Site Selection and Design Guidelines for LNG Ports and Jetties* recommend turning circles to have a minimum diameter of twice the overall length of the largest LNG carrier (i.e., 600 m for the Woodfibre LNG Project) and TERMPOL requires turning circle of 2.5 times the length, which equates to 750 m.

EAO proposes a condition requiring the development, in consultation with TC and DFO, of a marine transport management plan for construction and operations with the objective of mitigating and monitoring impacts to marine users.

BC Ferries

SCRD, the Village of Lions Bay, and members of the public raised concerns about potential impacts to the BC Ferries schedules from Horseshoe Bay as a result of the Project marine traffic.

> The Proponent clarified that during consultation with BC Ferries to date no concerns have been raised about potential impacts to ferry schedules. The Proponent would continue to consult with BC Ferries regarding potential interference, vessel routes and operating practices. On May 4, 2015, BC Ferries provided a letter to EAO confirming that the organization met with the Proponent and its consultants and have discussed the marine operations associated with the proposed Project and any potential areas of conflict and/or cooperation between BC Ferries' operations and safety versus the LNG carriers transiting Howe Sound. BC Ferries did not express concerns regarding the LNG carriers negatively impacting BC Ferries operations.

Wake Analysis

Concerns regarding the Proponent's analysis of vessel wake were raised by TC, Squamish Nation, Tsleil-Waututh Nation, Village of Lions Bay, District of West Vancouver, SCRD, Bowen Island Municipality, Islands Trust and the general public. Concerns were raised regarding the study methodology, potential impacts to recreational boaters, beach erosion, public safety on beaches, and docks. Tsleil-Waututh Nation also expressed concerns that wake could result in increased erosion along the shoreline and impacts to archeological and cultural sites such as shell middens.

> In response to a request from EAO, the Proponent submitted a supplemental memo (*Woodfibre LNG Project Vessel Wake Assessment*, April 2015). The purpose of the memo was to assess potential combined wake effects under both typical and severe weather conditions and at a range of travelling speeds and vessel configurations resulting from: an LNG carrier accompanied by 3 escort tugs; an LNG carrier with escort tugs and a BC Ferry; and the largest worker ferry.
>
> The assessment provided a description of predicted combined wake effects compared to natural waves under each scenario. In addition, the memo explained how the wake wash from the scenarios described above would potentially impact shorelines, infrastructure and marine activities (e.g. recreational boating, kayaking, fishing, aboriginal interests / public safety) within Howe Sound.
>
> The study results concluded that the wake generated by the carriers in normal conditions would be less than 10 cm at 50 m away from the LNG carrier, which is less than the wind-generated waves typically encountered in Howe Sound and that the small incremental increase in Project-associated vessel wake would not increase the existing vessel wake environment. Wake from Project vessels would

be smaller than the wake generated by BC Ferries and other vessels currently transiting to Squamish Harbour because Project vessels would transit at lower speeds and travel as far from shore as practicable. The Proponent does not expect that wake waves would impact public safety, contribute to shoreline erosion, adversely affect cultural sites or activities, or have any appreciable effect on existing infrastructure within Howe Sound. The study concluded that since vessel wakes are not expected to increase shoreline erosion, neither access to, nor site integrity of, heritage resources located along the shore would be damaged as a result of wakes generated by Project-related vessel traffic. Further discussion of the potential effects of wake on shell middens is included in Part C of this Report.

EAO proposes a condition requiring a wake verification plan during operations to confirm the conclusions during the EA. As part of the wake verification plan, an adaptive management plan would be developed to address the effects of wake on marine and shoreline users if the results of the wake verification plan indicate greater wake effects than predicted in the environmental assessment, or if unexpected effects occur.

Sea to Sky Marine Trail

Recreation Sites and Trails BC (FLNR) and the Village of Lions Bay raised questions about the potential effects of the proposed Project on the newly created Sea to Sky Marine Trail, which includes a series of proposed campsites around Howe Sound (including sites to the south and north of the Woodfibre site). FLNR noted that the number of recreational boaters could increase with the new marine trail and expressed concern about potential interactions between kayakers and LNG carriers, and about communication with users of the trail system in the event of an accident or malfunction.

In response, the Proponent committed to continuing to discuss potential effects and solutions with FLNR, as well as opportunities to promote public awareness of the trail. The Proponent responded that LNG carriers would be travelling at 8 to 10 knots in Howe Sound, and under normal visibility of around 10 to 13 km, kayakers would be able to see the oncoming vessel for at least 35 to 60 minutes before their potential interaction. They would therefore be able to plan their crossing well in advance as they would with any of the large vessels that currently operate within Howe Sound. In addition, the LNG carriers would be escorted by a minimum of three tugs in Howe Sound, one of which would be running ahead (by up to 500 m) to warn kayakers and recreational vessels of the LNG tanker's impending approach and to provide any assistance if needed. If a risk of collision exists, the LNG carrier, under the control of two BC Coast Pilots, would alter course, reduce speed, or stop the vessel utilizing the tethered tug boat until there is no longer a risk of collision.

The Proponent's ERP would list the locations of commonly used recreation areas along Howe Sound, including the Sea to Sky Marine Trail camps. As part of the ERP, the Proponent commits to work with emergency response agencies to

develop procedures, including notification or evacuation of people affected by an accident.

TERMPOL
Several Working Group members, including local governments, and members of the public raised several issues about marine transportation that the Proponent responded would be addressed through TERMPOL and that they would adhere to TERMPOL recommendations. The TERMPOL study includes a detailed shipping analysis and marine technical reviews, in consultation with TC and Aboriginal Groups. These TERMPOL studies include (but are not limited to) the following: a detailed quantitative risk assessment; further data collection to identify use of Howe Sound by small vessels (< 20 m); a fishery resources survey; route analysis, approach characteristics and navigability survey; special underkeel clearance survey; and berth procedures and provisions.

In response to the issues raised during Application Review and following additional consultation with TC, EAO proposes a condition for a marine transport management plan that would include how the results of the TERMPOL process respecting the project would be communicated to Aboriginal Groups, key stakeholders, and marine users.

7.3.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following potential residual adverse effects on marine transport:

- Interference with marine navigation and marine and shoreline activities from Project vessel movement and shipping.

Summarized below is EAO's assessment of the expected residual effects of the proposed Project on marine transport, as well as EAO's level of confidence in the effects determination (including their likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	High resilience	The waterways in Howe Sound are currently shared by a wide range of vessels including ferries, tugs, barges, cargo ships, and fishing boats. Large commercial vessels currently transit through Howe Sound to Squamish Terminals along the established shipping route.
Magnitude	Low to Moderate	After the implementation of proposed mitigation and conditions, there would be a low level of interaction between marine users and Project-related shipping resulting in a minor change to navigation. Although there would be a moderate level of residual impact on marine users prevented from accessing the area of the 'control zone' in front of the facility for safety and security reasons

Criteria	Assessment Rating	Rationale
		for the life of the Project, the impact would be tempered by the small area affected, which would not prevent users from accessing other important harvesting and recreational areas.
Extent	Local	Potential adverse effects of increased marine traffic could be felt throughout the shipping route in Howe Sound.
Duration	Long-term	Although adverse effects would occur over the life of the proposed Project while marine shipping is occurring, effects would be generally limited to the time it takes for an LNG carrier to pass through Howe Sound (about 2.5 hours). During construction, deep sea vessels would take less than 2 hours to transit Howe Sound, while loaded barges could take up to 4 hours.
Reversibility	Reversible	Adverse effects from Project marine vessel movement would be reversible once the vessel passes.
Frequency	Frequent/ Regular	The Proponent estimates that approximately 40 LNG carriers would transit to the facility per year (3-4 per month) during operations. During construction and operations, worker ferries between Darrell Bay (or Squamish Harbour) and the facility would operate several times a day.
Likelihood	The likelihood of there being a residual effect on marine transport is considered moderate due to the presence of vessel traffic in Howe Sound.	
Significance	Considering the above analysis and the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse residual effects on marine transport.	
Confidence	Moderate level of confidence based on the Proponent's analysis and in consideration of data limitations for small recreational vessels.	

7.3.5 Cumulative Effects Assessment

Past, present and future project activities within the marine transport RAA include commercial transport, fisheries, recreational activities, and tourism activities that have the potential to interact with the Project and to result in cumulative effects on marine transport. Shipping activities associated with the following projects and activities were included in the assessment of cumulative effects:

The proposed BURNCO Aggregate Project would contribute an additional 320 movements per year, or an average of 34 movements per month to existing traffic along the proposed route. However, the BURNCO barge-shipping route would only interact with the proposed Project marine traffic in Queen Charlotte Channel between Bowyer Island and Passage Island. With the additional barging traffic from the BURNCO project, combined with LNG carrier movements, larger vessel traffic in Howe Sound would increase by an estimated 3 % per year.

The proposed Eagle Mountain-Woodfibre Gas Pipeline Project proposes approximately 18 passenger vessels and 6 material barge movements per week during the proposed 18-month construction period. This anticipated additional barge traffic combined with Project related barge and passenger vessel movements would represent an increase of 21 % in overall larger vessel traffic in Howe Sound. The combined cumulative increase in traffic density would only be evident within established shipping lanes in Howe Sound and over a short time period when the construction periods for the proposed Eagle Mountain-Woodfibre Gas Pipeline Project and the proposed Woodfibre Project overlap.

During Application Review, TC, SCRD, and Islands Trust expressed concerns that Project-related marine traffic would have a negative effect on marine users such as CRA fishers, and requested more information to understand the cumulative effects on marine transport, in particular inclusion of the proposed Eagle Mountain-Woodfibre Gas Pipeline project marine barging activity in Squamish Harbour.

> The Proponent responded that during construction, the proposed Eagle Mountain-Woodfibre Gas Pipeline Project would require access to existing barge landing sites at the Woodfibre property and two new temporary barge landing sites at Squamish River for construction activities. The combined cumulative increase in marine traffic density would only be evident within the established shipping lanes in Howe Sound, and over a maximum of 18 months. This potential interaction would take place only when the construction periods for the proposed Eagle-Mountain Gas Pipeline Project and the proposed Project overlap.
>
> EAO proposes a condition requiring the development of a marine transport management plan for construction and operations with the objective of mitigating and monitoring impacts to marine users. The plan would identify navigational routes, fishing areas, and recreational and tourism use and proposed Project activities that have the potential to interfere with these. The plan would also include mitigation measures to minimize displacement of marine-based recreational activities, methods to coordinate activities with FortisBC, and measures to inform potentially affected Aboriginal Groups and stakeholders.

The Proponent committed to undertake additional passage planning concerning the interaction of future traffic in studies as part of TERMPOL. Further consultation would be required and the possibility of sharing LNG carrier transit times with BURNCO would be discussed. The Proponent has also committed to engage FortisBC in the

development of the marine transport management plan to reduce the potential cumulative effects during the overlapping construction period.

EAO concludes that there is a moderate likelihood of adverse cumulative effects on marine transportation and use in Queen Charlotte Channel between Bowyer Island and Passage Island and in the area around the proposed Project area and Squamish Harbour.

7.3.6 Conclusion

Considering the above analysis and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on marine transport.

7.4 Visual Quality

7.4.1 Background

Visual quality was selected as a VC because construction and operation of the LNG facility, including LNG carriers at the FSO may alter visual quality from a number of viewpoints in the surrounding area.

The LAA includes key viewing locations, visually sensitive areas, Aboriginal Group reserves, recreation sites, and transportation corridors within 8 km of the proposed Project area. The RAA includes viewing opportunities beyond 8 km to a maximum extent of 15 km, which was determined as the extent of the visible area.

There are no regulations in BC that manage the effects of LNG facilities on visual quality; however, provincial policy for the management of visual resources exists as per the *Forest and Range Practices Act*, and identifies scenic landscapes as an integral component in natural resource development. Visual Quality Objectives (VQOs) are established by Ministerial Order through the Government Actions Regulation, which then become a legislated requirement that forestry activities must then conform to. VQOs may also provide a basis for the consideration of other landscape-altering activities. The Sea-to-Sky Land and Resource Management Plan guides the management of an appropriate level of visual quality from viewpoints within designated scenic areas.

7.4.2 Potential Project Effects and Proposed Mitigation Described in the Application

The Application reported that there are a number of sensitive viewing locations within the LAA and RAA, with most located along or near the Sea-to-Sky Highway 99. The communities of Britannia Beach, Furry Creek and Squamish are located along the Sea-to-Sky Highway 99 with many residences having views overlooking Howe Sound. Five provincial parks and protected areas are located along the Sea-to-Sky Highway 99. The Furry Creek Golf Course, Sea-to-Sky Gondola and Britannia Mine Museum are additional tourism and recreational sites with views of Howe Sound and the Project area.

The Application indicated that the Project would be located in visual sensitivity units (VSUs) that are considered highly scenic with a high ability to attract viewer attention. The landscape is, therefore, highly sensitive to human-made visual alteration and new alterations are considered likely to lead to public concern. There is also a moderate ability to absorb visual alteration while maintaining visual integrity. The management objectives of the VSUs indicate a rating of Partial Retention, which requires visible alteration to be 7 % or less of the total VSU area.

Seven receptor sites were used to evaluate the baseline visual condition of the VSUs, which included viewpoints from Porteau Cove, Highway 99/Minaty Bay, Furry Creek, Stawamus Chief parking lot, Howe Sound (Watts Point), Stawamus Chief (First Peak) and the Sea-to-Sky Gondola. The receptor sites were all land-based viewpoints with the

exception of the Howe Sound (Watts Point) receptor site, which is a viewpoint from the water. The analysis determined the VSUs as viewed from the receptor sites were rated primarily as Partial Retention although ratings of Modification (7.1 % to 18 % allowable visible alteration) were identified for some viewpoints.

To determine the predicted visual effect of the Project, a computer-generated landscape model was developed using spatial data from the baseline visual analysis and Project design. Three dimensional simulated images were generated for each receptor site and overlaid on photographs to represent the potential effect of the proposed Project.

For each receptor site, the existing disturbed area was combined with the estimated area of proposed Project disturbance within the visible area of the intersected VSUs. The resulting percentage value was used to determine the total area of visual alteration likely to occur as a result of Project activities. The Proponent considered the total percent alteration in determining if the proposed Project has the potential to result in a change beyond the existing management objective.

The analysis indicated that the receptor sites at Highway 99/Minaty Bay and Howe Sound (Watts Point) would be anticipated to experience an increase in visual alteration that is noticeable (see **Error! Reference source not found.**2 and **Error! Reference source not found.**3). The existing visual condition at the Highway 99/Minaty Bay receptor site would change from Partial Retention to Modification. Even so, the Application indicated that the overall visual contrast would be limited and consistent with the historical and existing level of disturbance of the Project area as well as the LAA and RAA.

The Application also included an assessment of potential light-related effects due to the proposed Project by measuring existing light conditions for sky glow and light trespass, and estimating future light conditions. The light assessment assumed the following Project design and operating considerations would be used for controlling light:

- Lighting fixtures would be fully shielded to minimize uplight to the atmosphere;
- Lighting would be designed to ensure light levels that meet worker health and safety requirements while minimizing luminous flux;
- Where doing so would not affect safety or operation of the proposed Project, non-essential lighting would be turned off;
- Where possible, onsite structures would be dark in colour to absorb most of the incident light; and
- Lighting would be directed downward and managed from the control room so that the amount of light required could be regulated for specific tasks.

The analysis indicated that Project-related light emissions are not likely to result in a change to the existing environmental lighting zone at the points of reference, which included sites at Britannia Beach and Darrell Bay.





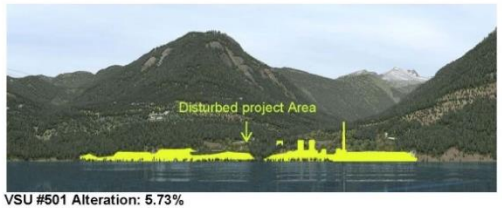
VSU #501 Alteration: 2.45%
VSU #504 Alteration: 0.72%

Degree of Contrast		Features			Overall Element Score	
		Land/Water	Vegetation	Structures		
		Disturbed soil (colour may vary and visible slopes.	Clearing exposes soil (colour may vary). Loss of texture from vegetation in cleared area.	Distinct colour of stack, Geometric forms of FSO and facilities.	10	
Elements	Colour	Weak	Weak	Weak	Low	3
	Form	Moderate	Weak	Moderate	Moderate	4
	Line	Weak	Weak	Moderate	Moderate	2
	Texture	Weak	Weak	Weak	Low	1

	Rational	Dominant	Co-Dominant	Subordinate	Inconspicuous
Scale Dominance	Small relative to landscape features			4	
Spatial Dominance	Located at edge and at bottom of descending ridge			4	
Overall Contrast Rating		Moderate		18	

Figure 7-2: Receptor site at Highway 99 / Minaty Bay





VSU #501 Alteration: 5.73%
VSU #504 Alteration: 0.43%

Degree of Contrast		Features			Overall Element Score	
		Land/Water	Vegetation	Structures		
		Disturbed soil (colour may vary) and angular slopes. Fine texture of slopes.	Clearing exposes soil (colour may vary). Loss of texture from vegetation in cleared area.	Distinct colour of stack. Detailed forms of FSO and facilities.	13	
Elements	Colour	Weak	Weak	None	Moderate	6
	Form	Moderate	Weak	None	Moderate	4
	Line	Weak	Weak	None	Moderate	2
	Texture	Weak	Moderate	None	Low	1

	Rational	Dominant	Co-Dominant	Subordinate	Inconspicuous
Scale Dominance	Features are apparent in size but occupying a minor portion of landscape features			4	
Spatial Dominance	Located at edge and at bottom of descending ridges			4	
Overall Contrast Rating		Moderate		21	

Figure 7-3: Receptor site at Howe Sound (Watts Point)

Following is a summary of the key mitigation measures included in the Application:

- Maximize the use of existing disturbed areas and minimize removal of vegetation;
- Reduce the level of contrast by finishing, re-finishing and maintaining the external surfaces of buildings with low glare materials and natural colours;
- Provide additional temporary or permanent vegetative screening of land-based infrastructure not currently screened by existing vegetation;
- Monitor and maintain natural screening to limit visibility of infrastructure and activity during operations; and
- Re-vegetate and re-contour disturbed areas.

7.4.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

The general public expressed concerns regarding potential effects on viewscapes from Britannia Beach, Minaty Bay and the Sea-to-Sky Gondola. The public also expressed concerns regarding the potential effects from increased light from the proposed Project on real estate values in Britannia Beach.

> The Proponent indicated that the visual effects of the Project are expected to be minor given the scale of the proposed Project and the historical and current level of human-related disturbance within the RAA. According to the Proponent, the proposed LNG facility would be designed to reduce the size of the disturbed area and to blend it into the environment as much as possible. Mitigation measures have been developed to avoid, minimize, restore onsite or offset the potential adverse effects of the Project. The Proponent assessed the potential changes in light due to the proposed Project on Britannia Beach as one of the light receptors. The conclusion of the assessment was that Project-related light emissions would not likely result in a change to the existing International Commission on Illumination environmental lighting zone or to result in a measurable contribution to sky glow or trespass levels at the receptor sites.

Representatives from the Sea-to-Sky Gondola expressed concerns about visual impacts from the proposed Project and submitted recommendations to help mitigate visual impacts.

> In response, the Proponent indicated that the Sea-to-Sky Gondola was one of seven viewpoints selected for the visual quality assessment. The Proponent indicated commitment to use building finishes that have low glare and natural colours. They also have committed to continuing to work with Sea-to-Sky Gondola representatives and other stakeholders to minimize visual quality impacts at the gondola and highway viewpoints as the Project design progresses. Additionally, the Proponent has indicated that the proposed Project's

landscaping plan would be shared with Sea-to-Sky Gondola representatives for review and comment.

EAO proposes a condition that would require the Proponent to develop and implement a visual quality management plan that specifies mitigation measures and includes a program to monitor and maintain natural screening and external finishes for minimal visibility of infrastructure. The Proponent would also be required to consult with BC Hydro and FortisBC to identify additional mitigation measures to minimize potential cumulative effects on visual quality from all three projects.

7.4.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effects on visual quality:

- Reduced visual quality due to site clearing, infrastructure development, and the mooring of LNG carriers.

Summarized below is EAO's characterization of the anticipated residual effects of the proposed Project, as well as EAO's level of confidence in the effects determination (including likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate resilience	The proposed Project and surrounding area have been visually modified by past development and activities but are considered visually sensitive with a limited ability to absorb modifications. The majority of the proposed Project area is a previously disturbed brownfield site.
Magnitude	Low	The proposed Project would result in a low visual change from the baseline conditions and is located in areas that have previously been altered by past development and activities. Two receptor sites are anticipated to experience an increase in visual alteration that is noticeable.
Extent	Local	The effects would be limited to some locations along Highway 99 and from some viewpoints along the water in Howe Sound.
Duration	Long-term	The effects would begin during construction and continue throughout operations and into decommissioning.
Reversibility	Reversible	The effects would be reversible after decommissioning and reclamation of the site.
Frequency	Continuous	Effects of the proposed Project infrastructure including the FSO would be continuous throughout construction and operations. Effects from LNG carriers would be intermittent during operations as 3-4 LNG carriers are expected to visit

Criteria	Assessment Rating	Rationale
		the facility each month and would be at the facility for approximately 24 hours to be loaded.
Likelihood	While there is a high likelihood of residual effects due to the nature of industrial development and infrastructure, visual quality is highly subjective and effects would be interpreted differently by individuals.	
Significance	Considering the above analysis and the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse residual effects on visual quality.	
Confidence	There is a moderate level of confidence in the analysis undertaken to support the conclusions, particularly in consideration of the effectiveness of mitigation and the likelihood of adverse residual effects.	

7.4.5 Cumulative Effects Assessment

The proposed Project is located in a region with past and current industrial, transportation and recreational uses, many of which have the potential to lead to reduced visual quality. The Application identified two other projects and activities in the RAA that have the potential to interact with the proposed Project and result in cumulative effects on visual quality based on line of sight from relevant receptor sites. These included BC Hydro's Woodfibre Substation and associated hydro lines and FortisBC's proposed Eagle Mountain-Woodfibre Gas Pipeline Project, both of which have the potential to introduce visual alteration to the visible landscape from receptor sites.

During Application Review, the DOS and general public expressed concern regarding the consideration of the cumulative visual quality effects resulting from the proposed BC Hydro Substation Project and the proposed Project.

> The Proponent responded that potential effects from other projects including the BC Hydro substation projects were considered in the cumulative effects assessment for visual quality based on the information that was available at the time of the assessment. The Proponent further indicated that discussions are ongoing between BC Hydro and the Proponent, a number of different scenarios are being considered, and no final decision has been made. Upgrades to the transmission system are being completed by BC Hydro and are outside the scope of the EA for the proposed Project.

The Proponent has committed to consult with BC Hydro and FortisBC to confirm construction areas and design to identify additional mitigation for potential cumulative effects on visual quality from these development projects. EAO proposes a condition to develop and implement a visual quality management plan that includes the requirement to consult with BC Hydro and FortisBC to identify additional mitigation measures to minimize potential cumulative effects on visual quality from all three projects.

In consideration of the above analysis and the mitigation proposed by the Proponent, EAO concludes that the residual adverse cumulative effects on visual quality would not be significant.

7.4.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on visual quality.

7.5 Community Health and Well-being

7.5.1 Background

Community health and well-being was included as a VC because of the potential for the proposed Project to affect the social and economic determinants of health and well-being.

The Proponent's assessment considered nine sub-components: employment and income; education and training; affordable housing; smoking, drug and alcohol use; community connectedness; accidents and mortality; health services; crime; and leisure and recreation. An assessment of the physical determinants of health is presented in section 9.1 (Human Health) of this Report. Employment and income were considered in section 6 (Economic Effects) of this Report, while affordable housing and health services were considered in section 7.1 (Infrastructure and Community Services), and recreation was considered in section 7.2 (Land and Resource Use).

The LAA for the assessment of community health and well-being encompasses the DOS, the RMOW and SLRD Electoral Area D. The RAA is the same as the LAA for this assessment.

7.5.2 Potential Project Effects and Proposed Mitigation Identified in the Application

Education and Training

Within the LAA, educational attainment is currently similar to the provincial average. The Application indicated that construction of the proposed Project is not likely to have a measurable effect on education and training due to the relatively short-term construction opportunities. For the operations phase, on-the-job employee training programs would be integrated into the proposed Project design to provide employees with the skills necessary to perform the duties related to their position at the proposed LNG facility. This is considered a positive effect.

Smoking and Drug and Alcohol Abuse

Smoking and drug and alcohol abuse influence overall health and well-being. The Application indicated that heavy drinking and cannabis use are estimated to be more prevalent in the North Shore/Coast Garibaldi Health Service Delivery Area than the rest of the Province, and are especially more prevalent in the Howe Sound Local Health Area (LHA).

The Application noted that higher incomes associated with the proposed Project could contribute to increased drug and alcohol use within a small segment of Project workers and their families. Lifestyle choices by some workers could result in increased spending of disposable income on alcohol and drugs. Substance abuse can have adverse effects on the health and well-being of the individual, families and the community as a whole.

The Proponent proposes the following key mitigation measures for smoking, drug and alcohol use:

- Implementation of a healthy living strategy;
- Establishment and enforcement of a substance abuse policy for workers;
- Addictions training for supervisors and managers to identify and offer support for workers who may be struggling with addiction;
- Providing life skills workshops; and
- Providing access to counselling services.

Community Connectedness

Community connectedness involves two social determinants of health, as identified by the Public Health Agency of Canada: community support and social environment.

- Community support is measured by the number and types of community organizations, sense of belonging and overall life satisfaction. The Application noted that there are over 100 community organizations in Squamish representing a broad range of interests. Self-reported sense of community belonging in the North Shore/Coast Garibaldi Health Service Delivery Area is higher than the provincial average, as is overall life satisfaction.
- The social environment is measured through the BC Stats socio-economic indices, which include 80 variables representing four key indicators: human economic hardship, crime, health problems and education. The Howe Sound LHA ranked 59 out of 77 on the overall regional socio-economic index.

The Application indicated that a typical work shift on a standardized schedule during construction of the proposed Project would be 10 hours, while a typical shift during the operations phase would be 12 hours. These work schedules could make it difficult for workers to participate in community activities and organizations, which could affect community cohesion and, in turn, have an adverse effect on the overall community health and well-being.

To mitigate the potential effects to community connectedness, the Proponent proposed to consult with representatives of community organizations about shift schedules to gather information about preferred shift scheduling options for workers.

Accidents and Mortality

The Application stated that the work shifts and long days associated with the proposed Project have the potential to cause fatigue and potentially lead to more traffic accidents. During construction and operations, it is anticipated that employees would work a 10-hour and 12-hour shift, respectively, and commute to and from the Project site via dedicated worker ferry. A return trip on the ferry would be approximately 1 hour long (30 minutes each way). Driving after a long shift (or consecutive long shifts) could increase the likelihood of fatigue impairment, which could contribute to traffic accidents as employees and contractors travel to and from the site.

To mitigate potential traffic accidents related to fatigued drivers, the Proponent would consider the use of employee buses and vans from designated locations in Metro Vancouver and Squamish. In addition, contractors would be required to have proven safety records and to comply with applicable regulatory requirements regarding shifts and driving hours.

EAO proposes a condition requiring the development and implementation of a traffic control management plan and a traffic impact assessment in consultation with the DOS and MOTI to guide the management of Project-related traffic including measures for traffic control, public communications, incident management and response, and plan implementation.

Crime

Project-related effects on crime may be associated with population increase from the in-migration of workers and, in particular, non-resident workers on short-term construction opportunities. The Application noted, that since most of the construction workforce would travel directly to and from the Project site, and since most of the operational workforce would live within the LAA on a long-term basis, the potential for increased crime as a result of the proposed Project is unlikely and no mitigation is proposed.

7.5.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

A number of Working Group members, in particular Vancouver Coastal Health Authority, requested additional details on the Proponent's methodology and rationale for the conclusion of negligible residual effects to community health and well-being.

> The Proponent issued a memo on March 31, 2015 that outlined the general qualitative approach taken to assess potential Project-related effects to community health and well-being. The memo described the interconnectedness (and often intangible nature) of the processes and factors involved and noted that the assessment involved a context-specific synthesis of information that acknowledged the source, limitations and uncertainties. The Proponent stated that the methodology used is consistent with best practices and that with mitigation, the residual effects associated with changes to community health and well-being are expected to be immeasurable within the broader community.

Members of the public raised the concern that construction of the proposed Project could cause an increase in crime in nearby communities.

> The Proponent indicated that the majority of direct construction employment (approximately 60 % or 1,067 FTE jobs) would be sourced from the local labour force, extending from Metro Vancouver to Whistler, and that this would minimize

Project-related effects on crime associated with population increase, especially non-resident workers on short-term construction opportunities.

Tsleil-Waututh Nation raised the concern that Aboriginal communities were not included in the assessment of community health and well-being. Tsleil-Waututh Nation expressed disagreement with the assessment boundaries, noting the dynamic nature of health through time and space, and that Tsleil-Waututh members living outside of the communities in the LAA have a connection to the area and may experience effects.

The Proponent indicated that the assessment of community health and well-being focused on communities that were located within the LAA and that members of the Tsleil-Waututh Nation residing within those communities were taken into account in the overall assessment. Tsleil-Waututh Nation communities are located at a distance from the proposed Project (Burrard Inlet) and would not be expected to be affected. Discussions are ongoing between the Proponent and Tsleil-Waututh Nation. An assessment of potential effects on Tsleil-Waututh Nation's Aboriginal Interests is provided in Part C of this Report.

7.5.4 Conclusions

Considering the above analysis and having regard to the conditions identified in the CPD and TOC (which would become legally binding as a condition of the EA Certificate), EAO is satisfied that the effect of the proposed Project on community and community quality of life would be negligible and therefore would not have significant adverse effects on community health and well-being.

8 Assessment of Heritage Effects

8.1 Heritage Resources

8.1.1 Background

Heritage resources are assessed as a VC because of their importance to Aboriginal Groups and British Columbians. The Application assessed the effects of the proposed Project on historical, archaeological and paleontological resources.

The LAA for historical, archaeological and paleontological resources was identical to the Project area and included both the marine and land-based portions. The RAA for historical resources was the same as the Project area. For paleontological resources, the RAA comprised the land surrounding and adjacent to Howe Sound, including the terrestrial areas captured within a 7 km buffer around the shoreline of Howe Sound. For archaeological resources, the RAA comprised a 10 km radius around the LAA.

Archaeological sites protected under the *Heritage Conservation Act* (HCA) are provincially regulated by the Archaeology Branch of FLNR, while historic and architectural sites are provincially regulated by the Heritage Branch of FLNR. Historic places may also be formally recognized and protected under the *Local Government Act,* and regulated by local governments. Historic sites are those defined by the BC *Archaeological Assessment Guidelines*, and architectural sites refer to modern (post-1846) sites, although not all post-1846 sites are architectural.

8.1.2 Potential Project Effects and Proposed Mitigation Measures in the Application

A desktop Heritage Resources Overview Assessment (HROA) was completed to identify known resources and areas of potential, identify potential effects, and determine where more detailed investigations should occur.

According to the HROA, the LAA for historical, archaeological and paleontological resources includes the location of a 20th century industrial facility and associated town site. Surface and buried historical features, including building foundations and infrastructure, and associated cultural materials may be located throughout the LAA. The HROA does not identify any previously-recorded archaeological sites in the LAA; however, there is the potential for undocumented sites to be situated in the LAA, including subsurface resources, surface lithic scatters, culturally-modified trees (CMTs), intertidal features and heritage wrecks.

While 47 previously recorded paleontological resources have been identified in the paleontology RAA, no paleontological resources have been recorded in the LAA. Even so, there is the medium potential for undocumented fossils and paleontological sites to exist in select portions of the LAA that could be affected by the proposed Project.

The following key measures to mitigate potential adverse effects to heritage resources would include:

- Avoid effects to heritage resources, if present, through partial Project redesign or relocation;
- Employ non-intrusive systematic data recovery techniques, which may include documentation of heritage resources, detailed recording of CMTs, or surface collection of paleontological material;
- Employ systematic data recovery (archaeological salvage or emergency excavation), if necessary, while ensuring applicable permits are sought;
- Continue monitoring where site-specific Project effects cannot be predicted or evaluated before construction or operation; and
- Develop heritage resource chance find management procedures to provide direction if unforeseen heritage resources are encountered.

In addition to the mitigation measures outlined above and based on the results of the HROA, the Proponent commits to completing a field-based Heritage Resources Impact Assessment (HRIA) prior to construction. The HRIA may include a preliminary field reconnaissance to refine archaeological and paleontological models, and help to focus the assessment for the presence of heritage resources. The results of the HRIA would be used to develop appropriate site-specific management and mitigation related to potential Project effects on heritage resources. The Proponent would require authorizations under the HCA prior to construction.

8.1.3 Potential Project Effects during Application Review

During Application Review, Tsleil-Waututh Nation expressed concerns that the erosion of shell middens by shipping activities (i.e., wake) was not included in the Application.

> The Proponent submitted a supplemental memo (*Woodfibre LNG Project Vessel Wake Assessment*, April 2015). The Proponent responded that the vessel wake assessment estimated that the wake generated by the carriers in normal conditions would be less than 10 cm at 50 m away from the LNG carrier, which would be less than the wind-generated waves typically encountered in Howe Sound. In addition, it identified that any wake generated by an LNG carrier along the shipping route would diminish in size the further it traveled away from an LNG carrier, and would be unnoticeable at the shoreline, given the natural occurrence of typical wind-generated waves in Howe Sound.
>
> EAO proposes a condition requiring the Proponent to develop a wake verification plan for operations that identifies monitoring areas within Howe Sound, at shorelines and in the ocean, to determine the accuracy of the results of the environmental assessment. The Proponent must engage Aboriginal Groups in developing and sharing information regarding implementation of the plan.

8.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the Project would result in the following residual adverse effect on heritage resources:

- Alteration to the integrity of and access to heritage resources.

Summarized below is EAO's characterization of the expected residual effect of the proposed Project on heritage resources, as well as EAO's level of confidence in the effect determination (including the likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Disturbance varies	The former mill and town site are located in the LAA and, as such, the potential exists for surface and buried historical resources to be present. There is also the potential for archaeological and paleontological resources to be located in the LAA. Heritage resources are protected under the HCA. Mitigation measures for potentially affected sites would be determined in consultation with the FLNR's Archaeology Branch and Heritage Branch, and may take the form of avoidance, systematic data recovery, and/or monitoring to avoid or reduce the loss of scientific data resulting from site destruction. Historical artifacts are not protected by the HCA.
Magnitude	Low	If previously unidentified heritage resources are affected, the information collected should generally mitigate these effects to that of a low magnitude.
Extent	Local	Generally limited to a site or sites within the Project area that would experience direct ground disturbance.
Duration	Permanent	Any heritage resources not collected or avoided prior to disturbance would likely be permanently destroyed if in the Project area.
Reversibility	Irreversible	Any permanent losses would be irreversible.
Frequency	Once	Disturbance to heritage resources would occur once (e.g., during construction ground disturbance).
Likelihood	The likelihood of residual effects on heritage resources is considered low to moderate as the results of the HRIA are pending, and systematic data recovery and implementation of a chance find procedure would decrease the likelihood of disturbance and permanent destruction of heritage resources.	
Significance	EAO notes that heritage resources are protected under the HCA and the mitigation measures for potentially affected sites would be determined in consultation with the FLNR's Archaeology and Heritage Branches and OGC. Considering the above analysis and having regard to the conditions identified in the TOC (which would become legally binding as a condition of an EA Certificate), EAO is	

Criteria	Assessment Rating	Rationale
	satisfied that the proposed Project would not have significant adverse residual effects on heritage resources.	
Confidence	Confidence in the overall effects assessment is considered high given that the Proponent has committed to completing a field-based HRIA prior to construction.	

8.1.5 Cumulative Effects Assessment

The Application indicated that FortisBC's proposed Eagle Mountain-Woodfibre Gas Pipeline Project and BC Hydro's proposed Woodfibre Substation would have potential residual adverse effects that could interact with the proposed Project's residual effect on heritage resources in a cumulative manner. The Woodfibre Substation site has been subject to archaeological and historical resources field reconnaissance, and no resources were identified. While paleontological resources were not considered in the field reconnaissance, the substation is situated in an area considered to be of negligible paleontological potential as identified in the model developed for the HROA for the proposed Project. Since there is a low to negligible potential for heritage resources to exist in the Woodfibre Substation site, the potential incremental effects to heritage resources are not likely to interact with residual adverse effects from the proposed Project to result in a significant cumulative residual adverse effect. The proposed Eagle Mountain-Woodfibre Gas Pipeline Project has implemented a HROA and initiated Archaeological Impact Assessment (AIA); however, at the time of writing, it is unknown if any resources have been identified in the area that would overlap with the proposed Project area.

In consideration of the above analysis, EAO concludes that the residual adverse cumulative effects on heritage resources would be not significant.

8.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse residual effects on heritage resources.

9 Assessment of Health Effects

9.1 Human Health Risk Assessment

9.1.1 Background

Public health was selected as a VC because the proposed Project has the potential to affect public health through the transfer of chemicals to humans and other biological receptors through exposure to air, water, soil and marine sediment or through food sources. The Application considered two VCs: a community health and well-being VC assessment focused on potential effects of the proposed Project on the social aspects of public health (assessed in section 7.5 of this Report) and a human health risk assessment (HHRA) VC considered the physical effects on human and other biological receptors, which is the focus of this section.

In BC, human health effects are assessed in relation to compliance with the BC *Public Health Act*, which is the responsibility of MOH. HC provides guidance on human health risk assessments and evaluates human health issues for major projects regulated under CEAA 2012. The methods used in the HHRA are based on guidance provided by MOE, HC, US EPA and other applicable risk assessment guidance documents and manuals.

The LAA for the HHRA included a 20 km by 20 km area surrounding the proposed Project. The RAA included a 50 km by 65 km area surrounding the proposed Project, including Horseshoe Bay to the south and the Squamish Nation Reserves to the north.

9.1.2 Potential Project Effects and Proposed Mitigation Described in the Application

The HHRA in the Application does not include the assessment of the chemical contributions from the historic operations of the former Woodfibre Pulp and Paper Mill since this contamination is addressed through site closure and the COC issued by MOE. Site investigation and HHRAs have been conducted as part of this closure process and are described in greater detail in Appendix 5.7-1 of the Application (Application for a Certificate of Compliance). In summary, the results of the Howe Sound sediment HHRA completed for the site indicate that adverse effects to Aboriginal and non-Aboriginal human receptors are not expected to occur in individuals consuming fish and crab at the concentrations measured in tissue samples obtained from the site area in both current and future use scenarios. The upland HHRA identified contaminants present at depth, but these would not be disturbed by proposed Project activities.

The COC requires that by January 1, 2016 the Proponent must complete a fish and shellfish tissue sampling program at the site to confirm that the risk to ecological and human health would be low and as predicted in the COC Application. The COC also requires the implementation and maintenance of a maritime exclusion zone to prevent entry by the public.

Based on the initial scoping and Project-environment interactions, the HHRA was subdivided into three separate risk assessments including acute inhalation, chronic inhalation and exposure to contaminants released into the environment (multimedia risk assessment). The HHRA considered air emissions during operations as a result of fugitive emissions from the landfill, amine unit incinerator, process combustion, flare pilots, fugitive emissions from the LNG facility, combustion from heating, ventilating and air conditioning equipment and marine vessel exhausts. The primary exposure pathway for this interaction would likely occur by inhalation, although there is potential for deposition of contaminants on soil and country foods and subsequent contact with or ingestion of these items.

Potential human health effects related to these risk assessments were evaluated for receptor locations near communities (14 locations), Aboriginal residences (17 locations), recreational areas (13 locations) and the maximum point of impingement. The Application indicated that there would be no adverse effects to human health due to noise, marine discharges, visual quality, light, or surface water quality. Potential direct effects related to these topics are assessed in other sections of this Report.

The acute inhalation assessment evaluated contaminants potentially emitted from the proposed Project that may pose an adverse health effect following short-term or acute exposure duration (i.e., 1 hour to 24 hour) to human receptors from normal and upset conditions. The contaminants assessed in the HHRA included: criteria air contaminants (e.g., sulphur dioxide, nitrogen dioxide); VOCs (e.g., 1, 3-butadiene, acrolein); metals (e.g., cobalt, lead); PAHs (e.g., anthracene, chrysene); particulate matter (e.g., PM10 and PM2.5); and reduced sulphur compounds (e.g., carbon disulphide, ethyl mercaptan).

No contaminants of potential concern (COPCs) were identified for the 1-hour exposure period. Dibenzo(a,h)anthracene was the only COPC identified for the 24-hour exposure period. Hazard quotients, which were used to evaluate the risk to human health based on the magnitude of the response, were calculated for dibenzo(a,h)anthracene. The hazard quotient values were predicted to be less than 1.0 for all locations except for the maximum deposition rate, where the hazard quotient is 1.4. In an assessment where only on-site exposures have been estimated, a hazard quotient of greater than 0.2 poses a potential concern and warrants further investigation, although does not necessarily indicate adverse health effects would occur due to the margin of safety that is applied in the predicted concentrations.

The chronic inhalation assessment evaluated contaminants potentially emitted from the proposed Project that may generate any adverse health effects following long-term or chronic exposure (i.e., many years to a lifetime). According to the Application, none of the predicted concentrations of contaminants exceeded the selected screening threshold for the chronic inhalation risk assessment, such that adverse health effects would not be expected to occur due to chronic exposure.

The multimedia risk assessment evaluated contaminants potentially emitted from the proposed Project that may generate an adverse health effect following long-term or chronic exposure (i.e., many years to a lifetime) to the applicable environmental media by the identified receptors. The risk assessment considered changes in chemical concentrations in several media; however, the assessment only considered metals that may be emitted by the proposed Project and accumulate in soil within the RAA. The risk assessment employs conservative estimates and compared baseline concentrations plus 10 % to relevant standards and guidelines. The Application indicated that the predicted metal concentrations would be anticipated to be less than the soil screening levels for the contaminants assessed and therefore no adverse health effects would be expected.

Mitigation measures related to acute and chronic inhalation are incorporated into the air quality predictions provided in the Application for the air quality VC. Additional mitigations are not identified, as the results of the HHRA do not indicate the potential for any adverse human health effects.

9.1.3 Potential Project Effects and Proposed Mitigation Identified During Application Review

The general public expressed concerns regarding the health effects of increased air pollution due to the proposed Project. For example, emissions of NOx and SOx can interact with other compounds to form fine particles, which can affect both the lungs and the heart and lead to reduced human health, especially for sensitive receptors, such as asthmatics.

> The Proponent responded that the proposed Project would be powered by electricity from BC Hydro as opposed to natural gas, which would reduce the emission of air quality contaminants of concern by up to 90 %. Air dispersion modelling was completed as part of the Application to predict air emissions from the proposed Project during operations. The results were compared against relevant guidelines and were below the air quality criteria.

HC requested additional information regarding the analysis for dibenzo(a,h)anthracene in the acute and chronic risk assessments. The inquiries were related to the hazard quotient and the baseline concentration of the contaminant applied in the evaluation. HC also questioned why dibenzo(a,h)anthracene was evaluated as a non-carcinogen using a hazard quotient instead of an Incremental Lifetime Cancer Risk given the Application indicates that the chemical is considered a probable human carcinogen. HC expressed concerns regarding the lack of modelling for the deposition of PAHs given that dibenzo(a,h)anthracene was predicted to exceed the relevant hazard quotient at the maximum point of impingement.

> The Proponent responded by providing additional information regarding the methods and approach used in determining if dibenzo(a,h)anthracene was a COPC and, in the case of the acute risk assessment, the magnitude of the potential hazard. The Proponent also responded that carcinogenic effects are not

typically included in an acute duration assessment although they were considered in the chronic inhalation assessment. The maximum predicted annual concentration of dibenzo(a,h)anthracene in air was below the screening criteria for both carcinogenic and non-carcinogenic effects and was, therefore, not retained as a COPC for the chronic assessment.

According to the Proponent, a hazard quotient of 1.0 is appropriate for the multimedia assessment as well as the acute and chronic air assessment according to HC and MOE. The Proponent explained that a hazard quotient of greater than 1.0 poses a potential concern and warrants further investigation, although does not necessarily indicate adverse health effects would occur due to the margin of safety that is applied in the predicted concentrations. The Proponent also explained that the use of HC's recommended HQ threshold of 0.2 would not have changed the outcome of the assessment, as only dibenzo(a,h)anthracene [24-hour predictions] was retained for further assessment based on the screening methods, which compared each of the COPCs to the most conservative regulatory threshold available.

Given the low magnitude of PAHs emitted from the proposed Project, the Proponent responded that as a small area of exceedance for a single PAH that is conservatively predicted to exceed a 24-hour threshold and occur over water as opposed to soil, and the conservative nature of the screening thresholds, PAH deposition was not modelled.

MOE, MOH and HC expressed the following concerns related to the Howe Sound sediment human health and ecological risk assessment appended to the Application:

1. The HHRA did not consider appropriate consumption rates for Aboriginal people;
2. The analytical and sample-specific detection limits for individual PAHs previously analyzed from crab tissue were too high to allow a quantification of consumption exposure estimates in the range relevant to decisions regarding health risk potential;
3. The marine resource sampling analysis plan did not include marine resources other than Dungeness crab;
4. Total toxic equivalencies for dioxins and furans exceeded CCME sediment quality guidelines for the protection of aquatic life, yet the COC Performance Verification Plan's required fish and shellfish tissue assessment program did not include requirements for analysis of dioxins and furan in crab tissue;
5. Baseline marine tissue data should be collected for dioxins and furans and other potential parameters; and
6. The HHRA did not adequately assess possible human consumption risks for other COPCs in aquatic species based on identified elevated concentrations of contaminants in sediment including copper, lead, zinc, methylmercury and tri-*n*-butyltin.

MOE, MOH and HC brought these concerns forward because the COC and supporting HHRA, which were appended to the Application, provided the rationale to not include

historical contamination in the assessment of Project-related effects on human health in the Application. MOE, MOH and HC indicated that because the Proponent would be undertaking specific pre-construction activities, such as dredging and removal of creosote-treated piles, there would be potential for the re-mobilization of legacy contaminants due to the disturbance of sediments.

In response to these concerns, the Proponent submitted a Technical Memorandum entitled '*Responses to the Ministries of Health/Ministries of Environment Comments on Howe Sound Sediment Human health Risk Assessment, Former Squamish Pulp Mill, Woodfibre, BC* (April 20, 2015),' which includes revised estimates of seafood consumption-based contaminant exposures using the assumed upper-limit daily consumption rates consistent with Aboriginal marine resource use and the associated health risk potential.

According to the results and in accordance with federal guidance, the risks were found to be unacceptable for Aboriginal receptors consuming fish and crab caught near the site. The risks were primarily attributed to cumulative PAH exposure, via the consumption of fish, followed by the consumption of crab muscle tissue. Notably, for many of the carcinogenic PAHs re-evaluated for risk, tissue concentrations were below detection limits in crab muscle, crab hepatopancreas and fish. The conservative nature of the exposure assumptions, given the lack of site-specific consumption data, likely overestimated potential exposure and risk. Furthermore, the Proponent is required under the COC to establish and enforce a marine exclusion zone to restrict public access to the water lots during the life of the proposed Project, which would discourage harvesting of fish and shellfish within the Project area.

The Proponent committed to undertake additional marine seafood resource sampling and analysis, which is also mandated under the COC issued for the site, described as a component of the Performance Verification Plan. As a condition of the COC, the Performance Verification Plan would also require the completion of a Fish and Shellfish Tissue Assessment Program by January 1, 2016. The Proponent committed to analyse crab and groundfish for PAHs, dioxins, furans, copper, lead, zinc, methylmercury and tri-*n*-butyltin during tissue sampling to be conducted during the summer and fall of 2015. The Proponent also commits to providing the tissue sampling workplan with MOE, MOH and HC for information purposes, as well as the results of the baseline tissue sampling.

EAO proposes a condition requiring the Proponent to develop a marine water quality management and monitoring plan for construction which must include the results of baseline shellfish and groundfish tissue sampling and the human health risk assessment, including polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and furans and TBT. The plan would also include a post-construction follow-up program to confirm human health risk assessment, including potential additional tissue sampling to confirm the assessment predictions regarding the bioavailability and bioaccumulation of toxins in marine

organisms consumed by humans, if the potential for human health risk is identified in the baseline HHRA.

Tsleil-Waututh Nation expressed concerns that the community's receptors, including Aboriginal use receptors, were not considered in the HHRA for the proposed Project. Tsleil-Waututh Nation also noted that a country foods survey was not conducted for the HHRA.

The Proponent responded that health risks associated with the proposed Project are not anticipated at locations of interest to Tsleil-Waututh Nation because the sites are likely outside of the "worst-case" boundary location. The Proponent reviewed the Tsleil-Waututh Nation TLU study and the locations of the traditional use sites identified by the Tsleil-Waututh Nation. The majority of the Tsleil-Waututh Nation traditional use sites fall within the RAA used for the HHRA. Forty-five locations were assessed as part of the HHRA and could be considered surrogate locations for other areas, including potential locations of interest to the Tsleil-Waututh Nation. Health risks associated with the Project are not anticipated at locations of interest to the Tsleil-Waututh Nation.

As no Project-related changes to soil and water quality are predicted (and subsequently impacts to the quality of country food items are not anticipated), the Proponent did not conduct a multimedia assessment, including a country foods survey. EAO required the Proponent to provide updated information for the HHRA assuming a higher consumption of country foods by Aboriginal people as compared to the general public, as described above.

EAO proposes a condition requiring the Proponent to develop a marine water quality management and monitoring plan for construction, as described above.

9.1.4 Characterization of Residual Project Effects

After considering all relevant proposed mitigation measures, EAO concludes that the proposed Project would result in the following residual adverse effects on human health:

- Inhalation exposures to dibenzo(a,h)anthracene.

Summarized below is EAO's characterization of the residual effects of the proposed Project, as well as EAO's level of confidence in the effects determination (including likelihood and significance).

Criteria	Assessment Rating	Rationale
Context	Moderate resilience	The health of the population is considered to have a moderate resilience to changes in air quality, as existing concentrations for all indicator CACs were below the most stringent air quality criteria.

Magnitude	Negligible to low	The hazard quotient for dibenzo(a,h)anthracene in the 24-hour acute air assessment was 1.4. Based on the conservatism in the exposure and toxicity parameters used in the risk assessment (e.g., use of chronic threshold value and assuming that all sources were operating at maximum capacity every hour of every day), the overall magnitude of risk for acute exposure to dibenzo(a,h)anthracene in air would be considered low and likely negligible. In addition, predicted 1-hour and annual air concentrations of dibenzo(a,h)anthracene would be over three orders of magnitude below their respective acute and chronic health-based air thresholds.
Extent	Local	The highest exposures to dibenzo(a,h)anthracene would occur at the maximum point of impingement (located outside of the Project area where maximum air concentrations are predicted to occur) for the 24-hour averaging time. Receptor locations further away from this area would be relatively less affected with a predicted hazard quotient of less than one.
Duration	Long-term	The duration of the effects on human health would be restricted to the life of the proposed Project (approximately 25 years).
Reversibility	Reversible	Effects to human health from exposure to dibenzo(a,h)anthracene would be reversible when proposed Project interactions cease.
Frequency	Continuous	Residual effects of exposure to dibenzo(a,h)anthracene would occur continuously throughout the operations phase, although respiratory events coinciding with periods of increased predicted concentrations are expected to occur sporadically (e.g., presence of LNG carriers).
Likelihood	The likelihood of residual effects on human health from exposure to dibenzo(a,h)anthracene is considered low due to the negligible to low magnitude of the predicted effect.	
Significance	Considering the above analysis and the conditions identified in the COC and TOC (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse residual effects on the physical aspects of human health.	
Confidence	There is a moderate level of confidence in the analysis undertaken to support the conclusions, particularly in consideration of the uncertainties associated with risk assessments.	

9.1.5 Cumulative Effects Assessment

The Application indicated that it was not possible to conduct a quantitative cumulative effects assessment for the physical effects on human health since there is insufficient information available to conduct air quality modelling of other certain and reasonably foreseeable projects and activities.

The assessment does include a qualitative discussion of cumulative effects for the atmospheric environment VC, which concludes that due to the distance between the existing and reasonably foreseeable projects and activities that would have the potential

to cumulate with the proposed Project the potential for cumulative air quality effects is negligible. The Application estimates that proposed Project-related emissions would be less than a 10 % increase from background concentrations at the location of reasonable and foreseeable project and activities.

EAO concludes that significant cumulative effects to human health are not expected as a result of the effects of the proposed Project interacting with effects of other past, present and reasonably foreseeable future projects and activities.

9.1.6 Conclusions

Considering the above analysis and having regard to the conditions identified in the TOC and the CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on the physical aspects of human health.

10 Accidents, Malfunctions and Effects of the Environment on the Proposed Project

10.1 Background

During the life of the proposed Project, unplanned events could occur resulting in potential adverse effects to environmental, social, health, heritage or economic values. The Application considered scenarios for each of the potential accidents or malfunctions, according to the likelihood of the scenario arising and the potential consequence or severity of the scenario arising. The Application also assessed how potential accidents or malfunctions could affect a range of VCs under a 'more likely' scenario as well as a 'credible worst-case' scenario.

During Application Review, EAO requested a supplemental memo to provide more information regarding the assessed risk from unplanned events and assessment of additional scenarios requested by the Working Group and the public (*Supplemental Report on Accidents and Malfunctions*, April 2015).

This section draws on information in the Application and the supplemental memo to provide an assessment of potential unplanned events associated with the proposed Project, the context within which they could arise, the potential impacts of each event and proposed key mitigation measures. Issues raised during Application Review are summarized, as well as EAO's conclusion on the consequence and risk posed by each unplanned event.

10.2 Accidents or Malfunctions

The following potential accidents or malfunctions are those assessed as being of greatest concern or potential consequence:

- Spills of toxic or hazardous materials (not LNG);
- Loss of containment of LNG at the facility or FSO;
- Explosion or fire at the LNG facility or FSO;
- Emergency facility shutdown;
- LNG carrier collision resulting in loss of containment and ignition; and,
- Project vessel collisions with other vessels or marine mammals.

Spills of Toxic or Hazardous Materials (not LNG)

Hazardous materials are defined according to the Spill Reporting Regulation under the BC *Environmental Management Act*. Various hazardous or toxic materials have the potential to be stored, used, or generated at the proposed facility including fuel (gasoline or diesel), solvent-or hydrocarbon-contaminated wastewater and surface runoff, catalysts and adsorbents, lubricating oils, solvents, untreated sewage, hydrogen sulfide (H_2S), benzene, and carbon dioxide (CO_2).

Vehicles and equipment used during construction and operations would contain fuel and other substances for their operations that could leak or spill, affecting the surrounding environment. The most likely scenario involving a hazardous material spill is a relatively small volume spill (less than a few litres) of fuel, hydraulic fluid, lubricants, sewage, concrete fines or other hazardous materials. Such spills are typically highly localized, limited to the required containment areas, and rapidly cleaned up by onsite crews using standard equipment and materials. The credible worst-case scenario for a facility-related hazardous material spill is a fuel delivery truck rollover, leading to a subsequent release of fuel into a stream, and transportation of material downstream to the marine environment.

The effects of a spill would depend on the characteristics, location, and volume of material spilled. A spill of fuel could potentially affect site contamination, freshwater and marine water quality, vegetation communities, freshwater and marine fish and fish habitat, marine and terrestrial wildlife, current use of land and resources, heritage resources, and human health.

This worst case type of event is considered rare or unlikely to occur during the life of the proposed Project. The consequence of such an event would range from minor to moderate without the implementation of any mitigation, but would be negligible to minor with the implementation of appropriate mitigation. While the consequences of a spill on water quality and amphibians would be moderate to high, the effects would be localized and fully reversible within a short-term and the event is considered unlikely. This scenario would be assessed further in a detailed Quantitative Risk Assessment (QRA) required by OGC during permitting.

Key mitigation proposed to address spills includes:

- Implementation of the Emergency Response Plans (ERPs) and other management plans, including the Spill Contingency Plan, that would set measures and controls to prevent release of toxic or deleterious substances into the marine environment as a result of unplanned events, and also to contain and clean up spills and leaks in the event that an accidental release takes place;
- Storage of hazardous materials would be prohibited within 30 m from waterbodies and other sensitive habitats;
- Appropriate emergency spill kits would be available at key locations on site;
- Spills would be reported and recorded and a formal investigation would be conducted if necessary;
- In the case of a reportable spill, the closest Coast Guard station or emergency coordination centre would be contacted;
- All operation-phase employees, contractors, and subcontractors would be trained and equipped to provide initial response or notification for hazardous materials spills; and
- Bunkering of fuel oils would be prohibited at the terminal regardless of whether loading operations are occurring.

Loss of Containment of LNG at the Facility or FSO

Several different scenarios relating to loss of containment of LNG are considered in the Application. During operations, LNG spills could originate from leaks within the LNG facility, the FSO along the loading line, or at the loading arm that connects to the berthed vessels receiving the LNG. The likelihood of LNG release is rare. The credible worst-case scenario is the release of LNG to the marine environment from one FSO tank. A release of LNG to the terrestrial environment would be contained as the entire upland processing train sits within a concrete bund that would capture and contain any spilt LNG.

If a large leak occurs during processing, it is expected that it would be detected through the facility monitoring system and the emergency shutdown would be initiated. Isolation valves would be used to contain the leak in a relatively short time. The credible worst-case scenario is the failure of a blow-down valve and release of the large volume of LNG inventory contained within a segment between two emergency shutdown valves. The result would be the formation of a vapour cloud with the majority of spilt LNG contained within the containment area.

Given the nature of LNG (e.g., extremely cold liquid that is much lighter than water), any liquid that exits onto water or land would spread on the surface and would quickly or immediately vapourize. An LNG spill could cause localized freezing, followed by a vapour cloud extending from the spill, but no soil contamination or effects below the water surface. Vapours would consist mostly of methane and would be expected to rapidly dissipate from the spill site as the natural gas dilutes into the surrounding air. A scenario involving an ignited vapour cloud resulting in a jet fire, pool fire, flash fire, or an explosion, is described more fully in the section below.

The effects of an LNG spill would depend on the characteristics, location, and volume of material spilled. A spill of LNG could potentially affect human health, contribute to atmospheric GHGs, and affect marine and terrestrial biophysical VCs including fish, birds and wildlife by loss of habitat and injury to individuals in the immediate area due to freezing or inhalation of vapours. The Application states that the main route of exposure of methane to people is through inhalation, which may cause drowsiness, headaches, dizziness, and possibly unconsciousness or asphyxiation at higher concentrations above the upper flammable limit. Similar effects may be expected in wildlife and birds. Lethal effects from LNG vapours would be localized to the vicinity of the spill site where the concentration of vapour would be highest. Similarly, a release of LNG to the marine environment is not expected to result in toxic effects as LNG does not persist in the environment, is odourless, colourless, and non-corrosive, leaves no residue, and is non-toxic to marine biota. As such, no cleanup actions are anticipated to be necessary as a result of an LNG spill. There is a potential that an LNG release could temporarily exclude fishing, recreation or marine transportation from the area of a release.

While the consequences of such an event could be high, this event is considered rare to occur during the life of the proposed Project due to preventative mitigations and the

regulatory regime. This scenario would be assessed further in a detailed Quantitative Risk Assessment (QRA) required by OGC during permitting.

Key mitigation proposed to address loss of containment includes:

- Prior to construction, conducting a risk assessment to identify high-risk locations and activities, and developing measures to reduce the identified risks and site- and activity-specific response measures;
- Use of control procedures to reduce effects, including the use of a fire water monitor to disperse the vapour cloud, water curtains around the source of leak, and a foam generator;
- A thorough investigation would be conducted to identify the cause of the leak and other inherent failures to prevent recurrence;
- Industry-standard personal protection equipment would be required and provided to staff and contractors to prevent worker injury in the event of a spill;
- A combination of a drainage system and a bund surrounding the proposed facility would be used to collect any spills in the process area;
- Spaces would be designed to reduce LNG congestion and to reduce the number of contained spaces where LNG vapour could accumulate and explode if ignited; and
- Fire and gas detection systems would mitigate against a risk of escalation.

Explosions or Fire at the LNG Facility or FSO

The Application and supplemental Accidents and Malfunctions Memo considered several explosion and fire scenarios resulting from loss of containment of LNG, including at the facility and at the loading arm and FSO.

Potential events at the loading arm and loading from the FSO to the LNG carrier could include a flash fire from a loading arm failure, a vapour cloud explosion, and a pool fire from a spill while loading the LNG carrier. Explosion or fire as a result of an accident involving a transiting LNG carrier is assessed separately, below. The credible worst-case scenario at the facility is an LNG explosion or fire that could potentially result in human fatalities outside the facility. The likelihood of this scenario occurring to individuals outside of the Project area is low since there are no populated areas adjacent. The closest populated areas to the proposed Project are Britannia Beach (5.8 km), Darrell Bay (6.1 km), and the Squamish city area (7.8 km).

LNG, as a liquid, is not explosive, and is dispersed in the air when exposed to a warmer medium. When a natural gas vapour cloud is within its narrow range of flammability in air, it would rapidly combust and burn back to the source, but would not explode. Rapid phase transition, where LNG expands explosively into a vapour, can occur if LNG quickly absorbs heat from a water body or if a build-up of LNG vapour occurs in a poorly ventilated or confined area. Explosions of LNG are improbable, except in poorly ventilated, confined conditions, when natural gas vapours are present within the range of flammability and exposed to an ignition source.

A flash fire, vapour cloud explosion, or pool fire of LNG at the facility has the potential to affect noise, light, air quality, contribute to GHGs, and affect birds, wildlife, vegetation and other resource users. A fire associated with a LNG release to the marine environment could also affect marine species. An explosion or fire at the site could potentially result in fatalities and injuries to workers. This scenario would be assessed further in a detailed QRA required by OGC during permitting. No fire or explosion scenarios within the plant facility are predicted to extend beyond the facility boundaries or the marine control zone, so the consequences to the public would be negligible. A fire or explosion of natural gas in a worst-case scenario would result in the emission of air contaminants of similar quantities to the emergency flaring scenario.

While it is unlikely that a fire would extend beyond the boundaries of the LNG facility, there is a remote possibility that an event at the facility could ignite surrounding vegetation, which could result in broader effects on vegetation and wildlife. The potential for adverse effects of fire to ecological receptors varies with location and size, and time of year. A large fire that spreads beyond the Project footprint during summer could result in long-term consequences.

While the consequences of such an accidental event would be high, this event is considered rare to occur during the life of the proposed Project due to effective preventative mitigations, best management practices and the regulatory requirements as outlined in section 11 of the Application.

In the event of flash fire, vapour cloud explosion, or pool fire from loss of LNG containment, actions would be initiated in accordance with Emergency Response Plans to protect human safety as a priority. The primary mitigation involves managing a LNG spill scenario to avoid a fire or explosion.

Key mitigation proposed to address explosions or fire include:

- Prior to construction, conducting a risk assessment to identify high-risk locations and activities, and developing measures to reduce the identified risks and site- and activity-specific response measures;
- Using control procedures to reduce effects, including the use of a fire water monitor to disperse the vapour cloud, water curtains around the source of leak, and a foam generator;
- Designing and arranging equipment and materials that pose a fire hazard to reduce the probability of fire escalation in the event of fire;
- Selecting fire-resistant construction materials and methods for selected load-bearing structures, such as pipe racks and vessel skirts;
- Locating firefighting equipment at pre-determined, strategic locations in the process areas;
- Supplying water to a storage tank for a gravity-fed firefighting system, plus providing a secondary system to pump seawater if required; and
- Using a fire and gas detection system linked to the emergency shutdown, which focusses on early detection and isolation.

Emergency LNG Facility Shutdown

In the event of an emergency upset or power outage, the flare stack would be used as a safety measure to prevent the accumulation of gases and protect plant components from overpressure. The flare system would be designed for short-term use during commissioning, plant start-up, planned shutdowns (maintenance), and for emergency scenarios to reduce the gas pressure at the facility during a fire, LNG spill, or when an emergency shutdown button is triggered. Any safety flaring would be of very short duration and would not occur during normal operation. The flare system would consist of a warm-flare system and an independent cold-flare system (for cryogenic reliefs).

As part of the application for a Facility Permit, the Proponent would be required to provide OGC with flaring, venting and relief system designs, comprehensive safety studies, a QRA, and the results of a preliminary hazard identification study. As part of Leave to Commence Construction, they would be required to provide updated hazard and safety studies.

Additional information on flaring, including effects from routine flaring, unplanned shutdowns and emergency flaring was provided in a supplemental memo (*Planned and Emergency Flaring Supplemental Report*, June 2015).

The credible worst-case scenario involves shutdown of both production trains at the LNG facility and flaring of feed gas for 10 minutes with a flare height above the flare stack of 50 m to 60 m. The likelihood of this scenario occurring is considered rare due to preventative mitigations and the regulatory regime. Such an event would release contaminants into the atmosphere. The release of H_2S during emergency flaring is not expected to affect human and ecological health, as the H_2S content of the natural gas supply is low, and it is assumed that nearly all H_2S would be oxidized to SO_2. Air contaminants would not affect personnel offsite or occupied neighbourhoods nearby (the closest populated area is 5.8 km away at Britannia Beach), but could affect nearby workers at the facility.

Some noise and visual disturbance from light would occur beyond the Project area for a short period of time. Flaring would generate heat for a short duration, but the consequences would be negligible. Allowable thermal radiation levels are established in the LNG Facility Regulation and the Proponent would be required to demonstrate that the Project complies with these levels. Birds and bats in the area may be attracted by the light produced by the flare (in particular if the event occurred in low light or night conditions) changing their migrating or foraging behaviours or potentially resulting in mortality. The magnitude of residual effects of emergency flaring on birds and bats is expected to be low and short-term in duration. Residual effects of an emergency LNG facility shutdown on air quality, the acoustic environment, visual quality and human health are assessed as negligible. Despite the potential consequences of such an event, this event is considered rare to occur during the life of the proposed Project due to effective preventative mitigations, best management practices and the regulatory requirements.

Key mitigation proposed to address emergency LNG facility shutdown include:

- Implementation of control and emergency shutdown systems, including protection barriers to safely shut down equipment;
- Implementation of a flare design with minimum destruction efficiency of 99.5 % and continuously lit pilot light(s);
- Implementation of administrative controls, including safe work procedures, work permits, and an ERP;
- Maintenance of emergency generators sufficient to restore power to the facility if external power fails;
- Design of the flare so that radiation levels are in accordance with the LNG Facility Regulation under the *Oil and Gas Activities Act*; and
- Conduct a complete hazard analysis, site-specific safety studies and a detailed QRA prior to construction to confirm the design scenarios for these units and ensure safety of the facility.

During Application Review, the Proponent also committed to undertake additional calculations and dispersion modelling with respect to thermal radiation from the flare, during detailed design, to assess the effects to personnel and equipment within the facility area. The Proponent committed to active outreach and communication with local aircraft operators and Squamish airport regarding flaring activities and to engage NAV Canada in order to provide them with the information required to update NAV Canada's charts.

LNG Carrier Collision Resulting in Loss of Containment of LNG and Ignition

The worst-case scenario for LNG release to the marine environment would involve the loss of containment from the largest LNG tank with a volume of 50,180 m^3 with a hole size of 750 mm, although it is very unlikely that this scenario would occur. The Application reports that while LNG carriers worldwide have experienced a number of minor collisions, none have resulted in a containment failure or release of cargo. For a collision to result in loss of containment, the collision would have to possess enough force to pierce twin hulls, the skirt, and the LNG sphere. Vessels in Howe Sound are not expected to have sufficient size (weight) and speed to generate the force required to rupture the LNG tank. Despite BC Ferries vessels being much smaller than the required weight to pierce an LNG tank, for this assessment, collision with a BC Ferries vessel was considered as the ferry would be the largest and most frequent other vessel in the shipping route traveling on a perpendicular course to the LNG carriers.

A grounding event is also considered unlikely since the majority of the shipping route would be in established shipping lanes with a minimum water depth of 60 m and the carriers would be accompanied by at least three escort tugs and guided by two BC Coast Pilots. The only credible grounding scenario in Howe Sound is the powered grounding of an LNG carrier. A powered grounding could result from navigational errors, propulsion or steering failure, or emergency maneuvers to avoid collision with another vessel. If an event occurred, it would most likely be a low-energy grounding which would

be unlikely to result in serious damage to the carrier as the three escort tugs would be capable of immobilizing and assisting the vessel.

A potential LNG carrier collision resulting in an LNG containment leak could result in loss of LNG into the marine environment. LNG weighs less than water, so it would float, and reduce the temperature of its immediate surroundings as it vapourizes and mixes with air. Since the temperature of saltwater is much higher than LNG, the LNG pool would rapidly vapourize until the whole pool is evaporated. Within the immediate area of a significant spill, people or ecological receptors would experience frost damage or mortality (due to freezing). The vapour cloud would contain methane and could cause nausea, headaches, dizziness, or asphyxiation and possible mortality at the higher concentrations, closer to the source of the leak. However, since methane gas is lighter than air, in an uncontained environment such as on the ocean the vapour cloud would disperse quickly with the wind to the upper atmosphere. In the unlikely absence of wind, the cloud would disperse more slowly.

LNG in liquid form is not flammable and in a gaseous state is only flammable in a narrow range of concentrations. The most likely source of ignition would be at the time of collision due to the friction of the collision or a spark, and therefore the effects would be limited to the immediate vicinity of the event. An ignited LNG spill could lead to a flash fire or a pool fire depending on the rapidity of ignition post-spill. A fire could cause burns or mortality to people and other organisms in the immediate vicinity of the fire. While the likelihood of such an event occurring is considered very rare given the specific conditions that would need to be in place for ignition to occur, the consequences of an event could range from minor to severe depending on the specific circumstances. The preliminary QRA for the Project modelled a worst-case scenario and more likely scenario. In the worst-case scenario, an LNG vapour cloud could travel approximately 408 m before reaching the lower flammable limit. In the more likely scenario with a smaller hole size, the LNG vapour cloud would travel approximately 293 m before reaching the lower flammable limit.

The magnitude of residual effects of an LNG carrier collision or grounding resulting in loss of containment of LNG and ignition on air quality, greenhouse gases, wildlife, fish, and public safety are assessed as high, with a mostly localized and short-term effect. While the consequence of effects could be severe, after mitigation, the likelihood of such an event is considered unlikely to rare.

In the unlikely event of a LNG carrier collision or grounding resulting in an LNG containment leak and ignition, actions would be initiated in accordance with the ERP to protect human safety as a priority. The risk of collisions would be managed through a combination of industry standards, regulatory requirements and Project-specific mitigation. For example, LNG carriers are required to be double-hulled with double-walled fuel lines. Regulations require that there be fire protection, independent LNG cargo areas and separation between engine and cargo. In addition, the proposed key mitigation includes:

- A safety awareness zone around a transiting LNG carrier using three escort tugs to provide warning to other marine users of the approaching vessel and assistance if needed;
- Use of firefighting equipment and suppression systems on board each vessel and implementation of control procedures to reduce potential effects, including the use of a fire water monitor to disperse the vapour cloud, water curtains around the source of leak, and a foam generator;
- LNG carriers would transit at low speeds in Howe Sound; and
- LNG carriers would be piloted by two experienced BC Coast Pilots through Howe Sound.

Project Vessel Collisions with Other Vessels or Marine Mammals

The Proponent's assessment included the potential for Project-related vessels, such as the LNG carrier and worker ferries, to collide with recreational watercraft such as a kayak, paddleboard, kiteboard, other small vessels and with marine mammals.

An LNG carrier would be transiting within the established marine shipping route in accordance with a posted schedule and at low speed; however, due to the size of the LNG carrier, there may be limited capacity to maneuver to avoid a recreational vessel in its path. However, three tugboats would accompany each LNG carrier transiting Howe Sound that could assist the vessel to maneuver, if required. Under the Collision Regulations (Government of Canada 2008a) smaller vessel operators (such as sailing vessels and fishing boats) would be expected to yield to the larger vessels. The Proponent would be required to develop a management plan to manage the interaction of Project vessel traffic with other marine users.

The information provided by the Proponent in the supplemental Accidents and Malfunctions Memo concludes that such an event would be unlikely to occur due to the use of three escort tugs, including one travelling in front of the vessel to warn any boaters who may be in the way of the vessel and the need to move out of the way.

Worker ferries would run regularly during construction between Darrell Bay and the proposed facility. Following initial operations, the worker ferry may run between Squamish Harbour and the proposed facility; however, the Proponent has not yet determined if the Squamish Harbour would be used as the departure point for the worker ferry. If worker ferries ran from Squamish Harbour, there would be a low potential for a collision with a recreational vessel in Squamish Harbour area where there are a higher number of recreational boaters. The likelihood of such events occurring is considered rare. More information about the potential effects on marine transport is provided in section 7.3 of this Report.

A collision between a Project vessel (such as an LNG carrier or a worker ferry) and a recreational vessel could result in a fuel spill, which would impact water quality, benthic habitat and fish and fish habitat. A collision could also impact public safety and worker safety of those people involved in the event, causing potential injuries or mortality.

The Application and Supplemental Memo assessed the potential for injury or mortality of marine mammals due to vessel strikes and concluded that with the proposed mitigation (primarily reduced speed of LNG carriers along the shipping route), the likelihood of a vessel striking a marine mammal would be considered rare and the consequences would be minor to moderate. Therefore, the risk of marine mammal strikes is considered low and the long-term viability of marine mammal populations in Howe Sound is unlikely to be affected. The Proponent's Application reported that low vessel speeds (less than 14 knots) have been found to greatly reduce the likelihood of ship strikes on marine mammals by providing time for these animals to avoid oncoming vessels, as well as time for crew to detect and avoid marine mammals during transits. Furthermore, the potential for a vessel-mammal collision would be limited to the proposed LNG carrier route.

In the event of a project vessel collision with a recreational vessel, actions would be initiated in accordance with ERPs to protect human safety as a priority. The primary mitigation involves avoidance of collisions.

Key mitigation proposed to address vessel collisions with other vessels and marine mammals include:

- Creation of a safety awareness zone around a transiting LNG carrier using three escort tugs to provide warning to other marine users of the approaching vessel and to assist if needed;
- Requiring LNG carriers to be piloted by experienced BC Coast Pilots through Howe Sound;
- Requiring LNG carriers to transit at low speeds in Howe Sound;
- Establishing speed profiles for different carrier route segments, exchanging information on marine mammal activity between pilots, and altering course and reducing speed if a marine mammal is sighted in the path of a vessel;
- Implementing a Squamish Harbour Vessel Traffic Plan that would manage the interaction of Project vessel traffic with recreational and tourism areas;
- Using Darrell Bay terminal for the worker ferry, where there is less marine vessel traffic; and
- Reporting marine mammal incidents to the DFO Observe, Record and Report 24-hour hotline.

Cumulative Effects from Accidents or Malfunctions

The Application describes potential cumulative effects of accidents or malfunctions associated with the proposed Project.

Potential adverse cumulative interactions associated with effects at the facility site were considered for the proposed FortisBC Eagle Mountain – Woodfibre Gas Pipeline project, the Woodfibre substation project, as well as for mineral claims, and forestry activities. These projects and activities, and their potential added effects to surface water quality in the proposed Project area have the potential to result in cumulative effects in the event of a spill or other accident resulting in impacts to water quality, fish

and fish habitat. The proposed BURNCO Aggregate Project and the proposed Project both have the potential for a fuel spill that could migrate to Howe Sound to affect marine water quality, benthic habitat and marine fish and mammals.

The increased number of vessels operating in Howe Sound as a result of the proposed FortisBC Eagle Mountain – Woodfibre Gas Pipeline Project, the BURNCO Aggregate Project, and other existing industrial, commercial and recreational vessels could result in potential cumulative effects related to increased risk of marine vessel collisions in portions of Howe Sound, both with other vessels and with marine mammals. The effects of such collisions are discussed in the sections above and could result in impacts to marine water quality, benthic habitat, marine fish and mammals as well as public health and safety.

A summary of issues raised during application review and general conclusions on accidents and malfunctions is provided in sections 11.1 and 11.2 of this Report, respectively.

10.3 Effects of the Environment on the Proposed Project

The following environmental events and processes were assessed in the Application with respect to their potential to affect the proposed Project and result in potential adverse effects to VCs:

- Extreme weather;
- Natural seismic events;
- Slope stability and mass wasting;
- Wildfire; and
- Predicted future climate scenarios.

Extreme Weather

Extreme weather and weather-related events considered in the Application included wind and waves, fog, extreme temperatures, lightning, drought, and flooding from precipitation or ocean conditions.

In the regional context, Howe Sound is typical of many fjords along the coast of BC that experience strong outflow winds during winter. The strongest winds at the Project site are anticipated to be funneled from the northeast and east. Extreme winds may produce high waves, dense blowing sea foam, heavy tumbling of the sea, and poor visibility, all of which could make land and marine working conditions hazardous, and potentially result in temporary closure of facilities. Wind and sea conditions can affect several aspects of shipping operations, including delaying pilot boarding or disembarking, docking, and LNG transfer.

The proposed Project area is protected from waves and swells from the Strait of Georgia by Bowen Island and Gambier Island, although there is potential for buildup of wave action from winds moving up Howe Sound. The marine Project components, such

as the FSO and ferry dock are somewhat sheltered from incoming waves and swells. LNG carriers are designed for open ocean transit and are unlikely to be affected by the largest waves possible in Howe Sound. Similarly, ocean-going tugs would be used and therefore interactions between waves and LNG carriers with their tugs are considered negligible.

Howe Sound and its approaches are subject to mandatory pilotage, which further increases safety during transit in fog or other conditions of reduced visibility. Pilots would board LNG carriers at the Victoria station and would bring LNG carriers into the proposed Project's marine terminal only in safe weather conditions and in compliance with terminal operation limits. In order to prevent loss of containment during loading of the LNG carrier in high wind conditions, there would be an emergency release system between the FSO and the LNG carrier. During extreme wind and wave events, if the movement between the FSO and the LNG carrier is outside safe operating parameters, the LNG transfer would safely shutdown and release the LNG carrier from its mooring, allowing the LNG carrier to move away from the FSO with assistance from the tugs on standby.

The Proposed Project would be designed for extreme temperatures (37.5 ºC and -20.5 ºC). Over the life of the proposed Project, occasional extreme temperatures could be expected to interrupt operations temporarily.

There is a potential for lightning strikes to occur in the Project area during the life of the Project, although most often lightening is accompanied by rains in the region, reducing the chances for wildfire ignition. A discussion of potential wildfires (that could result from lightning) is considered in the effects of the environment on the Project section below. In compliance with safe terminal operations, LNG loading operations would be suspended whenever lightning is observed in the vicinity.

Drought may indirectly affect the Project through low flows in Mill Creek and Woodfibre Creek, which would limit the process water supply. If streamflows are less than the minimum instream flow release, required to protect fish and fish habitat, water would not be withdrawn from Mill Creek and alternate sources of process water would be investigated. If an alternate source of water cannot be located, the LNG facility would be shut down until streamflows are sufficient to permit water extraction.

Flooding of the proposed Project area could occur from the streams on the site or from ocean flooding during storm events combined with a high tide. Based on the assessment of flooding risk, no overbank flow is anticipated along the lower portions of Mill Creek or Woodfibre Creek channels during an instantaneous one in 200-year peak flow event. Project components would be designed and constructed with consideration to the potential for marine flooding due to high tides and storms.

Given the location and appropriate design criteria of the proposed Project and proposed mitigations, it is highly unlikely that extreme weather would have a serious or long-term

adverse effect on the proposed Project. Short-term impacts causing delays or disruptions could occur.

Key mitigation measures proposed to address potential effects from extreme weather include:

- Weather and visibility stations would be built into the FSO infrastructure;
- Permanent vessel moorage for the LNG carriers and infrastructure would be designed to safely withstand extreme weather, wind, and marine conditions;
- An emergency release system between the FSO and the LNG carrier would be built;
- Wind, waves, currents, and tides would be monitored;
- The Project design would meet the survival condition (state where a vessel could remain safely moored at berth) threshold for new terminals (i.e., maximum wind velocity for a 30-second gust and a 25-year return period);
- Project-related vessels would only operate under safe weather conditions;
- If an alternate source of freshwater cannot be located, the LNG facility would be shut down until streamflows are sufficient to permit water extraction or water would be imported as needed to continue operations;
- LNG loading operations would be suspended whenever lightning is observed in the vicinity;
- Project infrastructure would be located outside of the Green Zone or a minimum of 30 m from the creek banks; and
- A perimeter dyke would be constructed along the shoreline to for wave protection and a minimum setback distance from the shoreline would be incorporated into the design of land-based components.

Natural Seismic Events

The proposed Project may experience potential adverse effects related to natural seismic events, including seismic ground motion (earthquakes) and associated events including liquefaction and tsunamis. The seismic hazard along the west coast of BC is substantial due to earthquakes that occur along offshore faults and along the Cascadia subduction zone. There is potential for very large earthquakes of magnitude 8.0 to 9.0.

The LNG facility, buildings, and FSO jetty would be designed to withstand a one in 2,475 year earthquake. Site-specific seismic hazard analyses were conducted to provide seismic parameters for design of Project components. The Proponent conducted a geotechnical site investigation that included onshore and offshore drilling, sample collection, downhole in situ material testing, downhole geophysics, surface geophysics, and laboratory testing. A worst-case scenario involving an earthquake with a magnitude substantially greater than the Project design for earthquakes could result in damage to the Project that could not be restored, either technically or economically. In addition, earthquakes could cause or contribute to steep slope landslides, rock falls, or debris floods on steeper terrain within the Mill Creek and Woodfibre Creek watersheds at higher elevations above the Project, resulting in damage to Project components, such as bridges.

Seismic activity of the region could result in a tsunami. Potential tsunami hazards for the Project site are those propagating from the Pacific Ocean, or from landslides or river delta failures within Howe Sound. Effects associated with exposure to a tsunami event would include mass-wasting and flooding, shoreline instability, and erosion. The Application reports that tsunamis generated within Howe Sound would likely be caused by terrestrial landslides and submarine slope failures, the latter of which have occurred at the Project site, Porteau Cove, Furry Creek, and Britannia Beach. However, there have been no recorded tsunamis from these events and the likelihood of tsunamis to be generated in Howe Sound by underwater slumps is negligible. The Project would be designed to accommodate similar magnitude wind-generated waves and is not expected to be damaged by a tsunami. The Proponent undertook a supplemental study during the EA, independently reviewed by industry experts, and submitted a technical report (*Supplementary Study of Tsunami Hazard Due to Submarine Landslides*, April 2015) to EAO. The potential for tsunamis to be generated in Howe Sound by underwater slumps is negligible.

Liquefaction is a dramatic loss of soil strength that can occur in saturated coarse-grained soils during seismic shaking. Liquefaction of onshore and offshore soils during earthquake events could lead to rapid loss of strength, lateral movements, and instability resulting in mass movements and settlements. These events could affect the Project area and surrounding area, and result in substantial damage to the Project infrastructure as well as pose a risk to people. The unconsolidated fluvial materials and fan/delta deposits within and adjacent to the Project area have potential for liquefaction in the event of a large magnitude earthquake. The Proponent conducted further geotechnical investigations to assess the potential for liquefaction at the site (*Foreshore Geotechnical Site Investigation Report*, May 2015). To address the potential for liquefaction, ground improvements (such as pilings, dynamic compaction, rapid impact compaction, stone columns, etc.) would be undertaken as part of construction and if deemed necessary, critical infrastructure would be moved to other locations within the Project site.

With the implementation of mitigation, including Project design measures, seismic events are not likely to have a serious effect on the Project.

Key mitigation proposed to address potential effects from natural seismic events includes:

- Design to the current applicable standards by registered professionals based on site-specific geotechnical and natural hazards investigations;
- The LNG facility, buildings, and FSO jetty would be designed to safely shutdown in a one in 2,475 year earthquake;
- Seismic monitors would be installed on critical process equipment and linked to the facility's Emergency Shutdown System, which would automatically trip and place itself in fail-safe mode should a substantial seismic event occur;

- The LNG transfer would safely shutdown and release the LNG carrier from its mooring and allow it to move away from the FSO with assistance from the tugs on standby, in the case of a seismic event; and
- Ground movement treatment measures to densify the potentially liquefiable soils would be used that would extend a distance equivalent to 1.3 to 1.5 times the thickness of the liquefiable layer beyond the outer perimeter of the main Project facilities.

Slope Stability and Mass Wasting

Rockslides, rock falls, debris slides, and slumps are not uncommon in the steep terrain of Howe Sound. Extreme weather events such as heavy rains can trigger debris flows and debris torrents. Avalanches, rockslides and, to a lesser extent, debris slides and debris flows have occurred along the mid-to upper valley slopes of both Woodfibre Creek and Mill Creek. The proposed Project would be located on an active fluvial fan with evidence of historic debris flows and debris floods. The Proponent committed to undertaking a debris flow assessment of Mill Creek during detailed design. Avalanches and landslides, both recent and historic, do not appear to directly affect the Project area. The proposed Project may be at risk of indirect damage resulting from upstream landslide or debris flow events. Under non-seismic conditions, it is anticipated that occurrences of subtidal slope instability, possibly triggered by extreme low tide events, would be of relatively limited extent along the Project area shoreline.

The Proponent is responsible for maintaining Henriette Dam in accordance with the Dam Safety Regulation. The Proponent indicates that upgrades would decrease the likelihood of failure of water containment from the dam that could lead to slope instability and mass wasting along Woodfibre Creek.

Stabilization efforts in the fluvial fan area to address the liquefaction potential would also further protect the Project facilities in the case of marine slope failure. The risk and extent of marine slope instability are considered to be less in those areas of the shoreline where the thickness of fluvial deposits is limited and where bedrock is present near the surface or at shallow depth below the seabed. With the implementation of mitigation measures and appropriate monitoring, slope stability and mass wasting events are not likely to have an effect on the Project.

Key mitigation measures proposed to address potential effects from slope stability and mass wasting include:

- Slope stability assessments would be conducted for the one in 2,475 year earthquake for LNG facilities; and
- Qualified professionals would be engaged to conduct a debris flow assessment for Mill Creek and a debris hazard assessment prior to construction. If required, debris flow mitigation measures would be designed and based on detailed site-specific geotechnical and natural hazards investigations.

Wildfire

The proposed Project area is situated in the Pemberton Zone of the Coastal Fire Centre, with a fire base in Pemberton and a base in Squamish. The fire season generally occurs during the period of high temperatures and low precipitation between the end of June and beginning of September. The potential consequences for the proposed Project from a wildfire in the Project area include risk to workers and damage to infrastructure. If a wildfire reaches the LNG plant, pipelines, or FSO, there would be a potential to cause structural damage leading to a loss of LNG containment and possible explosion or fire. Explosions and fire at the facility are addressed in section 10.2 of this Report. In the event of a wildfire within or immediately adjacent to the Project area, the Proponent would take action to extinguish the fire, report the fire to the authorities, and if needed rehabilitate areas damaged by fire control measures. If the situation was assessed to be life-threatening and could not be contained, the facility may be shut-down and evacuated. With the implementation of mitigation measures and appropriate monitoring, wildfires are not likely to have an effect on the Project.

Key mitigation measures proposed to address potential effects from wildfire include:

- Conduct a fuel hazard assessment based on the Guide to Fuel Hazard Assessment and Abatement in British Columbia (Wildfire Management Branch 2012), pursuant to the *Wildfire Act*;
- Maintain a cleared area around Project components as determined by the fire hazard assessment or as required by OGC facility permitting, whichever is greater;
- Monitor fire danger ratings as published by BC Wildfire Management Branch; and
- Prior to commencing construction, develop and implement an Emergency Response Plan.

Predicted Future Climate Scenarios

Climate change scenarios have predicted that climate in BC and the south coast will continue to change during the 21st century. Increases in average temperatures and precipitation are anticipated and may contribute to sea level rise. Other atmospheric changes related to climate change may include increased storm intensity and other changes relevant to coastal stability, such as surface winds, ocean waves, storm surges, and ice conditions.

The potential effect of climate change on the proposed Project was assessed qualitatively by examining the potential interactions between proposed Project works or activities and climate factors (e.g. extreme events, temperature and precipitation). Extreme events (e.g. storms) may result in a potential interaction with infrastructure; however, this is addressed through infrastructure design and would be monitored and addressed through ongoing maintenance during the life of the proposed Project. Increasing air temperatures may increase the electrical demand for cooling natural gas. Given the large thermal mass of Howe Sound and the annual and inter-annual mixing processes, the effect of projected climate change for the Project operation phase is not likely to be material, and would not be changed through increased air temperatures.

Extreme events and sea level rise may result in a potential interaction through increased maintenance of the FSO and impacts to the port facilities. Extreme drought events could limit the water supply for the facility from Mill Creek. The potential effects of climate change on the Project would be incremental and gradual, allowing for adjustments in Project activities as required. With the implementation of mitigation measures including appropriate design, future climate change is not likely to have an effect on the Project.

Key mitigation measures proposed to address potential effects from future climate change include:

- The design of the structures would incorporate a factor of safety to address changes in weather severity during the lifetime of the proposed Project, including storms and sea level rise resulting from climate change; and
- Project components would be designed to accommodate a sea level rise of 0.5 m, based on a 25-year design life.

10.4 Issues and Concerns Raised During Application Review

During Application Review, the DOS, Village of Lions Bay, the SCRD, TC, EC, NRCan, Squamish Nation, Islands Trust, Vancouver Coastal Health Authority and the general public raised concerns with the scope and methodology of the accidents and malfunctions assessment submitted with the Application, and an assessment of additional scenarios related to the LNG carriers. EAO requested a supplemental memo (*Supplemental Report on Accidents and Malfunctions*, April 2015) to provide further information on scenarios assessed in the Application and on additional scenarios that were identified through the Working Group and public comments.

> The assessment used credible worst-case scenarios that were described and assessed by qualified risk assessors. The results of the memo have been considered in the assessment of accidents and malfunctions in this Report.
>
> In addition, the Proponent provided an outline for the ERP. The Proponent's final ERP would involve all aspects of planning, training, and exercising emergency response and ongoing evaluation/quality assurance and would adhere to regulatory standards and procedures. The Plan would also incorporate any applicable recommendations from the TERMPOL, if available. The Proponent has committed to consulting with applicable provincial and federal government agencies, local governments, local emergency service providers, Aboriginal Groups, Western Canada Marine Response Corporation, and the Canadian Coast Guard, in developing the ERP. The potential for simultaneous failures are being considered in the scope for the TERMPOL assessment of risk and in the risk assessment conducted as part of OGC's facility permitting.

Squamish Nation requested information about the systems/regulations in place to ensure that third parties who own/operate the carriers carry sufficient liability insurance

to remediate and compensate losses incurred from negligence, accidents, or malfunctions.

> The Proponent responded that every vessel employed for the Proponent would carry compulsory insurance for $1 billion under the Civil Liability Convention for oil pollution. In event of an incident, and after all reasonable steps have been taken to recover payment of compensation from the owner of the ship, the liability would be covered by the Canadian Ship-source Oil Pollution Fund. Every vessel destined to a Canadian Port would hold a valid contractual arrangement with the Western Canada Marine Response Corporation under the *Canada Shipping Act 2001*, Part I – Pollution Prevention and Response.

Squamish Nation raised concerns about the assessment of impacts from an accidental collision with a marine mammal and in particular that for the southern resident killer whale population, the loss of a single individual may adversely affect genetic viability of the population as a whole.

> The Proponent responded that with implementation of mitigation, including vessel speed restrictions, vessel strikes on marine mammals would be avoided and that no individuals are anticipated to be lost. The Proponent was unable to find reports in the literature demonstrating killer whale deaths from a vessel strike. killer whales, along with all other toothed whales, are at relatively low risk of being struck by a ship due to their speed, agility, and increased awareness of their environment due to their ability to acoustically monitor it using echolocation / biosonar. Furthermore, LNG carriers would be transiting at low speeds in Howe Sound and should a marine mammal be sighted in the path of a vessel, ship operators would alter course and further reduce speed so that interactions with marine mammals can be avoided. If a marine mammal incident occurs due to the proposed Project, information about the incident would be communicated to DFO.
>
> EAO proposes a condition requiring the Proponent to develop a marine transportation management plan for operations which would specify practices to reduce disruption and collision risk with marine mammals along the shipping route.

Vancouver Coastal Health Authority, the Village of Lions Bay, and members of the public raised questions about potential terrorism risks to the proposed facility or the LNG carriers. Members of the public also referenced The Sandia Report (2004), which provided zones of impact in the event of an LNG release and explosion and the SIGTTO, risk reduction options as outlined in its *Site Selection and Design for LNG Ports and Jetties*.

> The Proponent engaged Lloyd's Register to undertake a preliminary QRA that incorporated historical site specific weather and environmental conditions. They concluded that for a credible worst case scenario arising from an accidental loss

of LNG containment, the furthest distance an LNG vapour cloud could travel from its spill location and still be within its flammable range was 670m for a loading arm failure and 409m for an LNG release from the FSO. Due to the winds in Howe Sound any loss of containment is expected to rapidly disperse below the flammable range.

The Proponent provided further information in response to the questions that were raised regarding the Sandia Report. For accidental spills, Sandia offers the following guidance for risk management. Zone 1; area 250 m from the spill location is the highest risk to public safety, Zone 2; 250 m – 750 m from the spill location as medium impact to public safety and at distances greater than 750 m (Zone 3) from an accidental spill to be low risk to public safety, where consequences to people and property are minimal (2004 Sandia Report). The Sandia Report also provides larger zones in the case of an intentional attack. In order for a vapour cloud to travel its furthest extent and still be flammable (i.e. lower flammable limit), minimal wind conditions must be present. Howe Sound frequently experiences winds which would increase the likelihood of rapid dispersion and mixing of the vaporizing LNG cloud outside of its flammable range within a shorter distance from the spill location. In the event of a spill, a methane vapour cloud would form around the carrier breach where LNG is escaping, this vapour cloud would be localised to one side of the collision point and disperse outward from the LNG carrier in a cigar-shaped plume based on the prevailing wind /current direction. Should an ignition source be present and the LNG vapour exists within its narrow flammable range, a flash fire would occur and burn back through the vapour plume to the source of the leak where it would continue to burn as a pool fire until all the fuel is consumed. The quantitative risk analysis conservatively modelled the size of rupture, spill rate and expected weather conditions to determine a maximum radius of 120 m that an LNG pool could extend from the rupture location.

EAO acknowledges that the likelihood of a terrorist attack cannot be predicted and the potential for terrorism is outside of the scope of the EA. While unlikely to occur, a worst-case attack could be expected to result in greater impacts than a credible worst-case scenario accident or malfunction, depending on the scale of the damage, spill size, location, and environmental conditions. The Proponent has indicated that while unlikely to occur, it is possible that an intentional attack on an LNG carrier could successfully penetrate an LNG container and result in loss of containment. Fire suppression equipment would be installed on the FSO and the firefighting tug on standby would help control any pool fire or loss of containment.

The primary objective of the marine control zone and perimeter fencing is for public safety and security. As part of the permitting process, the Proponent would be required to prepare a safety and loss management plan, which would include an ERP, and a security management plan to meet the requirements of the

regulatory agencies such as the OGC and TC. Security for LNG carriers in transit would be addressed by the Canadian Coast Guard and TC.

A discussion of SIGTTO is provided in section 7.3.3 of this Report.

The Village of Lions Bay requested information about the potential for an LNG Carrier to require anchorage or a place of refuge in Howe Sound, if needed.

The Proponent would not anchor an LNG carrier in Howe Sound. The Proponent responded that due to a lack of LNG carrier anchorages in Canadian waters, LNG carriers would defer their passage in Howe Sound if it appeared that the regular turn-around could not be maintained due to extreme weather or maintenance. In the event of an unplanned maintenance issue while a carrier is at the berth at the terminal, the carrier would be taken from the berth under guidance of the BC Coast Pilots and escorted out of Canadian waters by tug assistance. If the LNG carrier could not be taken out of Canadian waters, contingency anchorages (outside Howe Sound) that will be identified during the TERMPOL process for use during emergency circumstances would be used for maintenance.

The DOS and members of the public raised concerns about the potential of fire spreading from the proposed Project area to Squamish and about the Proponent's ability to be self-sufficient in emergency situations.

The Proponent responded that it would have appropriate training and personnel to deal with emergency situations. As part of the application for Leave to Operate under the LNG Facility Permit (OGC), the Proponent would be required to prepare an Emergency Response Plan including documented emergency response plans, required equipment, training requirements, identification of trained personnel and plans for emergency drills and exercises. It is the Proponent's intention to be self-sufficient for all possible emergency situations and it is not anticipated that the proposed Project would require First Responder emergency services. However, the Proponent would coordinate with local emergency service providers in case a situation arises that may require third party support to ensure appropriate communication and support procedures. The Proponent must meet the requirements under the *Wildfire Act* and Wildfire Regulation, including preparation of a Fire Preparation Plan.

The DOS and FLNR raised questions about the potential hazard posed from the Henriette Lake Dam on the proposed facility in the event of a breach.

The Proponent responded that it must maintain the dam and has undertaken an initial structural assessment. As the holder of the storage licence, the Proponent would assume the liability to maintain and inspect, or remove these works. The Proponent committed to maintain the dam in accordance with the British Columbia Dam Safety Regulation (Government of BC 2000). Further safety

studies and a dam beach analysis will be conducted. As the new owner of the dam, The Proponent is currently in discussion with FLNR regarding the approach to maintain the dam moving forward.

The Proponent engaged with DOS through the EA to provide information to address concerns related to effects of the environment on the proposed Project. Several detailed assessments were completed during the EA, which would be considered in detailed design, including:

- Initial geotechnical investigation;
- Supplementary investigation to assess potential liquefaction;
- Wind wave study;
- Mill creek flood study; and
- Site-specific tsunami study.

TC sought additional analysis related to flaring. In response, the Proponent developed a supplemental memo (*Planned and Emergency Flaring Supplemental Report*, June 2015).

In response to comments from TC, the Proponent included information about further calculations and dispersion modeling with respect to thermal radiation to assess the effects to personnel and equipment within and outside the facility boundaries that would be required during detailed design and a commitment to active outreach with Squamish Airport and other air operators in the supplemental memo.

NRCan provided substantive comments and technical questions regarding the geotechnical assessment and effects of the environment on the project. The Proponent provided additional information to address the comments. The detailed comments and responses are available in the working group tracking table.

10.5 Summary and Conclusions

Project design measures, mitigation and contingency measures would lower the likelihood and reduce the severity of any accident, malfunction or effect of the environment on the proposed Project. Prior to the commencement of construction activities, the Proponent would be required to develop an ERP and EMP, which would address preparedness, prevention and response to an accident or malfunction or an effect of the environment on the proposed Project. Should longer term gradual adverse effects of the environment on the proposed Project become evident, the effects would be evaluated and mitigation or design measures developed by a qualified professional and implemented, such that effects on the proposed Project and consequent effects to the environment would be avoided or mitigated.

Based on the combination of Project design measures, implementation of the ERP, EMP and associated plans, and having regard to the conditions identified in the TOC

and CPD (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that accidents and malfunctions and the effects of the environment on the proposed Project are not significant.

11 Summary of Environmental Management Plans and Follow-up Programs

Environmental management plans would be required for all phases of the proposed Project to minimize adverse effects of the proposed Project. The plans provide a framework to communicate and implement mitigation measures and best management practices, and to support compliance with applicable legislation, terms and conditions of permits, and approvals and authorizations issued in relation to the proposed Project, including an EA Certificate, if issued.

Management plans would be developed in consultation with appropriate regulatory agencies, Aboriginal Groups, and key stakeholders, as required. The Application outlined the following stand-alone plans that would be developed before construction:

- *Access Management Plan* – This plan would identify recreational backcountry opportunities while ensuring the safety and security of the public and of the Proponent's workers and facilities.
- *Emergency Response Plan* – This plan would reduce risks to the environment, personnel, and the community by increasing preparedness and establishing training and procedures in the event of an accident or malfunction. This plan would specify emergency contacts and procedures and include the requirements for establishing a comprehensive reporting program.
- *Security Management Plan* – This plan would provide a "control zone" around the LNG facility and FSO to protect the public and wildlife from harm by Project activities.
- *Traffic Management Plan* – This plan would provide guidance on how all Project-related traffic is managed in and around Squamish during each phase of the Project, including specifying driving routes and parking options for the Project's ferry location and for material and equipment laydown areas in Squamish.
- *Marine Transport Management Plan* – This plan would outline measures to ensure that all vessel traffic is aware of Project activities. The plan would also provide details of the communication channels to be used and the Project-related safety procedures to be followed.
- *Squamish Harbour Vessel Traffic Plan* – This plan would implement strategies, best management practices, and guidelines to avoid and minimize Project-related disruption of marine-based recreational activities in the Squamish Harbour area during construction and operation.
- *Construction Environmental Management Plan* (CEMP) – This plan would be prepared to provide guidance on actions and activities to be implemented during construction and commissioning of the Project. The CEMP would be designed to decrease the risks and the potential for adverse environmental effects associated with construction activities, and includes the following plans: *Creosote Pile Removal*; *Marine Works Management Plan*; *Marine Mammal Management Plan*; and the *Venting and Flaring Plan.*
- *Air Quality Monitoring Program* – This program would be developed and implemented as part of the Fugitive Emissions Management Plan.

- *Marine Water Quality Monitoring Program* – This program would include operational (or compliance) monitoring, that includes monitoring of Project emissions, effluents, discharges and footprints, and assessment of the Proponent and contractor's environmental performance and effects monitoring. The monitoring plan will address parameters measured and analyzed, and locations and frequency of measurements and sampling.
- *Surface Water Quality Monitoring Program* – This program would ensure that Project-related activities do not adversely affect water users and receptors and would be within applicable federal and provincial water quality guidelines.
- *Fisheries and Aquatic Life Monitoring Program* – This program would be implemented as an extension of the marine water quality monitoring and surface water quality monitoring programs during construction and operation.
- *Wildlife Monitoring Program* – This program would describe measures to protect wildlife and Project personnel to manage the potential for human-wildlife conflicts during construction and operation.
- *Vegetation Monitoring Program* – This program would minimize potential effects to vegetation resources as a result of Project construction activities. Identification and mapping of invasive plant species would be monitored in and adjacent to the Project footprint.

Some of the above plans would be required by provincial and federal agencies or authorities and a number of the EA Certificate conditions proposed by EAO and discussed in other sections of this Report. EAO also proposes conditions that require the development and implementation of several additional plans to those proposed in the Application

12 CEAA 2012 Requirements

Subsection 19(1) of CEAA 2012 identifies the factors which must be taken into account in an EA under CEAA 2012. These factors have been addressed by the EAO in the appropriate sections of this report. In addition to the factors that are considered as part of the assessment of individual VCs (e.g. Freshwater fish and fish habitat), the following factors are considered in separate sections of this report: alternative means of undertaking the project in section 2.2.4; the purpose of the project in section 2.3.1; and accidents and malfunctions and effects of the environment on the project in section 10.

In conducting a substituted EA, under the provisions of CEAA 2012, EAO is required to consider the environmental effects identified in subsections 5(1) and 5(2) of CEAA 2012. This section discusses the assessment for each of the subsections and references other relevant parts of this Report where additional details are presented.

12.1 Environmental Effects Related to CEAA 2012 5(1)(a)

CEAA 2012 paragraph 5(1)(a) requires an assessment of changes the project may cause to the following federal areas of responsibility:

(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*; and
(iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*.

The assessments of these effects are included within the assessments of various valued components assessed earlier in this report. Table 12-1 highlights the linkages to the relevant sections of this report and highlights the key mitigation measures.

Table 12-1: Summary of Effects Related to CEAA 2012 5(1)(a)

CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Fish and fish habitat as defined in subsection 2(1) of the *Fisheries Act*	The assessment in the Freshwater Fish and Fish Habitat, Marine Water Quality and Benthic Habitat and Marine Fish and Marine Mammals sections of this Report directly assess fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*. Refer to sections 5.3 (freshwater fish and fish habitat), 5.4 (marine water quality and benthic habitat) and 5.5 (marine fish and marine mammals) for these effects assessments. Potential effects of the proposed	Key mitigation measures related to fish and fish habitat from the Application include: • Designing and operating water intakes (freshwater and marine) in accordance with applicable DFO guidelines; • No discharges of any wastewater into Mill Creek, Woodfibre Creek or other watercourses during the Project's construction or operations; • Developing and implementing a water management plan, which would prescribe the minimum	**Freshwater fish and habitat:** Context – L - M Magnitude – L Extent – Lo Duration – ST - LT Frequency – S - R Reversibility – R Likelihood – L Confidence – M - H Significance – Not significant **Harm to freshwater fish:**

CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	Project on fish and fish habitat are: • Change in freshwater and marine benthic habitat; • Harm to freshwater fish, marine fish or mammals during construction and operation; and • Change in behavior of marine fish or marine mammals due to underwater noise during construction and operation.	instream flow releases (IFRs) for Mill Creek; • Reducing the amount of vegetation required to be cleared to the minimal amount required to accommodate Project footprint; • All diffusers would be designed and operated to meet discharge criteria in accordance with conditions of Waste Discharge Authorizations and would meet CCME and BC Water Quality Guidelines for the Protection of Aquatic Life; • Monitoring of seawater cooling discharge to assess the effectiveness of mitigation and confirm the results of the assessment; • The seawater cooling system intake will be located in deep water (greater than 25-m depth), below the photic zone; consequently, effects to marine vegetation (macroalgae) are not likely; • An Environmental Monitor would be responsible for monitoring noise and potential effects to fish and wildlife and taking corrective mitigation measures; • The seawater cooling system intake would be sited away from subtidal rock reefs supporting growth of macrophytes that provide nursery habitat for juvenile fish and benthic invertebrates; • Marine structures would be placed in marine areas of low habitat quality (i.e., low species diversity and abundance); • Marine works would be conducted during least risk fisheries windows specified by DFO; • Where required, turbidity monitoring would be implemented during all pile drilling/driving activities to not exceed	Context – L Magnitude – L Extent – Lo Duration – ST - LT Frequency – R Reversibility – R Likelihood – L Confidence – M - H Significance – Not significant **Marine fish habitat (benthic/forage/other):** Context – L Magnitude – L - M Extent – Lo Duration – ST - LT Frequency – I – C Reversibility – R Likelihood – H Confidence – M - H Significance – Not significant **Harm to marine fish (benthic/forage/other) and mammals** Context – L for forage fish, M - H for benthic and L – H for mammals Magnitude – L for mammals, L – M for benthic and M – H for fish Extent – Lo Duration – ST – LT for fish/benthic and ST for mammals Frequency – I - C Reversibility – R Likelihood – H Confidence – M - H Significance – Not significant **Marine fish and mammals behaviour:** Context – L for fish and L – H for mammals

CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		established water quality criteria; • Use of sediment containment systems as part of the creosote-treated pile removal mitigation measures; • Measures to minimize marine shading for ramps, gangways and docks; • Development and implementation of a marine water quality management and monitoring plan; • Development and implementation of an underwater noise management plan; • Use of piles to support the Project's marine structures, reducing the marine footprint and creating hard substrate for sessile organisms; • Adherence to *Best Management Practices for Pile Driving and Related Operations*; and • LNG Carrier speed would be restricted along the proposed shipping route.	Magnitude – M Extent – Lo for fish and Re for mammals Duration – ST (temporary over the life of the Project during operations) for mammals and ST for fish Frequency – I – C for fish and I – F for mammals Reversibility – R Likelihood – H Confidence – M - H Significance – Not significant
Aquatic species as defined in subsection 2(1) of the *Species at Risk Act*	Aquatic species include fish and marine plants. The assessment of effects to fish is summarized in the row above. Marine plants are assessed in section 5.4 (water quality and marine benthic habitat) of this Report. Marine construction would result in the alteration or destruction of intertidal and subtidal marine plants. Installation of Project infrastructure and effects from shading can have negative effects on the benthic community, including loss of intertidal and subtidal marine vegetation. More detail on the habitat types affected can be found in section 5.4 of this Report.	Key mitigation measures related to aquatic species from the Application include: • The seawater cooling system intake will be located in deep water (greater than 25-m depth), below the photic zone; consequently, effects to marine vegetation (macroalgae) are not likely; • The seawater cooling system intake will be sited away from subtidal rock reefs supporting growth of macrophytes that provide nursery habitat for juvenile fish and benthic invertebrates; • Structures will be placed in marine areas of low habitat quality (i.e., low species diversity and abundance); • Use of sediment containment systems as part of the creosote-	Context – L Magnitude – L Extent – Lo Duration – ST – LT Reversibility – R Frequency – I - C Likelihood – H Significance – Not significant

CEAA 2012 s.5(1)	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		treated pile removal mitigation measures; and • Measures to minimize marine shading for ramps, gangways and docks.	
Migratory Birds as defined in *Migratory Birds Convention Act, 1994*	Migratory birds are assessed as part of the terrestrial wildlife and marine birds assessment. Refer to section 5.7 for a description of effects specifically for migratory birds. The potential residual effects to migratory birds were determined through the assessment of effects on six representative terrestrial bird species (bald eagle, osprey, western screech-owl, barn swallow, band-tailed pigeon and olive-sided flycatcher and (more generally) through the effects assessment on marine birds. The key indicators represent habitat requirements for the 18 migratory bird families that have the potential to occur in the Project area. Potential effects of the proposed Project on migratory birds are: • Loss or change in terrestrial and marine habitat; • Sensory disturbance or behavioral alterations; and • Increased risk of injury or mortality.	Key mitigation measures related to migratory birds from the Application include: • Develop and implementation of a wildlife management plan; • Operational conditions requiring that controlled flaring during maintenance or a planned condition would be done, when practical, during daylight hours; • Avoid clearing during nesting season; • Maintain bird nest and marine bird breeding colony setbacks; • Develop and implementation of a blasting management plan to mitigate potential disturbance and harm to marine birds; and • Installation of barn swallow artificial nesting structures at suitable locations in the LAA.	Context – L - H for terrestrial and M for marine birds Magnitude – L Extent – Lo for terrestrial and Re for marine birds Duration - LT Reversibility – R Frequency – S for terrestrial and S - I for marine habitat loss I – R for sensory disturbance I - R for mortality risk Likelihood – H Significance – Not significant

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Irregular, R – Regular, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low likelihood, M – Moderate likelihood, H – High likelihood)

12.2 Environmental Effects Related to CEAA 2012 5(1)(b)

CEAA 2012 5(1)(b) requires an assessment of a change that may be caused to the environment by the Project that may arise :

(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.

As discussed in section 5.2 of this Report, EAO concludes that there would not be a significant residual adverse effect of the proposed Project related to GHG emissions in the context of CEAA 2012 5(1)(b).

The effects of the environment on federal lands were assessed because of the proximity of federal lands to the proposed Project, and the potential effects of the proposed Project on federal lands. The federal lands that are potentially affected are particularly the Indian Reserves in closest proximity to the Project site and along the shipping route (Cheakamus, Yookqwitz, Poquiosin and Skamain, Waiwakum, Aikwucks, Seaichem, Kowtain, Yekwaupsum, Stawamus, Defence Island, Kwum Kwum and Kaikalahun) (Table 12-2, Table 12-3 and Figure 12-1)

These effects are summarized in Table 12-4, including the significance conclusions related to the effects to federal lands by intermediate and valued components. See the relevant VC sections for the underlying analysis (section 5.1 – air quality, section 5.5 – marine fish and marine mammals, section 7.4 – visual quality and section 9.1 – human health risk assessment).

Table 12-2: Federal Lands within Intermediate and Valued Component Assessment Areas

Federal lands		First Nation Reserves**												Other	
		Cheakamus	Yookqwitz	Poquiosin and Skamain	Waiwakum	Aikwucks	Seaichem	Kowtain	Yekwaupsum	Stawamus	Defense Island	Kwum Kwum	Kaikalahun	Squamish HA Lands*	Tenderfoot Hatchery
Intermediate/ Valued Components	Atmospheric Sound									RAA				RAA	
	Light	RAA	RAA	RAA	RAA	RAA	RAA	RAA	LAA	LAA	RAA	RAA	RAA	LAA	RAA
	Air Quality	RAA	RAA	RAA	RAA	RAA	LAA	LAA	LAA	LAA	LAA	LAA	RAA	LAA	RAA

* The Squamish Harbour Authority is administered by DFO and is not a federal Port Authority as defined under the *Canada Marine Act*

*** All First Nation reserves are under the administration of Squamish Nation.*

Table 12-3: Federal Lands in Relation to the Proposed Woodfibre LNG Shipping Route

Federal Land	First Nation Reserves**						Other	
	Stawamus	Defense Island	Kwum Kwum	Kaikalahun	Chekwelp	Schaultuuch	Squamish HA Lands*	Bowen Island Parcels (3)
Approx. Distance to LNG Carrier Route (km)	6	1.5	2	15	15	12	6	2
Presence of Dwellings	Yes	No	No	Yes	Yes	Unknown	Yes	Yes

* The Squamish Harbour Authority is administered by DFO and is not a federal Port Authority as defined under the *Canada Marine Act*

*** All First Nation reserves are under the administration of Squamish Nation.*

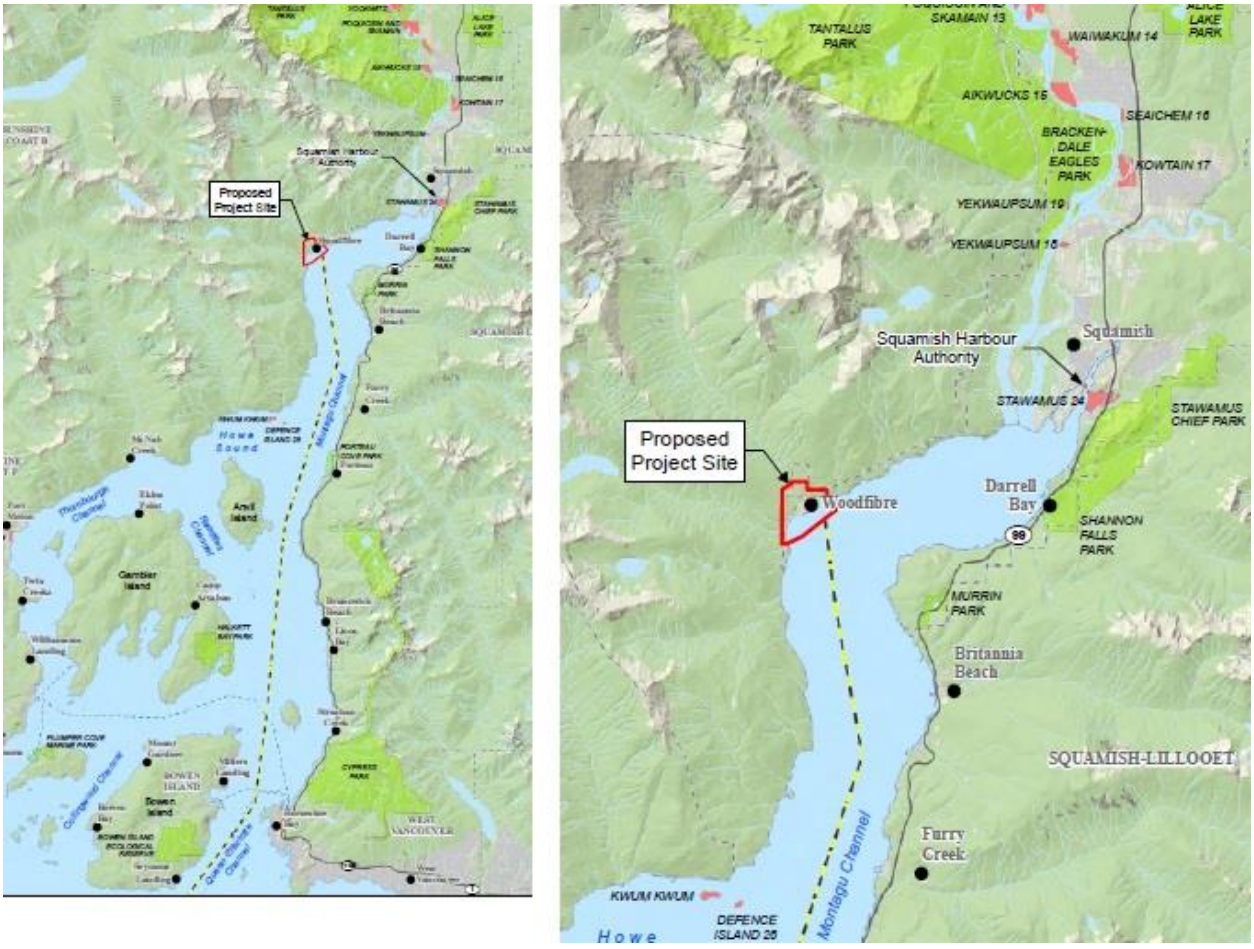


Figure 12-1: Location of Federal Lands

Table 12-4: Summary of Effects Related to CEAA 2012 5(1)(b)(i), Federal Lands

Valued Component/Intermediate Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Atmospheric Sound	Increase in overall noise levels and increase in low-frequency noise from facility works and activities during construction and operation. The Application characterized potential Project-related effects on atmospheric sound on receptors located within the LAA. The atmospheric sound levels at receptors assessed in the Application would remain within Health Canada's MNL guideline and the *OGC Noise Control Best Practices Guideline*. There are no federal lands identified within the LAA for atmospheric sound. Federal lands that are potentially affected by noise from the facility are the Stawamus Reserve and the Squamish Harbour Authority (both located in the RAA). Human receptors are expected at these locations. As the federal lands identified within the RAA are located further from the proposed Project area than the receptors within the LAA, potential changes to noise levels during construction and operation are likely to have lesser effects at these locations and are considered negligible. Indian Reserves that are potentially affected by noise from LNG carriers transiting are: Defense Island and Kwum Kwum. It is predicted that the sound associated with the LNG carrier would be less than 35 dBA (a soft whisper at 2 m) at these locations. A transiting LNG carrier is expected to transit Howe Sound in approximately 2.5 hours and therefore the sound effects at any location would be short-term in duration and infrequent.	Key mitigation measures related to Atmospheric Sound from the Application include: • LNG carrier speed would be restricted along the proposed shipping route in Howe Sound; • Advise nearby residents of high noise activities; • Schedule high noise emitting maintenance during the day where possible • Notify residents prior to noise-emitting maintenance activities; • Ensure that project related noise generated during operation complies with the OGC Noise Control Best Practices Guidelines at sensitive receptor locations; and • Receive feedback about high-noise activity. The acoustic environment mitigation measures would adequately address the potential effects that may arise on federal lands and no additional federal land-specific mitigation is proposed.	Context – L - M Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency Construction – II Operations – F for shipping and C for facility Likelihood – H Significance – Not significant
Visual quality /Light	Increase in overall light levels in the existing environment from the proposed Project construction, operation and decommissioning. Indian Reserves that are potentially	Key mitigation measures related to light from the Application include: • Lighting fixtures would be fully shielded to minimize uplight to the atmosphere,	Context – L - M Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency – I for

Valued Component/Intermediate Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	affected by light from the facility are: Yekwaupsum and Stawamus in the LAA; and Cheakamus, Yookqwitz, Poquiosin and Skamain, Waiwakum, Aikwucks, Seaichem, Kowtain, , Defence Island, Kwum Kwum and Kaikalahun located in the RAA. Other federal lands that are potentially affected by light from the facility are the Squamish Harbour Authority and Tenderfoot Creek Hatchery. Potential changes to the lighting regime for the identified federal lands are anticipated to be the same as or less than those receptor sites assessed within the Application, and are not likely to result in a change to existing light levels. Indian Reserves that are potentially affected by light from shipping are: Defense Island and Kwum Kwum. There would only be effects to the light associated with nighttime transits. A transiting LNG carrier is expected to transit Howe Sound in approximately 2.5 hours and therefore the light effects at any location would be short-term in duration and infrequent.	where doing so would not affect safety or operation; and • Where possible, the direction of lighting would be angled to minimize effects. The light mitigation measures would adequately address the potential effects that may arise on federal lands and no additional federal land-specific mitigation is required.	construction, R for shipping during operation and C for facility operation and Likelihood – H Significance – Not significant
Air Quality	Change in ambient air quality during construction and operations. Residual effects would cause an increase in CACs relative to baseline; however ground level concentrations of NO_2, SO_2, CO, TSP, PM_{10} and $PM_{2.5}$ would remain well below the most stringent applicable air quality objectives. Indian Reserves that are potentially affected by air quality effects from the facility are: Seaichem, Kowtain, Yekwaupsum, Stawamus, Defence Island, and Kwum Kwum in the LAA; and Cheakamus, Yookqwitz, Poquiosin and Skamain, Waiwakum, Aikwucks, and Kaikalahun in the RAA.	Key mitigation measures related to air quality from the Application include: • Project design, including using electricity to drive the LNG facility, and providing electrical power to the FSO and shore power for berthing LNG carriers; and • Limiting the use of power generators during operation. The air quality mitigation measures proposed would adequately address the potential effects that may arise on federal lands; no other federal land-specific mitigation is required.	Context – L Magnitude –N-M Extent – Lo Duration – LT Reversibility – R Frequency – C Likelihood – H Significance – Not significant

Valued Component/Intermediate Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	Other federal lands that are potentially affected by air quality effects from the facility are the Squamish Harbour Authority (LAA) and Tenderfoot Creek Hatchery (RAA). Based on the effects assessment Project-related residual effects to atmospheric environment are considered to be not significant or negligible. Accordingly, the effects to federal lands within the LAA and RAA are not likely to be significant. The potential residual adverse effects would be limited to the LAA.		

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low likelihood, M – Moderate likelihood, H – High likelihood)

12.3 Effects of Change to Environment on Aboriginal Peoples Related to CEAA 2012 5(1)(c)

CEAA 2012 5(1)(c) requires the assessment of any change to the environment caused by the Project on Aboriginal peoples:

(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.

Aboriginal people live in and use the area impacted by the proposed Project. The effects on Aboriginal peoples have been considered and assessed in other sections of this Report, including the assessments of social, economic, heritage and health VCs, as well as the assessment of impacts to Aboriginal Interests in Part C of this Report.

Potential effects related to the proposed facility would occur within Squamish Nation's asserted traditional territory. The proposed project area would overlap with areas used primarily by Squamish Nation members. Tsleil-Waututh Nation asserted traditional territory overlaps the marine areas of the proposed Project. Tsleil-Waututh Nation provided EAO with traditional use information during the EA. EAO reviewed the information and did not identify specific information related to the use of the proposed facility site, which would be located outside of Tsleil-Waututh Nation's consultation area. Both Squamish Nation and Tsleil-Waututh Nation use the waters of Howe Sound. Marine activity effects associated with the proposed Project would occur within an area

used by Squamish Nation and Tsleil-Waututh Nation members. Shipping-related effects were assessed within Howe Sound, which is also used by the Musqueam, Cowichan Tribes, Halalt, Lake Cowichan, Lyackson, Penelakut, and Stz'uminus First Nations. Métis Nation BC indicated that there are Métis peoples who also reside in the area and use land and resources.

The proposed Project would be located on fee simple lands and primarily on an existing brownfield site. It is noted that while the proposed Project area is not currently fenced, the condition of the site (primarily concrete and cleared of vegetation) is not likely conducive to use by Aboriginal people. The Project area is accessible only by water and since 2006 and the closure of the Woodfibre pulp and paper mill, access to the area has been restricted. Access to the proposed facility area including the marine control zone would be restricted for the life of the proposed Project due to safety reasons, which could also result in restricted use of upland areas that are near the proposed Project area and that are accessed through it.

EAO understands that one of Squamish Nation's conditions indicate that Squamish Nation members hunt and fish in areas within and beyond the controlled access zone and that the Proponent has committed to provide access to Squamish Nation members through the controlled access zone to allow for Squamish Nation practice of Aboriginal rights.

12.3.1 Effects on the Health and Socio-Economic Conditions of Aboriginal Peoples Related to CEAA 2012 5(1)(c)(i)

In relation to CEAA 2012 5(1)(c)(i), the environmental effects of the proposed Project on the health and socio-economic conditions of Aboriginal peoples, along with an overall conclusion, are summarized in Table 12-5.

Historically, high concentrations of dioxins and furans have been documented in marine sediments and shellfish in Howe Sound, resulting in the closure of some commercial and recreational fisheries. Fisheries for harvesting all bivalve molluscs (e.g. clams, oysters, mussels) are closed in Howe Sound; however, fisheries for most other benthic invertebrate species (e.g. Dungeness crab, prawn) have remained open or have re-opened with some restrictions. As the site of the former pulp and paper mill, legacy contaminants in the soil and marine sediments have the potential to affect organisms and human health. MOE has issued two risk-based COCs to WFP for the Woodfibre property (land and water lots) based on remediation completed to meet risk-based criteria. EAO concluded that potential residual effects to marine water and sediment quality during site preparation and construction would be localized to the immediate area of disturbance and temporary in duration, based on the effectiveness of the proposed mitigations and the requirements of the COCs.

The results of the Howe Sound sediment HHRA completed for the site as part of the COC application indicated that adverse effects to Aboriginal and non-Aboriginal human receptors are not expected to occur in individuals consuming fish and crab at the concentrations measured in tissue samples obtained from the site area in both current

and future use scenarios. However, during the EA, the Proponent submitted revised estimates of seafood consumption-based contaminant exposures using the assumed upper-limit daily consumption rates consistent with Aboriginal marine resource use and the associated health risk potential, which were found to be unacceptable for Aboriginal receptors consuming fish and crab caught near the site The Proponent considered the revised estimates to human health risk to be conservative in nature as the exposure assumptions are likely overestimated. Site-specific information shared by Tsleil-Waututh Nation during the EA does not indicate any fishing or marine harvesting adjacent to the Project area and human health risks associated with locations of interest for Tsleil-Waututh Nation are not anticipated.

As a requirement of both the upland and sediment COCs the Proponent must ensure that any contaminants remaining onsite have been remediated to risk-based standards and would not be re-mobilized in the future. To ensure that that the COCs remain valid the Proponent must adhere to all performance verification plans, such as the tissue sampling program and establishment of a maritime exclusion zone for the sediment portion COC, and develop contingency plans, maintenance plans and long term monitoring plans to the satisfaction of an Approved Professional. The Proponent is required to complete a confirmatory fish and shellfish tissue sampling program at the site prior to construction to confirm that the risk to ecological and human health would be low. The Proponent is also required to implement and maintain a maritime exclusion zone to prevent entry by the public, swimming and shellfish harvesting activities under the COC and there is no known Aboriginal fishing or marine harvesting that occurs within the maritime exclusion zone. The maritime exclusion zone would extend to the boundaries of the two water lots fronting the Woodfibre site with an approximate area of 32 ha. This maritime exclusion zone would also occur wholly within the control zone (see Section 7.3.2) and public and Aboriginal access to the area would be restricted through the life of the proposed Project.

Contamination of marine country foods as a result of Project-related activities would not extend beyond this maritime exclusion zone, due to the depth of the water beyond the water lots, the proposed mitigation measures, and as all marine construction activities and any temporary disturbance of marine sediments would occur within the water lots boundaries. EAO proposes a condition requiring the Proponent to develop a marine water quality management and monitoring plan for construction which must include the results of baseline shellfish and groundfish tissue sampling and the human health risk assessment, including polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and furans and TBT. For these reasons EAO would not consider there to be residual adverse effects on human health, including Aboriginal people, from the consumption of contaminated country foods as a result of the proposed Project. The marine water quality management and monitoring plan would also include a post-construction follow-up program to confirm human health risk assessment, including potential additional tissue sampling to confirm the assessment predictions.

One Aboriginal business was identified that could be effected by the proposed Project. Northwest Squamish Forestry Ltd., which is owned by the Squamish Nation, holds a

Forest License with an AAC of 21,965 m^3. Northwest Squamish Forestry Ltd. accessed its chart areas through the Project area and also used the log dumps located at the northern and southern ends of the proposed Project property under an agreement with the previous land owner. The proposed Project would eliminate access to the private roads that Northwest Squamish Forestry Ltd. uses to access the THLB on the nearby Crown lands. This represents approximately a 24% loss of its available THLB. This would reduce or eliminate timber harvesting by Northwest Squamish Forestry Ltd. in these areas and potentially affect the company's silvicultural obligations and planned second growth harvest in the Mill Creek watershed. The Proponent is engaging with tenure holders prior to construction, to seek opportunities for future ongoing access for forestry operations, while ensuring the safety and security of the site. EAO has proposed a condition to require this engagement to continue with the affected tenure holders and key agencies.

Table 12-5: Summary of Effects Related to CEAA 2012 5(1)(c)(i), the Health and Socio-Economic Conditions of Aboriginal Peoples

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Human Health (due to air quality)	The proposed Project has the potential to impact human health, including the health of Aboriginal peoples, from impacts to air quality. A summary is provided below, and more detail can be found in section 9.1 of this Report. The proposed Project would not be expected to have any adverse health effect following long-term exposure to air quality contaminants, as exceedances of the most stringent applicable AAQOs would not be expected. Dibenzo(a,h)anthracene was the only contaminant of potential concern identified for the 24-hour exposure period.	Potential effects would largely be in Squamish Nation asserted traditional territory and within the Tsleil-Waututh Nation consultation area boundary. Métis peoples and members of the Musqueam Indian Band and the HTG are also expected to use or reside in the area.	No additional key mitigation measures are identified beyond those identified in section 5.1 and 9.1 of this Report. Key mitigation measures related to air quality from the Application include: • Project design, including using electricity to drive the LNG facility; • Providing electrical power to the FSO and shore power for LNG carriers at berth; and • Limiting the use of power generators during operation.	Context – M Magnitude – N-L Extent – Lo Duration – ST - LT Reversibility – R - I Frequency –I - C Likelihood – M Significance – Not significant
Acoustics (Facility and Shipping)	The Application found that sound levels are expected to increase, although potential Project-related effects of atmospheric sound on	Potential effects would largely be in Squamish Nation asserted traditional	Key mitigation measures related to atmospheric noise from the Application include:	Context – M Magnitude – N-L Extent – Lo Duration – ST - LT Reversibility – R

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	Aboriginal members located within the LAA would remain within Health Canada's MNL guideline and the *OGC Noise Control Best Practices Guideline*. The Application found that noise effects from marine shipping activities would comply with federal and provincial noise guidelines.	territory and within the Tsleil-Waututh Nation consultation area boundary. Métis peoples and members of the Musqueam Indian Band and the HTG are also expected to use or reside in the area.	• Advise nearby residents, which may include Aboriginal people, of high noise activities and maintenance activities and receive feedback about high noise activities.	Frequency –I - F Likelihood – M Significance – Not significant
Marine Transportation and Use/Marine Harvesting	Marine transportation has the potential to interfere with marine fisheries and shoreline harvesting conducted by Aboriginal people, which could adversely affect the Aboriginal social and economic systems that rely on harvesting activity or Aboriginal businesses involved in those activities, leading to adverse economic effects in Aboriginal communities. EAO understands from one of Squamish Nation's conditions that Squamish Nation members hunt and fish in areas within and beyond the controlled access zone that would be required for safety and security reasons, although EAO is not aware of specific sites of use by Squamish Nation. While Project shipping activities are predicted to increase traffic by 3-4 one-way transits per month, the majority of fishing grounds do not overlap with the marine access route and fishers use	Potential effects would largely be in Squamish Nation asserted traditional territory and within the Tsleil-Waututh Nation consultation area boundary. Métis peoples and members of the Musqueam Indian Band and the HTG are also use or reside in the area. It is unknown if there are any aboriginal marine-based tourism companies that operate in the project area. Tsleil-Waututh Nation has food, social and ceremonial allocations for crab and prawns under the Salish	No additional key mitigation measures are identified beyond those identified in section 7.3 of this Report. Key mitigation measures from the Application regarding marine transportation and use are: • Prepare and implement a Marine Transport Management Plan prior to construction activities, which would include communication measures with key stakeholders, including Aboriginal Groups; • Develop and implement a Squamish Harbour Vessel Traffic Plan, which would identify mitigation measures to avoid and minimize Project-related	Context – H Magnitude – L Extent – Lo Duration – LT Reversibility – R Frequency –F Likelihood – L Significance – Not significant

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	gear that precludes interference. Aboriginal Peoples' access to the shipping route in Howe Sound for would be restricted temporarily and for a short duration during construction and operations of the proposed Project while Project-related marine traffic is in transit. Potential environmental effects on marine fish and marine mammals may interfere with harvesting, social or ceremonial practices conducted by Aboriginal people, which could adversely affect Aboriginal social and economic systems or Aboriginal businesses involved in those activities, leading to adverse socio-economic effects in Aboriginal communities. The proposed Project has the potential to impact marine-based tourism and commercial fishing through Project effects on the behaviour of marine mammals and fish from increased noise near the facility and from loss or alteration of marine fish habitat. Vessel noise may produce a localized behavioural response, including avoidance of the area around vessels and the terminal. See section 5.5 (marine fish and marine mammals).	Seas joint venture with Musqueam and Sliammon First Nations. Prawn harvesting occurs around the entrance to Howe Sound around Bowen Island and much of southern Howe Sound has been identified as a priority harvest area for prawns (see Part C).	disruption of marine-based recreational activities in the Squamish Harbour area; • Prohibit mooring or anchoring of LNG carriers anywhere in Howe Sound; and • LNG Carrier speed would be restricted along the proposed shipping route. EAO understands that the Proponent has committed to meet Squamish Nation's condition to provide access to Squamish Nation members through the controlled access zone to allow for Squamish Nation practice of Aboriginal rights.	

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Visual Quality	The Project may alter visual quality from terrestrial and marine viewpoints with views of the LNG facility and LNG carriers travelling along the marine access route. Potential changes to visual quality may interfere with harvesting, social or ceremonial practices conducted by Aboriginal people, which could adversely affect Aboriginal social and economic systems or Aboriginal businesses involved in those activities, leading to adverse socio - economic effects in Aboriginal communities. The proposed Project would be located on a brownfield site, of which approximately 74 % (27 ha) of the proposed Project area is disturbed and covered by concrete and compact fill. Limited vegetation clearing would be required to construct the proposed Project, which would result in some impact to visual quality. During Operations, 3-4 LNG carriers would transit to the Project area per month – a crossing time of approximately 2.5 hours from the mouth of Howe Sound to the Project area. See section 7.4 (visual quality).	Potential effects would largely be in Squamish Nation asserted traditional territory and within the Tsleil-Waututh Nation consultation boundaries. Shipping related visual effects along the shipping route would also include the Musqueam, Cowichan, Halalt, Lake Cowichan, Lyackson, Penelakut, and Stz'uminus First Nations. Métis peoples reside in the area.	No additional key mitigation measures are identified beyond those identified in section 7.4 of this Report. Key mitigation measures related to visual quality from the Application include: • Reduce the level of contrast by finishing, re-finishing and maintaining the external surfaces of buildings with low glare materials and natural colours; • Provide additional temporary or permanent vegetative screening of land-based infrastructure not currently screened by existing vegetation; • Monitor and maintain natural screening to limit visibility of infrastructure and activity during operations; and • Prohibit mooring of LNG carriers in Howe Sound, which would reduce visual quality effects.	Context – M Magnitude – L-M Extent – Lo Duration – LT Reversibility – R Frequency –C Likelihood – H Significance – Not significant

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Non-Marine Harvesting	Potential environmental effects on vegetation and wildlife resources could potentially affect traditional harvesting of country foods and Aboriginal Groups' socio-economic conditions by: 1) adversely affecting traditional harvesting activities that depend on those species and the Aboriginal social and economic systems that are based on that traditional harvesting activity, and 2) reducing consumption of country foods among Aboriginal people, resulting in increased consumption of less nutritious market food alternatives and changes in diet and nutrition within Aboriginal communities. The proposed Project would be located on a brownfield site, of which approximately 74 % (27 ha) of the proposed Project area is disturbed and covered by concrete and compact fill. Limited vegetation clearing would be required to construct the proposed Project. The proposed Project area is not currently fenced, the condition of the site (primarily concrete and cleared of vegetation) is not likely conducive to hunting or trapping as it has limited wildlife habitat value. Aboriginal Peoples' access to the proposed facility area to hunt or trap would be restricted for the life of the proposed Project due to	Potential effects would be within the proposed Project footprint and in Squamish Nation asserted traditional territory. Members of Tsleil-Waututh Nation may also use the proposed Project area. Métis peoples may also use or reside in the area.	Key mitigation regarding particular species are in the relevant sections of this Report, while key mitigation regarding Aboriginal Groups use of traditional harvesting areas are discussed in Part C of this Report. Key mitigation measures include: • Minimize clearing of sensitive and important ecosystems by avoiding or limiting possible riparian area along Mill Creek and the mature forest adjacent to the creek; • Avoid vegetation clearing during terrestrial and marine bird breeding season; and • An Environmental Monitor would be responsible for monitoring noise and potential effects to wildlife and implementing corrective mitigation measures.	Context – MR Magnitude – L Extent – Lo Duration – ST-LT Reversibility – R Frequency – I - C Likelihood – H Significance – Not significant

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	safety reasons, which may also restrict access to nearby areas for hunting, trapping and gathering.			

Cumulative effects on the health conditions of Aboriginal peoples are not expected as the potential residual effects from changes to air quality and from noise are determined to be low (negligible-low in magnitude, short term in duration and reversible) and are not expected to interact cumulatively with any past, present or predicted projects or activities. Potential effects on marine transportation uses, visual quality and marine harvesting of resources by Aboriginal peoples, while variable in duration, are low in magnitude (due to the limited number of proposed LNG carrier transits compared to existing levels of marine vessel activity and the availability of other areas of Aboriginal use within Howe Sound) and reversible, and similarly not expected to interact with any past, present or predicted projects or activities. Therefore, no cumulative effects on the health and socio-economic conditions of Aboriginal peoples are anticipated

Overall Conclusion

Based on the analysis conducted by EAO, the combined environmental effects of the above IC/VCs from the proposed Project on Aboriginal peoples' health and socio-economic conditions are expected to be of low magnitude. Facility-related effects, which occur within an area used primarily by the Squamish Nation and the Tsleil-Waututh Nation, would be long term and localized. Shipping-related effects within Howe Sound, would affect areas also used by the Musqueam, Cowichan, Halalt, Lake Cowichan, Lyackson, Penelakut, MNBC, and Stz'uminus First Nations. During operation, there would be approximately 40 LNG carriers transiting per year in established shipping lanes. The effects at any one time would be localized, short-term and intermittent.

EAO anticipates that there will be residual effects to the health and socio-economic conditions of Aboriginal peoples, however these effects are expected to be of low magnitude (due to the limited number of proposed LNG carrier transits compared to existing levels of marine vessel activity and the availability of other areas of Aboriginal use within Howe Sound) and are not expected to interact spatially or temporally with any past, present or predicted projects or activities. Consequently, no cumulative effects on the health and socio-economic conditions of Aboriginal peoples are predicted.

Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on the health and socio-economic conditions of Aboriginal peoples.

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low likelihood, M – Moderate likelihood, H – High likelihood)

12.3.2 Effects on Aboriginal Peoples' Physical and Cultural Heritage Related to CEAA 2012 5(1)(c)(ii)

In relation to CEAA 2012 5(1)(c)(ii), the effects of the proposed Project on Aboriginal peoples' physical and cultural heritage, along with an overall conclusion, are summarized in Table 12-6.

Tsleil-Waututh Nation noted that many registered archaeological sites in Howe Sound are identified as being on lands adjacent (or less than one kilometre) to the marine shipping route and Project area (marine traffic area). The specific locations of these sites were not identified. EAO understands from the Proponent's response to Squamish Nation's conditions that the Proponent committed to restore Mill Creek and adjacent area to a "green zone" designation and formal recognition that the proposed Project is located in the former Squamish Nation village of Swiy'a'at, that must also be in the green zone. Part C includes more discussion of current land and resource use for each Aboriginal Group.

Table 12-6: Summary of Effects Related to CEAA 2012 5(1)(c)(ii), Aboriginal Physical and Cultural Heritage

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Visual Quality	The Project may alter visual quality from terrestrial and marine viewpoints with views of the LNG facility and LNG carriers travelling along the marine access route. The proposed Project would be located on a brownfield site, of which approximately 74 % (27 ha) of the proposed Project area is disturbed and covered by concrete and compact fill. Limited vegetation clearing would be required to construct the proposed Project, which would result in some impact to visual quality. During Operations, 3-4 LNG carriers would transit to the Project area per month – a crossing time of approximately 2.5 hours from the mouth of Howe Sound to the Project area See section 7.4 (visual quality).	Potential effects would largely be in Squamish Nation asserted traditional territory and within the Tsleil-Waututh Nation consultation area boundary. Shipping-related effects within Howe Sound may affect areas that may also be used by the Musqueam, Cowichan, Halalt, Lake Cowichan, Lyackson, Penelakut, and Stz'uminus First Nations, and MNBC	No additional key mitigation measures are identified beyond those identified in section 7.4 of this Report. Key mitigation measures related to visual quality from the Application include: • Reduce the level of contrast by finishing, re-finishing and maintaining the external surfaces of buildings with low glare materials and natural colours; • Provide additional temporary or permanent vegetative screening of land-based infrastructure not currently screened by existing vegetation; • Initiate planting programs during the construction phase; • Monitor and maintain natural screening to limit visibility of infrastructure and activity during operations; and • Prohibit mooring of LNG carriers in Howe Sound, which would reduce visual quality effects; and; • Where possible, the direction of lighting would be angled to minimize effects.	Context – M Magnitude – L-M Extent – Lo Duration – LT Reversibility – R Frequency –C Likelihood – H Significance – Not significant

EAO is not aware of any identified physical or cultural sites that may be impacted by the marine based activities of the Project and the proposed Project area would be located on an industrial-zoned brownfield site . Impacts on the cultural experience of using the area may be impacted by effects on visual quality, however in taking into consideration the proposed mitigation measures, impacts are considered to be not significant. Cumulative effects on physical and cultural heritage of Aboriginal peoples are not anticipated with any past, present or reasonably foreseeable projects

Overall Conclusions
Based on the analysis conducted by the EAO, the effects of the proposed Project on Aboriginal peoples' physical and cultural heritage are expected to be of negligible magnitude.

Facility-related effects, which occur within an area used primarily by the Squamish Nation and the Tsleil-Waututh Nation, would be long term and localized. The site is primarily an existing brownfield site. Shipping-related effects within Howe Sound on physical and cultural heritage, which could affect areas that may also be used by the Musqueam, Cowichan, Halalt, Lake Cowichan, Lyackson, Penelakut, Stz'uminus First Nations, and MNBC, would be negligible and would have a very low likelihood of occurring.

EAO expects that residual effects on the physical and cultural heritage of Aboriginal peoples would be of low magnitude, and does not anticipate cumulative effects as there are no identified sites of importance that may be impacted by the Project and another reasonably foreseeable project in the area.

Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on the physical and cultural heritage of Aboriginal peoples.

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low, low likelihood, M – Moderate likelihood, H – High likelihood)

12.3.3 Effects on Aboriginal Peoples' Current Use of Lands and Resources for Traditional Purposes Related to CEAA 2012 5(1)(c)(iii)

In relation to CEAA 2012 5(1)(c)(iii) the effects of the proposed Project on Aboriginal peoples' current use of land and resources for traditional purposes, along with an overall conclusion, are summarized in Table 12-7.

Current uses of lands and resources by Aboriginal peoples for traditional purposes were identified based on information from Aboriginal Groups related to harvesting, the aesthetic experience of land and marine use, and sites, landforms and natural features associated with ritual or spiritual use.

The Proponent's Application included an assessment of the Current Land and Resource Use for Traditional Purposes VC. The Squamish Process independently assessed issues of concern to Squamish Nation and accordingly, no specific current use sites were provided by Squamish Nation to the EAO.

EAO sought and requested traditional use and site-specific information related to Squamish Nation's Aboriginal Interests and current use of lands and resources, however information was not provided or available. Tsleil-Waututh Nation identified that members use the waters of Howe Sound for traditional purposes including fishing and

marine harvesting. The Tsleil-Waututh Nation Traditional Land Use (TLU) Report did not identify any specific fishing or marine harvesting areas within the marine control zone or the area affected by the marine facilities. However, the TLU Report describes several fishing areas around much of Howe Sound, including areas around the Squamish River estuary and just south of Watts Point and indicates that the transiting LNG carriers would pass through several reported fishing locations. The TLU Report describes shellfish harvesting at several locations in Howe Sound including around Watts Point. This includes several instances of crab harvesting, one instance of oyster harvesting, and one instance of prawn harvesting in Howe Sound. The described prawn harvesting area and one of the described crab harvesting areas appear to be within the proposed marine shipping route.

Part C includes more discussion of current land and resource use for each Aboriginal Group.

Table 12-7: Summary of Effects Related to CEAA 2012 5(1)(c)(iii), Aboriginal Peoples' Current Use of Lands and Resources for Traditional Purposes

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Traditional Harvesting (including fishing)	Access to the proposed facility area and marine control zone (70 ha, extending 550 m from the LNG facility shoreline) would be restricted for the life of the proposed Project due to safety reasons, which could also result in restricted use of upland areas that are near the proposed Project area and that are accessed through it. EAO is not aware of any current Aboriginal harvesting activities within the area of the marine control zone. EAO does not anticipate that there will be Project-related effects on marine country foods outside of the control zone, including those harvesting areas identified in the Tsleil-	Potential effects would largely be in Squamish Nation asserted traditional territory and within the Tsleil-Waututh Nation consultation area boundary. Shipping related effects would occur in the asserted traditional territories of Squamish Nation and Tsleil-Waututh Nation. Métis peoples and members of the Musqueam Indian Band and the HTG are also expected to use or reside in	Key mitigation regarding particular species are in the relevant sections of this report, while key mitigation regarding Aboriginal Group's use of traditional harvesting areas are discussed in Part C of this Report. Key mitigation measures related to Aboriginal People's current use of lands and resources for traditional purposes from the Application include: • Reducing the amount of air contaminants and greenhouse gas emissions generated by the proposed Project by proposing to power the facility with electricity supplied by BC Hydro; • Conducting site reclamation and restoration of the	Context – M Magnitude – L Extent – Lo Duration – ST-LT Reversibility – R Frequency – MR - C Likelihood – H Significance – Not significant

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	Waututh TLU Report. Furthermore, high concentrations of contaminants as a result of historic industry have been documented in marine sediments in Howe Sound, resulting in past closures of some commercial, recreational and Aboriginal fisheries in the area and harvesting of all bivalves (e.g., clams, oysters, mussels, etc.) is closed in Howe Sound. Therefore, restricted harvesting of marine country foods from within the control zone would not result in a substantial change to current harvesting levels by Aboriginal peoples within Howe Sound. Due to the requirements in place under the COC and the implementation of key mitigation and EA conditions it is unlikely that impacts from the proposed Project activities would affect the harvesting areas around Watts Point or the mouth of the Squamish River. The proposed Project would be located on fee simple lands and primarily on an existing brownfield site that was a former pulp and paper mill. It is noted that while the proposed Project	the area but the traditional territories of these Aboriginal Groups are located in and around the mouth of Howe Sound and could be impacted by transiting LNG carriers.	existing site to reduce legacy environmental effects; • Making shore power available at the FSO docking facility to LNG carriers that are equipped to use this power in order to reduce the emissions from the vessels; • Designing the site to minimize the potential adverse visual effects and commitment to maintain a 'greenzone'; • Prepare and implement a marine transport management plan prior to construction activities, which would include communication measures to ensure all vessel traffic is aware of Project activities, and further consultation with key stakeholders, including Aboriginal Groups, to identify areas of concerns and to identify additional mitigation; • Develop and implement a Squamish harbour vessel traffic plan that would include strategies, best management practices and guidelines to avoid and minimize Project-related disruption of marine-	

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	area is not currently fenced, the existing condition of the site (primarily concrete and cleared of vegetation) is not likely conducive to use by Aboriginal people. The Project area is accessible only by water and since 2006 and the closure of the Woodfibre pulp and paper mill, access to the area, including shoreline access, has been restricted. Vessel wake from LNG vessels along the shipping route could potentially have effects on water safety, shoreline safety, and could potentially cause erosion of shoreline habitats. Aboriginal Peoples' access to the shipping route in Howe Sound for current uses for traditional purposes would be restricted temporarily and for a short duration during construction and operations of the proposed Project while Project-related marine traffic is in transit. It is noted that approximately 3-4 LNG carriers would transit through Howe Sound per month – a voyage of approximately 2 hours.		based activities in the Squamish Harbour area during construction and operation; • Prohibit the mooring and anchoring of LNG carriers in Howe Sound; and • LNG Carrier speed would be restricted along the proposed shipping route in Howe Sound. EAO also understands that the Proponent continues to work with Aboriginal Groups to continue to address concerns related to access to the Project Area. In addition, EAO understands that the Proponent has committed to the Squamish Nation condition, to provide access to Squamish Nation members through the Controlled Access Zone to allow for Squamish Nation practice of Aboriginal rights.	

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	Assessment of impacts to each Aboriginal Group's harvesting activities is discussed in greater detail in Part C of this report. See section 7.3 (marine transport) and section 7.2 (land and resources).			

Changes to the environment that could impact the current use of lands and resources for traditional purposes by Aboriginal peoples were identified for traditional marine harvesting and are predicted to be of low magnitude and reversible and, taking into consideration proposed mitigation, are considered not significant. No past, present or reasonably foreseeable projects or activities are anticipated to interact with the predicted effects to traditional marine harvesting and therefore no cumulative effects have been identified.

Overall Conclusions

Based on the analysis conducted by the EAO, the combined effects of the above VCs from the proposed Project on Aboriginal peoples' current use of lands and resources for traditional purposes are expected to be of low magnitude.

Facility-related effects, which occur within an area used primarily by the Squamish Nation and the Tsleil-Waututh Nation, would be long term and localized. The site is primarily an existing brownfield site. Shipping-related effects within Howe Sound, would affect areas also used by the Musqueam, Cowichan, Halalt, Lake Cowichan, Lyackson, Penelakut, Stz'uminus First Nations, and MNBC. During operation, there would be approximately 40 LNG carriers transiting per year in established shipping lanes. The effects at any one time would be localized, short-term and intermittent.

Changes to the environment that could affect the current use of lands and resources by Aboriginal peoples were only identified for traditional marine harvesting and are predicted to be of low magnitude (due to the limited number of proposed LNG carrier transits compared to existing levels of marine vessel activity and the availability of other areas of Aboriginal use within Howe Sound). No other reasonably foreseeable projects or activities are anticipated to interact with the effects to traditional marine harvesting and therefore no cumulative effects have been identified. Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on current use of lands and resources for traditional purposes of Aboriginal people.

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low, low likelihood, M – Moderate likelihood, H – High likelihood)

12.3.4 Effects on Structures, Sites, or Things that are of Historical, Archaeological, Paleontological, or Architectural Significance to Aboriginal Peoples Related to CEAA 2012 5(1)(c)(iv)

In relation to CEAA 2012 5(1)(c)(iv) the effects of the proposed Project on' any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Aboriginal peoples, along with an overall conclusion, are summarized in Table 12-8.

EAO understands from the Proponent's response to Squamish Nation's conditions that the Proponent committed to restore Mill Creek and adjacent area to a "green zone" designation and formal recognition that the proposed Project is located in the former Squamish Nation village of Swiy'a'at, that must also be in the green zone. Part C includes more discussion of current land and resource use for each Aboriginal Group.

Table 12-8: Summary of Effects Related to CEAA 2012 5(1)(c)(iv), Structures, Sites or Things that are of Historical, Archaeological, Paleontological or Architectural Significance to Aboriginal Peoples

VC/Topic	Effects Assessment	Potentially Impacted Aboriginal Peoples	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Heritage resources	There were no paleontological, archaeological, or historical sites identified within the LAA, although there is the potential for undocumented sites to be situated in the LAA. EAO understands from the Proponent's response to Squamish Nation's conditions that the proposed Project is located in the former Squamish Nation village of Swiy'a'at. The proposed Project would be located on a brownfield site, of which approximately 74 % (27 ha) of the proposed Project area is disturbed and covered by concrete and compact fill. Tsleil-Waututh Nation	Potential effects would largely be in Squamish Nation asserted traditional territory and within the Tsleil-Waututh Nation consultation area boundary. Métis peoples and members of the Musqueam Indian Band and the HTG are also expected to use or reside in the area.	Key mitigation measures regarding heritage and archaeological resources are discussed in section 8.1 of this report. Key mitigation measures related to heritage resources from the Application include: • Avoid effects to heritage resources, if present, through partial Project redesign or relocation; • Employ non-intrusive systematic data recovery techniques, which may include documentation of heritage resources, detailed recording of CMTs, or surface collection of paleontological material;	Context – Disturbance varies Magnitude – L Extent – Lo Duration – LT Reversibility – I Frequency – S Likelihood – L-M Significance – Not significant

	identified concerns that erosion of shell midden sites from vessel wake could disturb the resting places of ancestors. Thirty of the approximately 125 registered archaeological sites identified by Tsleil-Waututh Nation in Howe Sound are identified as being on lands adjacent (or less than one kilometre) to the marine shipping route and Project area (marine traffic area). Specific locations of sites were not provided. Since vessel wake is not expected to increase shoreline erosion, neither access to, nor site integrity of, heritage resources located along the shore are likely to be damaged as a result of wakes generated by Project-related vessel traffic wake verification study during operations to confirm the conclusions during the EA, including an adaptive management plan to address the effects of wake on marine and shoreline users. See section 7.3 (Marine Transport), section 8.0 (Heritage) and Part C of this Report.		• Employ systematic data recovery (archaeological salvage or emergency excavation), if necessary, while ensuring applicable permits are sought; • Continue monitoring where site-specific Project effects cannot be predicted or evaluated before construction or operation; and • Develop Heritage Resource Chance Find Management Procedures to provide direction if unforeseen heritage resources are encountered. • LNG carrier speed would be restricted along the proposed shipping route in Howe Sound Proponent has committed to completing a field-based Heritage Resources Impact Assessment (HRIA) prior to construction. The HRIA may include a preliminary field reconnaissance to refine archaeological and paleontological models, and help to focus the assessment for the presence of heritage resources. The results of the HRIA would be used to develop appropriate site-specific management and mitigation related to potential Project effects on heritage resources.	

EAO is not aware of any documented paleontological, archaeological, or historical sites identified within the LAA. However key mitigation is proposed to address any potential impacts on undocumented sites. Project effects to structures, sites or things that are of historical, archaeological, paleontological or architectural significance on Aboriginal peoples are expected to be low in magnitude, and while potentially irreversible, are expected to be low or moderate in likelihood and accordingly no cumulative effects are predicted.

Overall Conclusions
Based on the analysis conducted by the EAO, the effects of the proposed Project on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Squamish Nation, Tsleil-Waututh Nation, Musqueam, Cowichan , Halalt, Lake Cowichan, Lyackson, Penelakut, Stz'uminus First Nations, and MNBC is expected to be negligible.

Project effects to structures, sites or things that are of historical, archaeological, paleontological or architectural significance to Aboriginal peoples are expected to be negligible and therefore no cumulative effects are predicted.

Considering the above analysis and with the implementation of key mitigation measures identified by EAO, EAO is satisfied that the proposed Project would not likely have significant adverse environmental effects on historical, archaeological, paleontological or architectural to Aboriginal people.

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low, low likelihood, M – Moderate likelihood, H – High likelihood)

12.4 CEAA 2012 5(2) Requirements

CEAA 2012 5(2)(a) requires an assessment of changes to the environment that are directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority. Paragraph 5(2)(b) requires an assessment of changes to any associated effects on health, socio-economic conditions, matters of historical, archaeological, paleontological or architectural interest, or other matters of physical or cultural heritage not already considered in under paragraph 5(1)(c).

If approved, the proposed Project may require a *Fisheries Act* authorization for serious harm to fish (including death of fish or permanent alteration or destruction of fish habitat). The requirement for an authorization would be determined following permitting applications with a Request for Review to DFO based on final engineering design and mitigation measures. If DFO determines an authorization is required, an Offsetting Plan may be required to offset impacts and maintain the ongoing productivity of commercial, recreational and Aboriginal fisheries.

The following federal authorizations are anticipated to be required by this proposed Project:

1. Approval under subsections 6(1) and 9(1) of the *Navigation Protection Act* for works in and about navigable water.

The assessments required for CEAA 2012 5(2)(a) are summarized in Table 12-9. The table only includes effects to IC/VCs that were not previously assessed in the CEAA 2012 5(1) sections above.

Table 12-9: Summary of Effects Related to CEAA 2012 5(2)(a)

Valued Component/Intermediary Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Serious harm to fish – *Fisheries Act* para. 35(2)(b)			
Atmospheric Sound	Replacement of four clear-span bridges over Mill Creek would result in additional atmospheric sound.	No additional key mitigation measures related to atmospheric sound are identified beyond those identified for the purposes of CEAA 2012 ss .5(1). Key mitigation measures related to atmospheric sound from the Application include: • Advise nearby residents of high noise activities • Schedule high noise emitting maintenance during the day where possible • Notify residents prior to noise-emitting maintenance activities • Ensure that project related noise generated during operation complies with the OGC Noise Control Best Practices Guidelines at sensitive receptor locations • Receive feedback about high-noise activity	Context – M Magnitude – N Extent – Lo Duration – ST Reversibility – R Frequency – S Likelihood – L-M Significance – Not significant
Marine Water Quality	Construction and operation of the seawater cooling system including installation of the inlet and outlet structures, withdrawal of seawater at the intake, discharge of cooling	No additional key mitigation measures related to marine water quality are identified beyond those identified in	Context – M Magnitude – N Extent – Lo Duration – ST Reversibility – R

Valued Component/Intermediary Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	water at the diffuser could potentially have effects on marine water quality.	section 5.4 of this Report and for the purposes of CEAA 2012 ss .5(1). Key mitigation measures related to marine water quality from the Application include: • No discharges of any wastewater into Mill Creek, Woodfibre Creek or other watercourses during the Project's construction or operations; • All diffusers would be designed and operated to meet discharge criteria in accordance with conditions of Waste Discharge Authorizations and would meet CCME and BC Water Quality Guidelines for the Protection of Aquatic Life; • Monitoring of seawater cooling discharge to assess the effectiveness of mitigation and confirm the results of the assessment. • Where required, turbidity monitoring would be implemented during all pile drilling/driving activities to not exceed established water quality criteria; • Use of sediment containment systems	Frequency – S Likelihood – L Significance – Not significant

Valued Component/Intermediary Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		as part of the creosote pile mitigation measures; and • Development and implementation of a marine water quality management and monitoring plan.	
Works in and about navigable water – *Navigation Protection Act*, ss. 6(1) and 9(1)			
Air Quality	Construction and operation of the marine terminal, mooring of LNG carriers, patrolling of control zones, passenger ferry terminal, refurbished rail car barge ramp, small craft float and uploading dock have the potential to affect air quality. This effect is included in section 5.1 (air quality) of this Report.	No additional key mitigation measures related to air quality are identified beyond those identified for the purposes of CEAA 2012 ss .5(1). Key mitigation measures related to air quality from the Application include: • Project design, including using electricity to drive the LNG facility; • Providing electrical power to the FSO and shore power for LNG carriers at berth; and • Limiting the use of power generators during operation.	Context – L Magnitude – N Extent – Lo Duration – LT Reversibility – R Frequency – C Likelihood – H Significance – Not significant
Atmospheric Sound	Construction and operation of the marine terminal, mooring of LNG carriers, patrolling of control zones, passenger ferry terminal, refurbished rail car barge ramp, small craft float and uploading dock have the potential to affect the atmospheric sound. This effect is included in section 9.0 (human health) and section 5.5 (marine fish and marine mammals) of this Report.	Key mitigation measures related to atmospheric sound from the Application include: • LNG carrier speed would be restricted along the proposed shipping route in Howe Sound • Advise nearby residents of high noise activities • Schedule high noise emitting	Context – M Magnitude – L Extent – Lo Duration – MT Reversibility – R Frequency – MI Likelihood – H Significance – Not significant

Valued Component/Intermediary Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		maintenance during the day where possible • Notify residents prior to noise-emitting maintenance activities • Ensure that project related noise generated during operation complies with the OGC Noise Control Best Practices Guidelines at sensitive receptor locations • Receive feedback about high-noise activity	
Visual Quality	The Project may alter visual quality from terrestrial and marine viewpoints with views of the LNG facility and LNG carriers travelling along the marine access route. See section 7.4 (visual quality) Effects from a transiting LNG carrier would be infrequent and short-term in duration.	No additional key mitigation measures related to visual quality are identified beyond those identified for the purposes of CEAA 2012 ss .5(1). Key mitigation measures related to light from the Application include: • Lighting fixtures would be fully shielded to minimize uplight to the atmosphere, where doing so would not affect safety or operation • Where possible, the direction of lighting would be angled to minimize effects • Prohibit mooring of LNG carriers in Howe Sound, which would reduce visual	Context – M Magnitude – L-M Extent – Lo Duration – LT Reversibility – R Frequency – C Likelihood – H Significance – Not significant

Valued Component/Intermediary Component	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
		quality effects.	
Marine Water Quality	Construction and operation of the marine terminal, mooring of LNG carriers, patrolling of control zones, passenger ferry terminal, refurbished rail car barge ramp, small craft float and uploading dock have the potential to affect marine water quality. This effect is included in the marine water quality section of this report.	Same as above key mitigation identified for marine water quality (under Serious harm to fish – *Fisheries Act* para. 35(2)(b)).	Context – M Magnitude – L Extent – Lo Duration – MT Reversibility – R Frequency – MI Likelihood – H Significance – Not significant

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low, low likelihood, M – Moderate likelihood, H – High likelihood) .

Environmental effects not already described in the sections above, resulting in a change to health and socio-economic conditions, physical and cultural heritage and any structure, site or thing that is of historical paleontological or architectural heritage directly linked or necessarily incidental to the exercise of a power or performance of duty or function by a federal authority would not be anticipated as a result of the proposed Project.

12.5 *Species At Risk Act* 79(2) Requirements

SARA 79(2) requires the identification of adverse effects of the proposed Project on the SARA listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them.

The assessments required for SARA 79(2) are summarized in Table 12-10.

Table 12-10: Summary of Effects Related to SARA 79(2)

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Marine Resources VC			
Killer whale – Southern Resident (endangered)	Potential effects of the proposed Project are: Potential injury to as a result of underwater noise as a result of pile driving during construction	Key mitigation measures from the Application include: o An Underwater Noise Management Plan would be developed that would include measures to address sequencing of noise-generating activities, monitoring of underwater pile driving activities, and the	Context – L - M Magnitude L – Harm M – Behaviour Extent Lo – Harm Lo - Re – Behaviour Duration ST – Harm

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
	Changes in behaviour due to underwater noise from pile driving during construction and vessel activities during construction and operations	identification of least-risk fisheries work windows. A qualified specialist marine mammal observer would also monitor for marine mammals and communicate presence/absence to the contractor. ○ A Marine Mammal Management Plan would be developed that would include: ○ LNG carriers and other deep-sea vessel speeds will be kept at a maximum of 8 to 10 knots when operating in the LAA. ○ All Project vessels will follow established shipping lanes/navigational routes typically used in the area. ○ Under no circumstances, other than in the case of an emergency, will vessels approach within 100 m of any marine mammal. ○ During impact pile driving activities, a qualified specialist marine mammal observer will monitor for marine mammals and will communicate presence/absence to the contractor.	ST (temporary over the life of the Project during operations) – Behaviour Reversibility – R Frequency I – Harm R – Behaviour Likelihood – H Significance – Not significant
Killer whale – Northern Resident (threatened)			Same as above
Killer whale – Transient (threatened)			Same as above
Killer whale – Transient (special concern)			Same as above
Harbour porpoise (special concern)			Same as above
Humpback whale (threatened)			Same as above
Grey whale (special concern)			Same as above
Steller sea lion (special concern)			Same as above
Northern abalone (endangered)	No effects		
Wildlife			
Coastal tailed frog (special concern)	Potential effects of the proposed Project are: Loss or change in habitat Increased risk of injury or mortality	Key mitigation measures from the Application include: • Re-vegetation of Green Zone area adjacent to Mill Creek • Minimize clearing of sensitive and important ecosystems • Identify and avoid sensitive amphibian habitat prior to construction • Develop and implement an Erosion Prevention and Sediment Control Plan • Develop and implement a Water Quality Monitoring Program • Environmental monitor would be responsible for monitoring noise and potential effects to wildlife, and implementing corrective mitigation measures	Context – M Magnitude – L Extent – PF Duration – LT Reversibility – R Frequency S – Habitat I - Mortality Likelihood – H Significance – Not significant
Western Toad (special concern)			Same as above
Northern red-legged frog (special concern)			Same as above
Marbled murrelet	Potential effects of the	Key mitigation measures from the	Context – M

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
(threatened)	proposed Project are: Loss or change in habitat Sensory disturbance or behavioral alterations Increased risk of injury or mortality	Application include: • Re-vegetation of Green Zone area adjacent to Mill Creek • Minimize clearing of sensitive and important ecosystems • Avoid vegetation clearing during terrestrial and marine bird breeding season if possible or conduct pre-clearing surveys for nesting birds • Minimize the amount of ultraviolet, red or white lighting, where possible • Minimize the duration of construction activities within the intertidal zone to the extent possible • Establish and maintain marine bird breeding colony setbacks, adhering to the 300 m setback for waterbird colonies related to vessel traffic and refrain, where possible, from blowing horns or whistles, and maintain constant engine noise when passing colonies • An environmental monitor would be responsible for monitoring noise and potential effects to wildlife, and implementing corrective mitigation measures • Vibrational pile driving would be used were practicable and feasible • Initial cool down and loading of LNG carriers would be done during daylight when possible to reduce potential and injury and mortality events from the flare • Incorporation of flare-specific mitigation measures in the Wildlife Management Plan, in consultation with agencies. • Install Western screech-owl nesting structures • Retain snags and wildlife trees wherever possible, to maintain important habitat features for terrestrial birds and bats	Magnitude – L Extent: Lo – for habitat Re – for sensory Re – for mortality Duration – LT Reversibility – R Frequency: S – for habitat I – R – for sensory R – for mortality Likelihood – H Significance – Not significant
Great blue heron *fannini* (special concern)	Potential effects of the proposed Project are: Loss or change in habitat Sensory disturbance or behavioral alterations Increased risk of injury or mortality		Same as above
Olive-sided flycatcher (threatened)	Potential effects of the proposed Project are: Loss or change in habitat Sensory disturbance or behavioral alterations Increased risk of injury or mortality		Context – L Magnitude – L Extent – PF Duration – LT Reversibility – R Frequency: S – for habitat MI – MR – for sensory MI – MR – for mortality Likelihood – H Significance – Not significant
Common nighthawk (threatened)			Same as above
Western screech-owl kennicottii subspecies (special concern)			Same as above
Band-tailed pigeon (special concern)			Same as above

SARA Species	Effects Assessment	Key Mitigation Identified by EAO	EAO's Significance Conclusion
Little Brown Myotis (endangered)	Potential effects of the proposed Project are: Loss or change in habitat Sensory disturbance or behavioral alterations Increased risk of injury or mortality	Key mitigation measures from the Application include: • Re-vegetation of Green Zone area adjacent to Mill Creek • Minimize clearing of sensitive and important ecosystems • Avoid clearing during bat maternity season or conduct pre-clearing maternity roost surveys • Establish acceptable non-disturbance buffers around active maternity roosts • Install bat boxes away from sources of potential mortality • Minimize the amount of ultraviolet, red or white lighting, where possible • Retain snags and wildlife trees wherever possible, to maintain important habitat features for terrestrial birds and bats • An environmental monitor would be responsible for monitoring noise and potential effects to wildlife, and implementing corrective mitigation measures • Incorporation of flare-specific mitigation measures in the Wildlife Management Plan, in consultation with agencies.	Context – M Magnitude – L Extent – PF Duration – LT Reversibility – R Frequency: S – for habitat MI – MR – for sensory MI – MR – for mortality Likelihood – H Significance – Not significant
Northern Rubber Boa (special concern)	No effect		
Northern goshawk *laingi* (threatened)	No effect		
Northern spotted owl (endangered)	No effect		
Peregrine falcon *Pealei* (special concern)	No effect		
Pacific water shrew (endangered)	No effect		
Short-eared owl (endangered)	No effect		

Note: Residual Effects Ratings: Context (L – Low resilience, low capacity to recover , M – Moderate resilience, moderate capacity to recover, H – High resilience, high capacity to recover); Magnitude (N – Negligible, L – Low, M – Moderate, H – High); Geographic Extent (PF – Project footprint, Lo – Local, Re – Regional); Duration (ST – Short-term, MT – Medium-term, LT – Long-term); Frequency (S – Single event, I – Infrequent, F – Frequent, C – Continuous); Reversibility (R – Reversible, I – Irreversible); Likelihood (L – Low, low likelihood, M – Moderate likelihood, H – High likelihood) .

PART C – CONSULTATION WITH ABORIGINAL GROUPS

13 EAO Consultation Process Overview

The Governments of BC and Canada are legally obligated to consult on and, if necessary, accommodate asserted or established Aboriginal rights including title, or treaty rights ("Aboriginal Interests") that may be impacted by government decisions. In *Haida Nation v. British Columbia (Minister of Forests), 2004 SCC 73* (*Haida*), the Supreme Court of Canada established that the Crown is required to consult with Aboriginal Groups when the Crown contemplates conduct that might adversely affect potential or established Aboriginal or Treaty rights. The extent (or level) of the consultation is proportionate to preliminary assessments of the following factors:

- Strength of the case for the claimed Aboriginal rights (including title) that may be adversely affected; and
- Seriousness of potential impact of contemplated Crown action or activity to adversely impact Aboriginal Interests.

EAO and the Agency worked together to identify which Aboriginal Groups could potentially be impacted by the proposed Project and the extent of consultation required based on these two factors.

The extent (or level) of the Crown's obligation to consult is described in the *Haida* case as lying on a spectrum from notification to deep consultation. An EA is not a process to determine Aboriginal rights or title, nor does EAO have all of the necessary information to make such a determination. EAO's assessment of whether Aboriginal Groups may have a *prima facie* claim to Aboriginal rights or title, based on available information, is intended solely to inform the level of consultation required for each Aboriginal Group for the EA of a proposed Project. A key objective of an EA is to identify potential adverse effects of proposed projects on Aboriginal Interests and explore measures to avoid, mitigate or otherwise appropriately address such effects.

On March 21, 2014, EAO issued a Section 11 Order which specified the consultation activities that both EAO and the Proponent would undertake with all Aboriginal Groups potentially affected by the proposed Project. EAO considered the overlap of the proposed Project facility and proposed shipping route within an Aboriginal Group's asserted traditional territory, the nature of the potential effect on Aboriginal Groups' Aboriginal Interests and an initial assessment of the strength of claimed Aboriginal rights and title to determine the level of consultation it would undertake with Aboriginal Groups. Squamish Nation asserted traditional territory overlaps both the marine and terrestrial areas of the proposed Project and was therefore listed on Schedule B and provided with opportunities for consultation at a higher level on both the proposed Project site effects and marine effects. Tsleil-Waututh Nation's asserted traditional territory overlaps the marine areas of the proposed Project and was listed on Schedule C and consulted at a higher level in relation to the marine effects. Aboriginal Groups

identified on Schedule D were identified to have part of their asserted marine territory overlapped by a portion of the proposed shipping route at the mouth of Howe Sound and were therefore consulted at a lower level in relation to potential marine effects.

EAO consulted the following Aboriginal Groups listed in the Section 11 Order:

Schedule B:

- Squamish Nation

Schedule C:

- Tsleil-Waututh Nation

Schedule D:

- Musqueam Nation
- Cowichan Tribes First Nation
- Halalt First Nation
- Lake Cowichan First Nation
- Lyackson First Nation
- Penelakut Tribe
- Stz'uminus First Nation
- Métis Nation British Columbia[14]

Aboriginal Groups listed on Schedule B and C of the Section 11 Order were provided with the following opportunities for consultation at the deeper end of the consultation spectrum including:

- Notifications at key milestones in the EA;
- Participation in the Working Group;
- Participation in meetings to identify and discuss both Aboriginal Interests that may be affected by the proposed Project and potential measures to avoid, mitigate, address or otherwise accommodate impacts;
- Review and comment on key documents, including the draft Section 11 Order, draft VC document, draft AIR, the Proponent's Application for an EAC, and EAO's draft Assessment Report, including the part describing consultation with Aboriginal Groups (Part C of this Report), and the Proponent's Aboriginal Consultation Reports; and
- Submission of a document outlining the Aboriginal Group's views on the Assessment Report to be included in the package of materials sent to Ministers when the proposed Project is referred for decision.

[14] British Columbia consulted MNBC on behalf of the Government of Canada pursuant to the Memorandum of Understanding on Substitution of Environmental Assessments (CEAA, EAO 2013). Consultation with MNBC is not an acknowledgement on the part of BC that it owes a duty of consultation or accommodation to Métis in BC under Section 35 of the *Constitution Act, 1982*.

The Section 11 Order also required the Proponent to develop and implement an Aboriginal Consultation Plan with respect to the Aboriginal Groups in Schedules B and C, to the satisfaction of EAO.

Aboriginal Groups listed on Schedule D of the Section 11 Order were provided the following opportunities:

- Notification of key milestones – such as the issuance of the AIR, acceptance of the Application for review, timing of public comment periods (including open houses), when the final Assessment Report is referred to Ministers and the resulting decision;
- Consider information from such Aboriginal Groups regarding Aboriginal Interests in the proposed Project area;
- Invitation to review and comment on EAO's draft Assessment Report, including the part describing consultation with Aboriginal Groups (Part C of this Report); and
- Implement additional measures for consultation and accommodation of such Aboriginal Groups, where appropriate.

In addition to the opportunities listed above, EAO provided Aboriginal Groups listed on Schedules B, C and D with the draft proposed TOC and the draft CPD for comment.

On June 3, 2014, EAO issued a Section 13 Order which required the Proponent to respond to comments received from Aboriginal Groups in Schedule D on the draft VC selection document and other specified Pre-Application Information. However, no comments were received from any Schedule D Aboriginal Groups during the Pre-Application period.

On February 19, 2014 the federal Minister of the Environment approved BC's request to substitute the provincial EA process for the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) EA for the proposed Project. Sections 1 and 13 of this Report contain additional information on the substitution process and the CEAA 2012 requirements. The VC, Current Land and Resource Use for Traditional Purposes, has been considered within Part C of this Report.

As part of the substituted EA process, EAO consulted all the Aboriginal Groups listed on Schedules B, C and D of the Section 11 Order on behalf of the federal government.

On November 19, 2014 EAO provided additional guidance to the Proponent to engage with the Aboriginal Groups listed on Schedule D of the Section 11 Order and submit a report containing analysis of environmental effects related to all factors outlined in section 5(1)(c) of CEAA 2012 for each Aboriginal Group (including those listed in schedules B, C and D) in order to meet the requirements of the substituted decision. The Proponent provided the draft report to each of the Aboriginal Groups with its assessment of potential impacts from the proposed shipping activities on the Aboriginal

Interests of these Aboriginal Groups for review. The Proponent offered some capacity funding to assist each Aboriginal Group to engage in the review.

The Section 11 Order required the Proponent, as part of the substituted EA process, to consult with Métis Nation British Columbia (MNBC) on behalf of the Federal Crown as per the delegated procedural aspects of Aboriginal consultation set out in the *Memorandum of Understanding between the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office on Substitution of Environmental Assessments (2013).* MNBC was included on Schedule D of the Section 11 Order and provided the consultation opportunities listed above. Consultation with the MNBC is not an acknowledgement on the part of BC that it owes a duty to consult or accommodate Métis in BC under section 35 of the *Constitution Act, 1982.*

The Proponent and Squamish Nation entered into an agreement early in the EA that set out a process for how the Proponent and Squamish Nation would engage during the EA (the 'Squamish Process').

At the request of the Proponent, on November 6, 2014, EAO issued a Section 13 Order, amending the procedural requirements for the Proponent, related to consultation with Squamish Nation. The Section 13 Order delayed aspects of the Proponent's reporting requirements related to Squamish Nation until day 105 of the Application Review Stage, at which time any information provided by Squamish Nation regarding Squamish Nation's Aboriginal Interests in the proposed Project area, the potential impacts of the proposed Project on Squamish Nation's Aboriginal Interests and any mitigation measures were to be provided to EAO.

During the EA, EAO continued to seek to consult with Squamish Nation directly, including providing Squamish Nation with opportunities to participate in the EA process and seeking any information regarding the potential impacts of the proposed Project on Squamish Nation's Aboriginal Interests and measures to avoid, mitigate or accommodate those Aboriginal Interests. Squamish Nation's technical representatives, Pottinger Gaherty Ltd. (PGL), provided technical review comments through Working Group review and participated in some of the Working Group meetings. More information about consultation with Squamish Nation is provided in section 20.1.1 of this Report.

EAO has considered all comments and information received from Aboriginal Groups consulted on the proposed Project throughout the EA process. During all stages of the EA, issues, comments and concerns raised by Aboriginal Groups with EAO, submitted via correspondence or raised directly at meetings or in Working Group meetings in relation to the proposed Project were forwarded to the Proponent for tracking and response, as required. Input from Aboriginal Groups was received through various avenues including participation in Working Group meetings, teleconferences, direct meetings with EAO and/or the Proponent and written correspondence (letters or emails).

EAO has reviewed the adequacy of the Proponent's responses to all comments received from Aboriginal Group representatives on the Working Group and recorded in the Working Group Issues Tracking Table. EAO required the Proponent to update the Working Group Issues Tracking Table and supporting Technical Memos as appropriate and EAO considered the comments and issues in the development of this Report. Aboriginal Group representatives on the Working Group had the opportunity to review the responses of the Proponent to comments. In addition, EAO arranged specific Working Group meetings on key issues of interest to Aboriginal Groups on the Working Group and offered to meet with all Aboriginal Groups directly to discuss any outstanding concerns.

A draft of this Report, demonstrating how EAO considered all Aboriginal Groups' comments received up until about July 7, 2015, was provided to Aboriginal Groups participating in the Working Group and to the Schedule D Aboriginal Groups on July 9, 2015 for review and comment. Comments and feedback on the draft Report received up until August 18, 2015 have been considered in the final version of this Report.

14 Aboriginal Groups Consulted

14.1 Coast Salish People

Prior to European contact, the southern end of the Strait of Georgia, most of the Strait of Juan de Fuca, and the Lower Fraser Valley were inhabited by the Coast Salish, which included five language groups.

All of the potentially affected Aboriginal Groups are part of the Central Coast Salish cultural-linguistic grouping, with the exception of the Métis. The Coast Salish were organized into local groups of one or more households and included a central kingroup and dependent households; the local group was frequently named for the site it occupied.

Coast Salish groups traditionally subsisted on fish (including salmon, herring, herring spawn and halibut), sea mammals, beach foods, land mammals (including deer, elk, black bear, and mountain goats), waterfowl and plants. Many Coast Salish groups participated in a 'seasonal round' involving a cycle of hunting, fishing, food gathering, and cultural and spiritual activities. Coast Salish peoples would migrate in the summer to take advantage of seasonal salmon runs in different places. Transportation was primarily via canoe and villages would be constructed near water where canoes could be launched. The traditional diet was also supplemented by many plants including berries, fruit, nuts, roots, and bulbs. Certain plants including camas, wild carrots, wapato, and brake ferns were cultivated and held as individual or family property by some groups. Fruit and shellfish would also be gathered and preserved. Cedar was important for a variety of purposes including cordage, baskets, and bedding. In the

winter, people would gather in villages and eat dried foods stored from the warmer seasons. Winter villages were comprised of a group of households.

14.2 Métis Nation British Columbia

The Métis are recognized as Aboriginal peoples, distinct from Indian and Inuit, as noted in section 35(2) of the *Constitution Act, 1982*. The Métis are originally the descendants of eighteenth-century unions between European men (explorers, fur traders and pioneers) and Indian women, mainly on the Canadian plains (Manitoba, Saskatchewan and Alberta). Within a few generations the descendants of these unions developed a culture distinct from their European and Indian forebears. In early times, the Métis were mostly nomadic. Later, they established permanent settlements centered on hunting, trading and agriculture. The test for evaluating whether an individual can be considered a Métis was set out by the Supreme Court of Canada in the 2003 case *R. v. Powely*. The MNBC has six geographical divisions with 35 chartered communities and provides services to Métis across BC.

15 EAO-Led Consultation Activities with Aboriginal Groups

This section provides an overview of consultation activities undertaken by EAO.

15.1 Capacity Funding

Capacity funding was provided by EAO to Aboriginal Groups in Schedules B and C of the Section 11 Order to assist with their participation in consultation discussions and Working Group meetings during both the pre-Application and Application Review phases of the EA[15]. The Agency provided capacity funding to EAO for distribution to each Aboriginal Group listed on Schedules B, C and D of the Section 11 Order. All Aboriginal Groups, except Penelakut Tribe, accepted the capacity funding.

In addition, the Proponent offered capacity funding to Aboriginal Groups listed in Schedule B and C of the Section 11 Order, to assist with their participation in regulatory processes, gather Project-based traditional use information to inform the Application, and to understand the potential impacts to Aboriginal Interests posed by the proposed Project. The Proponent also offered capacity funding to the following Aboriginal Groups listed on Schedule D to assist with their review of the report prepared on current use of lands and resources for traditional purposes: Lyackson First Nation, Penelakut Tribe, Stz'uminus First Nation and MNBC. None of these groups accepted the funding, stating that it was insufficient. Halalt First Nation and Cowichan Tribes First Nation deferred to

[15] The amount of capacity funding provided by EAO to each Aboriginal Group is outlined in Section 18 of this Report.

Squamish Nation and chose not to engage in the process. Musqueam Nation did not respond to the Proponent's efforts to engage.

15.2 Working Group Activities

Aboriginal Groups on Schedules B and C of the Section 11 Order (Squamish Nation and Tsleil-Waututh Nation) were invited to participate in the Working Group.

During the Pre-Application phase of the EA, EAO held two Working Group meetings:

- May 12, 2014 – Held in Vancouver to introduce the proposed Project and the Proponent, review the EA process and the Working Group roles and responsibilities, and to discuss the purpose of the VCs and the AIR. Working Group members had the opportunity to provide feedback on the draft VC selection document and the draft AIR; and
- October 8, 2014 – Teleconference held to provide information about the process of Application Evaluation (screening) and to introduce key principles and the role of the Working Group in screening and Application Review.

During Application Review, EAO held two Working Group meetings and a site visit on:

- January 29, 2015 – A site visit was held for the Working Group to visit the Woodfibre site and ask questions of the Proponent and technical experts;
- March 4-5, 2015 – Held in Vancouver to discuss the Proponent's Application, assessment results, responses to the first round of comments from Working Group members, and proposed mitigation. Working Group members had opportunities to ask questions and seek information from subject matter experts, provincial and federal regulators, and the Proponent; and
- April 13, 2015 – Marine Transportation Working Group meeting held in Vancouver. Working Group members had opportunities to ask questions and seek information from subject matter experts, provincial and federal regulators, and Proponent related to marine transportation.

EAO provided Aboriginal Groups participating on the Working Group with opportunities to review and provide comments on key documents of the EA, including meeting summaries from Working Group meetings.

During the Pre-Application phase, which began in November 2013 and ended on January 12, 2015, EAO provided the following documents for comment:

- Draft Section 11 Order;
- The draft VC selection document;
- The draft AIR;
- Draft Section 13 Orders; and

- The Application submitted for screening.

During Application Review, which began on January 13, 2015 and ended on August 19, 2015, EAO provided the following documents for review and comment:

- The Application and supplemental information submitted during Application Review;
- Working Group Issues Tracking Table and the Proponent's responses (twice);
- Draft TOC and CPD; and
- EAO's draft Assessment Report, including Part C of this Report.

Comments on the Application from Aboriginal Groups were considered by EAO and the Proponent, and incorporated into this Report, as appropriate. Detailed comments from Aboriginal Groups, Proponent's responses, and EAO's comments on these are contained in the Working Group Issues Tracking Table, which was updated and shared with the Working Group throughout the EA.

15.3 Government-to-Government Consultation

EAO provided the opportunity for government-to-government consultation to all Aboriginal Groups listed on Schedules B, C and D of the Section 11 Order to discuss their views on potential impacts of the proposed Project on their Aboriginal Interests. The sections below provide an overview of meetings with specific Aboriginal Groups. Key issues of concern raised by Aboriginal Groups related to Aboriginal Interests are discussed below, and concerns related to specific VCs are discussed in the VC-specific sections of this Report.

15.4 Province-Led LNG benefit discussions and other LNG-Related Initiatives

The Province, led by the Ministry of Aboriginal Relations and Reconciliation (MARR), approached Aboriginal Groups to discuss initiatives that would provide economic, employment, and skills training benefits. Discussions of proposed benefits agreements with Squamish Nation, Musqueam Nation and Tsleil-Waututh Nation are on-going and include consideration of the proposed Woodfibre LNG facility; the proposed Eagle Mountain-Woodfibre Gas Pipeline Project; transit of marine related traffic associated with the facility; BC Hydro related infrastructure; and any provincial Crown land or waterways that may be used for the proposed Project. The Province provided capacity funding to assist Aboriginal Groups' engagement in negotiations of LNG benefit agreements with the Province of BC.

A number of provincial and federal programs exist to assist Aboriginal Groups in addressing training requirements associated with the current and potential future workforce needs associated with LNG-related proposals, including the proposed Project. The Province has engaged Aboriginal Groups affected by the proposed Project to supplement community-related skills training requirements. In December 2014,

MARR provided funding to Squamish Nation to partner with Musqueam Nation and Tsleil-Waututh Nation to hold community planning sessions involving Aboriginal Groups and other partners to identify skills training and employment opportunities linked to LNG, and to develop a one year skills training and employment plan to enable Aboriginal members potentially impacted by LNG in the region to move into business and career opportunities.

As part of BC's Skills for Jobs Blueprint, the Province will invest up to $30 million over the next three years across BC for new Aboriginal skills-training projects and partnerships. Investments made possible by this new fund will be guided by community-based discussions on labour market and skills training needs with Aboriginal Groups. MARR will continue to engage Aboriginal Groups in the Lower Mainland area to identify priorities for this investment and to leverage the new funding with additional investments from partners, including the federal government and industry. MARR will also help to address key barriers that communities face in accessing skills development and labour market programs and services.

These initiatives are additional measures developed outside of the regulatory process, intended to help address the impacts of LNG-related development, including the proposed Project, on Aboriginal Interests.

16 Proponent-Led Consultation Activities with Aboriginal Groups

As part of the Section 11 Order, EAO directed the Proponent to undertake procedural aspects of consultation during the EA with Aboriginal Groups listed on Schedules B and C. The Section 11 Order issued by EAO required the Proponent to develop and share drafts of an Aboriginal Consultation Plan and multiple Aboriginal Consultation Reports with the specified Aboriginal Groups at prescribed milestones during the EA. These documents were reviewed by Aboriginal Groups and revised by the Proponent prior to being submitted to EAO, based on input received from and concerns expressed by Aboriginal Groups. The intent of these documents was to enable EAO to understand the Proponent's consultation efforts and the perspectives of the Aboriginal Groups related to those efforts, any issues and concerns identified by Aboriginal Groups to the Proponent, and to evaluate the Proponent's consultation plan for subsequent activities required with these Aboriginal Groups during Application Review.

The Proponent also engaged with the Aboriginal Groups listed on Schedule D of the Section 11 Order in preparing a separate report containing its assessment of environmental effects related to all factors outlined in subsection 5(1)(c) of CEAA 2012 for each Aboriginal Group in order to meet the requirements of the substituted decision. The Proponent provided the draft report for review and comment to each of the Aboriginal Groups. The draft report included an assessment of potential impacts from the proposed shipping activities on the Aboriginal Interests of these Aboriginal Groups. The Proponent reports that it only received comments from MNBC and based on those comments revised the report and submitted it to the EAO. The final reports have been considered by EAO and incorporated into this Report.

From 2013 to 2015, the Proponent used a number of communication and information sharing methods with Aboriginal Groups including meetings, written correspondence and telephone conversations. A complete description on the Proponent's consultation with Aboriginal Groups is provided in the Proponent's Aboriginal Consultation Reports and a summary of consultation with individual Aboriginal Groups is provided in section 18 of this Report. The Proponent-led activities involved:

- Discussion of potential adverse effects on Aboriginal Interests, and possible mitigations;
- Information sharing on the proposed Project and potential adverse effects;
- Engagement on socio-economic issues;
- Agreement for capacity funding to support studies, ongoing engagement and involvement in the regulatory process;
- Traditional land use (TLU) studies; and
- Engagement on economic benefits, contracting, education and training opportunities.

In addition, at the direction of EAO, the Proponent participated in the majority of Working Group activities, including making presentations on the proposed Project, participating in discussions at Working Group meetings, and tracking and responding to comments from Aboriginal Groups.

The Proponent signed a MOU with the Tsleil-Waututh Nation which included capacity funding to assist with their participation in regulatory processes, gather Project-based traditional use information to inform the Application, and to understand the potential impacts to Aboriginal Interests posed by the proposed Project. Tsleil-Waututh Nation provided the *Tsleil-Waututh Nation Aboriginal Interests – In Relation to the Woodfibre LNG Project* (Tsleil-Waututh Traditional Land Use [TLU] Report) to the Proponent in March, 2015. The Proponent also provided funding to Squamish Nation in support of the 'Squamish Process'; however, the details of the agreement between the Proponent and Squamish Nation also remain confidential.

The Proponent indicated that it is actively engaged in on-going long-term benefit agreement negotiations with the Aboriginal Groups listed on Schedules B and C of the Section 11 Order. EAO anticipates that these benefits could include opportunities related to employment, training and contracting. The Proponent views these agreements as part of its overall commitment to ongoing engagement with potentially affected local Aboriginal Groups.

17 Potential Impacts of the Proposed Project on Aboriginal Interests

The description of the proposed Project is provided in Part A of this Report.

EAO sought input from each Aboriginal Group on the nature and scope of their Aboriginal Interests and how they might be impacted by the proposed Project. A summary of the potential impacts is provided in the sections below. Responses to the full set of concerns are described in the Issues Tracking Table. Key issues raised during the EA are described in each Aboriginal Groups' section of this Report.

With respect to assessing the seriousness of potential impacts of the proposed Project on Aboriginal Interests, EAO considered relevant factors, including:

- The location of each Aboriginal Group's asserted traditional territory;
- Past, present, and anticipated future Aboriginal uses of the proposed Project area and its surroundings, including the frequency and timing of such uses by each Aboriginal Group;
- The impact of the proposed Project on the exercise of Aboriginal Interests;
- Mitigation measures proposed to avoid or minimize adverse effects to corresponding Aboriginal Interests;
- Environmental effects with respect to Aboriginal peoples specifically listed under subsection 5(1)(c) of CEAA 2012;
- The baseline conditions of VCs, including those associated with the exercise of Aboriginal Interests, incorporating consideration of other development in the local or regional area that may contribute to the current condition of the VCs;
- Residual and cumulative effects of the proposed Project on VCs associated with the exercise of Aboriginal Interests (e.g. fish, vegetation, wildlife);
- The extent to which the proposed Project could affect each Aboriginal Group's access to, and use of the proposed Project area to exercise Aboriginal Interests;
- The relative importance of the proposed Project area and its surroundings to the exercise of each Aboriginal Group's Aboriginal Interests, including any special characteristics or unique features of that area; and
- The relative availability of other areas in reasonable proximity, within the traditional territory of each Aboriginal Group, where the meaningful exercise of Aboriginal Interests could reasonably occur.

EAO recognizes that areas within the asserted traditional territory of each Aboriginal Group, including areas within the vicinity of the proposed Project, may be particularly important and valuable for specific qualities associated with traditional cultural or spiritual practices, or traditional harvesting sites (e.g., hunting, trapping, fishing and gathering in areas with specific resource values or cultural importance), and that some areas may be associated with traditional harvesting activities or cultural practices of a specific Aboriginal Group's individual members or families.

EAO considered that potential impacts from the proposed Project on Aboriginal Interests related to traditional harvesting activities (e.g. hunting, fishing, trapping and gathering) and to archaeological and cultural heritage resources and sites (if present) include:

- Quantitative and qualitative changes in preferred harvested species and

traditional use sites;
- Changes in, or restrictions on, preferred harvesting methods or areas;
- Quantity and quality of identified traditional use locations, landscape features for spiritual purposes, and access corridors;
- Temporary restrictions in access to harvesting areas and traditional use areas via trails and marine travelways;
- Quantitative change in production levels of traditional foods;
- Changes in the quality of traditional foods; and
- Alteration or removal of archaeological or cultural heritage sites, sacred sites, trails and culturally or spiritually important sites and CMTs.

The Proponent's Application includes an assessment of potential effects on environmental, social, economic, heritage and health VC's with interactions and effects on Aboriginal Interests. The assessment of these VCs is discussed in Part B of this Report.

In addition to specific mitigations proposed in the Application to avoid and minimize potential adverse effects to VCs, EAO also considered the Proponent's consultation with specified Aboriginal Groups, and efforts to identify and avoid or modify the proposed Project as a key mitigation in minimizing potential impacts of the proposed Project on Aboriginal Interests.

The Proponent's Project design and planning includes mitigation to avoid and reduce potential adverse effects to wildlife, marine mammals, terrestrial and marine birds, vegetation, benthic habitat, marine fish, heritage, current land and resource use for traditional purposes, and to Aboriginal Interests related to hunting, trapping, fishing or gathering. Examples of proposed Project design mitigation include:

- Reducing the amount of air contaminants and greenhouse gas emissions generated by the proposed Project by proposing to power the facility with electricity supplied by BC Hydro;
- Minimizing the amount of vegetation clearing required by siting the proposed Project on the former Woodfibre Pulp and Paper Mill site, an industrially zoned, brownfield site;
- Conducting site reclamation and restoration of the existing site to reduce legacy environmental effects;
- Relocating the proposed Project from floating to a land-based LNG facility to reduce the effects on the marine environment;
- Making shore power available at the FSO docking facility to LNG carriers that are equipped to use this power in order to reduce the emissions from the vessels; and
- Designing the site to minimize the potential adverse visual effects and commitment to maintain a 'greenzone'.

A discussion of Project design and alternatives that were considered is provided in section 2.2 and Appendix 1 of this Report.

17.1.1 Hunting and Trapping

A number of wildlife species that are traditionally important may be impacted by the proposed Project. Several species of interest that were identified by Aboriginal Groups were considered in the development of the key indicators for the marine and terrestrial birds and marine mammal VCs during Pre-Application. EAO considered how hunting and trapping by Aboriginal Groups could be adversely affected by the proposed Project including changes to the related VCs (assessed in Part B of this Report), and potential impacts to Aboriginal Interests.

Sections 5.5 (marine fish and mammals), 5.7 (marine and terrestrial birds) and 7.3 (marine transport) of this Report include a discussion of the potential impacts of the proposed Project on these VCs and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

EAO considered the following key factors in assessing the potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interest associated with hunting and trapping:

- The assessment of potential effects of the proposed Project on Aboriginal Groups' Aboriginal Interests associated with hunting and trapping is informed by the analysis of potential residual effects on relevant VCs. Potential effects, proposed mitigation, and residual effects are characterized for terrestrial wildlife and marine birds in section 5.7 and for marine fish and mammals in section 5.5 of this Report.
- The primary effects of the proposed Project on terrestrial wildlife such as terrestrial birds, are expected to be caused by changes in habitat suitability, changes in movement and behaviour, and increased mortality risk from clearing and from flaring. The magnitude of the residual effect on key indicator species for terrestrial birds is expected to be low, following implementation of proposed mitigation. The proposed Project would be constructed on a brownfield site, and clearing would be limited.
- The primary effects of the proposed Project on marine birds are expected to be loss of shoreline habitat, disturbances due to noise, vibrations, and lighting and mortality from collisions and flaring. The magnitude of the residual effect on marine birds is expected to be low, following implementation of proposed mitigation. Marine habitat loss would be primarily site-specific, except for smaller amounts of temporary and indirect habitat losses along the shipping route due to physical exclusion.
- The primary effects of the proposed Project on marine mammals are expected to be underwater noise from pile driving during construction and from shipping. The magnitude of the residual effect on marine mammals is expected to be low to moderate, following implementation of proposed mitigation. LNG carriers and construction noise are expected to elicit behavioural responses, including avoidance. The Application determined that LNG carriers and escort tugs would

not be expected to emit underwater noise at levels sufficient to cause injury to marine mammals. In a worst-case scenario, these behavioural disturbances could lead to a change in migration patterns, and reduced foraging efficiency, increased energy expenditure, and could result in reduced fecundity and population health.

- The potential effects on marine mammals from accidents and malfunctions would be due to accidental spills of toxic or hazardous non-LNG materials and accidental vessel strikes. After the implementation of the proposed mitigation measures, injury or mortality of individual marine mammals from a hydrocarbon spill would be unlikely and would not have long-term effects on marine mammal populations in Howe Sound. The ability of an Aboriginal Group to harvest or carry out cultural activities related to marine mammals could be impacted temporarily in the event of such an incident. The assessment (see section 10) determined that with the proposed mitigation (primarily reduced speed and relatively low frequency of LNG carriers compared to other existing shipping and other boat traffic along the shipping route), the likelihood of a fatality or injury of a marine mammal from a vessel strike would be considered rare and that the long-term viability of marine mammal populations in Howe Sound would be unlikely to be affected.
- The nature and extent of effects would depend on the inherent sensitivity of each wildlife species and habitat type, the nature and timing of the disturbances, and the effectiveness of mitigation.
- EAO understands that an Aboriginal Group's hunting and trapping activities depend, in part, on the status of wildlife populations within their area of traditional use. The LAA is intended to capture the direct and indirect impacts from the proposed Project, while the RAA is intended to capture the area where the influence of other land uses and activities could overlap with proposed Project-specific effects and result in cumulative adverse effects.
- Overall habitat disturbance from the proposed Project would be relatively small as the majority of the proposed Project footprint would be located on an existing brownfield site. No old-growth forest (important nesting/roosting habitat) would be lost as a result of the proposed Project.
- EAO has not received specific information on whether trapping or hunting sites or traplines are used by any Aboriginal Groups in the proposed Project area, with respect to terrestrial wildlife that overlap or are in proximity to the proposed Project footprint. If such usage were to exist, it would indicate a greater potential effect on that Aboriginal Group's Aboriginal Interest associated with hunting or trapping. It is noted that while the proposed Project area is not currently fenced, the condition of the site (primarily concrete and cleared of vegetation) is not likely conducive to hunting or trapping as it has limited wildlife habitat value. The proposed Project area is accessible only by water and since 2006, with the closure of the Woodfibre pulp and paper mill, access to the area has been restricted to the public.
- An Aboriginal Group's access to the proposed facility area to hunt or trap would be restricted for the life of the proposed Project due to safety reasons, which could also restrict use of areas that are near the Project area that are accessed

through it. EAO has not been provided information on specific Aboriginal use of the facility area and the site has actively used for industry for approximately 100 years.
- An Aboriginal Group's access to the shipping route in Howe Sound for hunting marine birds or mammals would be disturbed temporarily and for a short duration during construction and operations of the proposed Project while Project-related marine traffic is in transit. It is noted that approximately 3-4 LNG carriers would transit through Howe Sound per month.
- EAO considers the effectiveness of the proposed mitigation to avoid and reduce potential effects to terrestrial wildlife and marine birds and marine mammals to be moderate to high.
- The permitting process may also require additional mitigation if an EAC is issued. The Proponent has proposed mitigation to avoid and minimize potential effects to terrestrial wildlife and marine birds and marine mammals, and other concerns associated with hunting activities raised by Aboriginal Groups. The Proponent's proposed key mitigation measures are included in Part B of this Report.

Proposed conditions of the EA Certificate include:

- The development of a marine mammal management and monitoring plan applicable during construction;
- The development of a wildlife management plan for construction and operations that includes mitigation measures that would be implemented for the protection of wildlife habitat features in the Project area, and that includes a monitoring and follow-up program;
- A requirement for the Proponent to retain a qualified Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the proposed EA Certificate;
- The development of a construction and operations environmental management plan (EMP);
- Engagement with Aboriginal Groups, to seek to provide opportunities for members of Aboriginal Groups to participate in monitoring activities identified in the plans in the Table of Conditions that are occurring within their asserted traditional territory; and
- A requirement for continued engagement with Aboriginal Groups regarding construction planning and design, as well as regarding the development and implementation of the EMP and other management plans.

The potential impact of the proposed Project on Aboriginal Interests associated with hunting for each Aboriginal Group is described in section 18 of this Report.

17.1.2 Fishing and Marine Harvesting

Aboriginal Groups identified several traditionally important fish species, including salmon, smelt, cod, flounder, eulachon, herring, crabs, prawns, oysters, sea urchins and clams. Several species of interest that were identified by Aboriginal Groups were

considered in the development of indicators for the marine fish and freshwater fish VCs during Pre-Application. The Proponent assessed potential effects of the proposed Project on freshwater fish and fish habitat, marine fish, and marine benthic invertebrates.

Marine benthic invertebrates are a major food source for many species of marine fish, birds and mammals and are important to local fisheries and Aboriginal Groups. Several benthic invertebrate species are also harvested by Aboriginal people within Howe Sound. Dungeness crabs, tanner crabs, shrimps, sea cucumbers, urchins, anemones, and seastars were observed in the study area; however, the Application found that compared to reference areas within Howe Sound, the marine benthic community biodiversity and abundance within the LAA is reduced in several areas, primarily due to existing degraded habitat quality and wood waste debris on the seafloor from the former Woodfibre pulp mill operations. High concentrations of dioxins and furans as a result of historic industry, including the Britannia Mine, have been documented in marine sediments and shellfish in Howe Sound, resulting in the closure of some fisheries in the area. Fisheries for harvesting all bivalve molluscs (e.g. clams, oysters, mussels) are closed in Howe Sound. Aboriginal Groups have expressed support for the recovery of Howe Sound and the eventual return to the ability to harvest traditional foods (e.g., bivalve molluscs) in Howe Sound. Remediation, including the removal of creosote pilings and woody debris, is expected to improve the marine environment in the future.

EAO considered how fishing and marine harvesting by Aboriginal Groups could be adversely affected by the proposed Project including changes to the related VCs (assessed in Part B of this Report), and potential impacts to Aboriginal Interests.

The operation of the seawater cooling system has the potential to result in direct and indirect mortality of marine fish from impingement and entrainment at the seawater cooling system intake. Treated thermal water discharges to the marine environment from the seawater cooling system have the potential to result in fish mortality due to exposure to chlorine or changes to ambient water temperatures within the vicinity of the diffuser. During the EA, it was identified that there would be potential for risk to juvenile herring due to proximity to a herring spawn area.

Construction of the proposed FSO jetty and associated marine infrastructure would result in temporary increases in underwater noise with the potential to cause behavioural changes, injury, or mortality to marine fish and marine mammals. Vessel noise may produce a localized behavioural response in fish and mammals, including avoidance of the area around vessels and the terminal. The assessment determined that LNG carriers and escort tugs would not be expected to emit underwater noise at levels sufficient to cause injury to marine mammals in the LAA.

Lighting at the facility at night could affect fish behaviour and increase the risk of predation. To mitigate that effect, the Proponent is committed to shield and/or direct lighting away from adjacent marine areas with the exception of mandatory navigational

lighting and angle lighting such that it minimizes direct illumination and reflection off the sea surface.

Sections 5.3 (freshwater fish and fish habitat), 5.4 (marine water quality and benthic habitat) and 5.5 (marine fish and marine mammals) of this Report include a discussion of the potential impacts of the proposed Project on these VCs and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

EAO considered the following key factors in assessing the potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interests associated with fishing and marine harvesting:

- The assessment of potential effects of the proposed Project on Aboriginal Groups' Aboriginal Interests associated with fishing is informed by the analysis of potential residual effects on relevant VCs including freshwater fish and fish habitat (section 5.3), marine water quality and benthic habitat (section 5.4), and marine fish and marine mammals (section 5.5) characterized in this Report.
- The magnitude of the residual effects on freshwater fish and fish habitat and potential fish mortality is expected to be low, following implementation of proposed mitigation. The residual effects are not expected to be significant. No critical fish habitats were identified in the LAA. The direct loss of instream and riparian habitat within the Project footprint would be relatively small compared to total available habitat in the RAA.
- The magnitude of the residual effects on marine fish habitat is expected to be low to moderate, following implementation of proposed mitigation. Construction of marine facilities, seawater cooling system intake and diffuser, and the treated process water diffuser would result in direct and indirect loss of marine habitat; however, generally, the marine footprint would be in an area of existing degraded benthic habitat with low species diversity and abundance.
- The magnitude of residual effects on marine fish (physical harm) is expected to be low to moderate, following implementation of proposed mitigation. Marine infrastructure would be located in marine areas with low habitat quality (i.e., low species diversity and abundance). Direct mortality of marine fish from construction and dismantling marine infrastructure would be of low magnitude after the implementation of mitigation measures. Operation of the seawater cooling system intake would have the potential to cause impingement or entrainment of marine fish. Juvenile and larval life stages are particularly susceptible to entrainment. The seawater cooling system intake would be installed away from important fish habitats, in deep-water below the photic zone and 2 m above the seafloor to reduce potential marine fish mortality. The intake would employ a travelling screen mechanism to further reduce potential harm to marine fish. Based on the location of the marine water intake, herring spawning locations and anticipated larvae movement, entrainment of juvenile herring is unlikely to result in population level impacts resulting in a residual adverse effect of low to moderate magnitude after the implementation of mitigation measures.

- Key fishing sites identified by Aboriginal Groups that overlap or are in proximity to the proposed Project were considered in relation to past, present and anticipated future use of the area for fishing and marine harvesting.
- EAO understands that an Aboriginal Group's fishing activities depend, in part, on the status and sensitivity of fish populations within their area of traditional use, the nature and timing of the disturbances, and the effectiveness of mitigation, and the extent to which the proposed Project could affect an Aboriginal Group's access and use of the area.
- The likelihood of residual adverse effects to freshwater fish would be low based on the effectiveness of the proposed mitigations and the absence of critical fish habitat in the proposed Project area.
- The likelihood of residual adverse effects to marine fish would be high.
- An Aboriginal Group's access to the shoreline and marine area in front of the proposed facility would be restricted during Project construction and operations to ensure safety and security of the site. However, the geographic extent of this area is generally small. It is noted that there would be a marine control zone of approximately 70 ha (extending out about 550 m from the shoreline and 2.1 km along the shoreline) where access would be restricted for safety purposes;
- Marine shipping could impact an Aboriginal Group's access to fishing and marine harvesting areas while transiting through Howe Sound. These effects would be short-term in duration and low frequency. It is noted that approximately 3-4 LNG carriers would transit through Howe Sound per month – a voyage of approximately 2 hours. As LNG carriers would be travelling at speeds of 8 to 10 knots, they would be visible from a point of observation for 45 to 60 minutes before arriving at that location. In addition, the LNG carriers would be accompanied by escort tugs, including one in the lead with the ability to warn or assist other vessels in the path of a carrier if required. Given the low frequency of proposed LNG carrier traffic, and other mitigations, the likelihood is low that carrier travel would coincide with harvesting activities, therefore allowing sufficient time to access the resource.
- The permitting process may require additional mitigation and a DFO authorization would be sought in situations where serious harm to fish cannot be avoided. DFO has identified that suitable opportunities for offsetting are available at the site in the event that a serious impact to fish cannot be avoided.
- EAO considers the effectiveness of the Proponent's proposed mitigation to avoid and reduce potential effects to freshwater fish and fish habitat and marine fish and mammals and benthic habitat to be moderate to high. The Proponent's proposed key mitigation measures are included in Part B of this Report.
- The proposed Project would be constructed in accordance with the habitat protection provisions of the *Fisheries Act*, DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* (formerly DFO Operational Statements), the *Environmental Protection and Management Regulation* under the *Oil and Gas Activities Act* and OGC's *Environmental Protection and Management Guide.*

Proposed conditions of the EA Certificate include:

- The development of a marine fish and fish habitat management and monitoring plan, which would describe measures to avoid or mitigate impacts to fish and fish habitat and specify an adaptive management plan to address the effects on fish and fish habitat, if those effects are not mitigated to the extent identified in the Application or if unexpected effects occur;
- The retention of a qualified Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the Certificate requirements;
- The development of a marine transport management plan for construction and operations with the objective of mitigating and monitoring impacts to marine users. The plans would also identify existing and traditional navigational routes and fishing areas, and would identify methods to inform affected Aboriginal Groups of potential interference with marine navigation;
- The development of a marine water quality management and monitoring plan for construction and operations that would include results of baseline shellfish and groundfish tissue sampling and a follow up program to confirm human health risk assessment;
- The development of a construction environmental management plan;
- Engagement with Aboriginal Groups, to seek to provide opportunities for members of Aboriginal Groups to participate in monitoring activities identified in the plans in the Table of Conditions that are occurring within their asserted traditional territory; and
- Continued engagement with Aboriginal Groups regarding construction planning and design, as well as the development and implementation of the EMP and other management plans.

The potential impact of the proposed Project on Aboriginal Interests associated with fishing and marine harvesting for each Aboriginal Group is described in section 18 of this Report.

17.1.3 Gathering

None of the Aboriginal Groups consulted during the EA provided information regarding the use of any plant species harvested for food, medicinal or other cultural purposes in the proposed Project area. Approximately 74 % (27 ha) of the proposed Project Area is disturbed and is covered by old concrete and compact fill. The remaining 10 ha consists of vegetation in various stages of regeneration and is generally dominated by invasive Himalayan blackberry. The riparian area along Mill Creek and the mature forest adjacent to the creek are considered sensitive ecosystems. While little site clearing would be required, clearing and associated construction would result in the direct reduction in the extent of vegetation communities.

EAO considered how gathering by Aboriginal Groups could be adversely affected by the proposed Project including changes to the related VCs (assessed in Part B of this

Report), and potential impacts to Aboriginal Interests. Sections 5.6 (vegetation) and 9 (human health) of this Report include a discussion of the potential impacts of the proposed Project on these VCs and summarizes the key questions and concerns raised by Aboriginal Groups and other members of the Working Group during the course of Application Review.

EAO considered the following key factors in assessing the potential impacts of the proposed Project on an Aboriginal Group's Aboriginal Interest associated with gathering:

- The assessment of potential effects of the proposed Project on Aboriginal Groups' gathering activities depend, in part, on the abundance and condition of preferred plant species within their area of traditional use and is informed by the analysis of potential residual effects on relevant VCs. Potential effects, proposed mitigation, and residual effects for the vegetation VC are characterized in section 5.6 of this Report and, as related to country foods, was considered in section 9 (human health).
- The primary effects of the proposed Project on vegetation are expected to be caused by loss or alteration of vegetation, which are expected to be of low magnitude because of the small amount of directly impacted vegetation communities.
- The effects to vegetation would likely be confined to the proposed Project footprint and little vegetation clearing and alteration would be required. Two hectares of mature forest (0.6 % of RAA), 4 ha of young pole/sapling forest and less than 1 ha of shrub/herb vegetation would be cleared.
- EAO understands that an Aboriginal Group's gathering activities depend, in part, on the status of vegetation within their area of traditional use. The nature and extent of effects would depend on the inherent sensitivity and prevalence of vegetation communities, the nature and timing of the disturbances, and the effectiveness of mitigation.
- Access restrictions impacting gathering activities at the proposed Project site, during construction, operation and decommissioning or abandonment, would be for the duration of the proposed Project; however, the geographic extent of these lands is very small and it is noted that access to the private property has been restricted since 2006.
- Key gathering sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project were considered in relation to past, present and anticipated future use of the area for gathering. There were no gathering sites identified by an Aboriginal Group that overlap or are in close proximity to the proposed Project footprint that could indicate a greater potential effect on that Aboriginal Group's Aboriginal Interest associated with gathering.
- The Proponent's proposed mitigation to avoid and minimize potential effects to vegetation is presented in the Application. EAO considers the effectiveness of the proposed mitigation to avoid and reduce potential effects to vegetation to be high. The Proponent's proposed key mitigation measures are included in Part B of this Report.

Proposed conditions of the EA Certificate include:

- The retention of a qualified Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the proposed EA Certificate;
- The development of an invasive plant management plan that would describe measures to prevent, monitor, and control the establishment and spread of invasive plant species during construction and operations;
- The development of a construction and operations environmental management plan;
- Engagement with Aboriginal Groups, to seek to provide opportunities for members of Aboriginal Groups to participate in monitoring activities identified in the plans in the Table of Conditions that are occurring within their asserted traditional territory; and
- Continued engagement with Aboriginal Groups regarding construction planning and design, and the development and implementation of the EMP and other management plans.

The potential impact of the proposed Project on Aboriginal Interests associated with gathering for each Aboriginal Group is described in section 18.

17.1.4 Archaeology and Cultural Heritage Interests

Based on the results of a Heritage Resources Overview Assessment, the Application does not identify any previously-recorded archaeological sites in the LAA; however, there is the potential for undocumented sites to be present, including subsurface resources, surface lithic scatters, culturally-modified trees (CMTs), and intertidal features. The proposed Project area is primarily a disturbed brownfield site. While none of the Aboriginal Groups consulted on the proposed Project provided information to EAO regarding specific archaeology sites and cultural heritage sites and features (including habitation sites, cultural and spiritual sites, and trails and travelways) that could be impacted by the proposed Project, Tsleil-Waututh Nation raised concerns about the potential for wake to impact cultural sites located around the shores of Howe Sound and for disruption to traditional canoe routes. The Application assessed the potential effects from the proposed Project on Heritage (section 8 of this Report).

The proposed Project could impact archaeological and cultural heritage resources and sites, if present. As most of the proposed Project Area is a previously disturbed brownfield site, it is possible that the previous activity destroyed any archaeological sites and information that may have been present. Potential residual effects on heritage resources include the disturbance of some archaeological sites, and loss of some site-specific archaeological information, as any archaeological values that may be present and not collected would likely be permanently destroyed. Archaeological and cultural heritage sites, trails and travelways identified by an Aboriginal Group that overlap or are in proximity to the proposed Project were considered in relation to past, present, and

anticipated future use of the area. Multiple archaeological or heritage sites identified by an Aboriginal Group that overlap or are in proximity to the proposed Project would indicate a greater potential effect on the Aboriginal Group's Aboriginal Interests associated with the historical connection to and continued use of these sites.

Marine travelways[16] used by Aboriginal Groups would experience an increase in shipping traffic as LNG carrier shipping traffic volume is estimated to be approximately 40 vessel visits per year (3-4 visits per month). Aboriginal Groups raised concerns that wake generated from marine traffic associated with the proposed Project could affect shell middens located on the shores of Howe Sound, although they did not provide the EAO with specific locations of shell middens.

Wake effects are discussed in section 7.3 (marine transport) of this Report. The assessment concluded that wake waves would not exceed the natural wave action in Howe Sound. Therefore, vessel wakes are not likely to adversely affect the use of Howe Sound for boat-based activities such as fishing or cultural activities nor are vessel wakes likely to increase shoreline erosion. Consequently, neither access to, nor site integrity of, heritage resources located along the shore are likely to be damaged as a result of wakes generated by Project-related vessel traffic.

Archaeological sites in BC are protected under *the Heritage Conservation Act* (HCA), and FLNR's Archaeology Branch is the agency responsible for administering the HCA and maintaining the Provincial Heritage Site Register. Section 13 of the HCA specifies that an individual (or corporation) must not "damage, excavate, dig in or alter, or remove any heritage object" from a heritage site, unless under a permit issued by the Minister pursuant to sections 12 and 14.

For the proposed Project, OGC would be responsible for reviewing any applications for and issuance of any section 12 site alteration permits.

The Proponent has proposed mitigation to avoid and minimize potential effects to archaeological and heritage resources. The Proponent's proposed key mitigation measures are included in Part B of this Report.

Proposed conditions of the EA Certificate include:

- The retention of a qualified Environmental Monitor, who would have full authority to cease construction activities that are inconsistent with the proposed EA Certificate;
- The development of a wake verification plan for operations that must identify monitoring areas within Howe Sound, at shorelines and in the ocean, and specify

[16] "Travelways" is a term used to refer to freshwater or ocean watercourses that are used to access traditional land use areas.

an adaptive management plan to address the effects of wake on marine and shoreline users if the results of the wake verification plan indicate greater wake effects than predicted;
- The development of a construction environmental management plan, with engagement of Aboriginal Groups;
- Engagement with Aboriginal Groups, to seek to provide opportunities for members of Aboriginal Groups to participate in monitoring activities identified in the plans in the Table of Conditions that are occurring within their asserted traditional territory; and
- Continued engagement with Aboriginal Groups regarding construction planning and design, as well as the development and implementation of the EMP and other management plans.

Confidence in the overall effects assessment is high, given that provincially required mitigation programs would be conducted and would be based on input from Aboriginal communities and regulatory bodies.

The potential impact of the proposed Project on culturally-important sites, trails, and travelways for each Aboriginal Group is described in section 18 of this Report.

17.1.5 Aboriginal Title

The proposed Project has the potential to affect Aboriginal title claims, primarily related to the construction, operation and decommissioning of the proposed LNG facility. The Project site would be located at the former Woodfibre Pulp and Paper Mill site, the terrestrial portion of which is a fee simple, industrially-zoned, brownfield site within the asserted traditional territory of Squamish Nation and includes a marine portion that is Crown foreshore and within the asserted traditional territory of both Squamish Nation and the Tsleil-Waututh Nation.

EAO considered potential effects to Aboriginal title claims, including temporary effects related to construction and longer-term effects that could persist for the life of the proposed Project.

Potential effects of the proposed Project on Aboriginal title claims from the proposed Project may include:

- Potential disruption of subsistence activities, including hunting, trapping, fishing and plant gathering, during construction;
- Loss of access for Aboriginal Groups to the proposed Project area and potentially to nearby areas to hunt, trap, fish, gather or conduct other activities, as access would be restricted for the life of the proposed Project for safety reasons;
- Disruption of use and connectivity of trails and travelways, and cultural, habitation and spiritual sites;

- Potential effects of vessel wake with shoreline resource harvesting activities and other cultural activities, and potential damage to intertidal and subtidal archaeological sites; and
- Potential disruption of access due to increased marine traffic and reduction in the enjoyment of the land in proximity to the shipping route for the proposed Project from visual, noise, light and other sensory disturbance.

The following factors have informed EAO's consideration of potential seriousness of impact of the proposed Project on Aboriginal title claims:

- The majority of Project effects would be confined to a relatively small area of the proposed facility site, a previously disturbed brownfield site;
- During construction and operations of the proposed facility, access on and through the fee simple lands (including approximately 2.1 km of the shoreline) would be restricted for safety reasons. It is noted that while the proposed Project area is not currently fenced, the condition of the site (primarily concrete and cleared of vegetation) is not likely conducive to Aboriginal use. The Project area is accessible only by water and since 2006 and the closure of the Woodfibre pulp and paper mill, access to the area has been restricted to the public;
- Uses of the areas along the proposed shipping route would generally not be precluded, and any disruption to marine users along the shipping route would be temporary and short-term in nature;
- The Proponent committed to posting a marine transportation schedule on its website;
- The Proponent would discourage marine users from approaching within approximately 550 m of the marine infrastructure at the proposed facility in order to ensure safety of users and the facility;
- The analysis of potential residual effects on VCs relevant to other related Aboriginal Interests, particularly the wildlife, fish and fish habitat, marine fish and mammals, vegetation, and heritage VCs - characterized in this Report – are low to moderate magnitude, and are not expected to be significant; and
- The Proponent proposed mitigation to avoid and minimize potential effects, which have been referenced and included in other sections of this Report.

EAO has proposed conditions in response to the issues raised during Application Review. These proposed conditions are referenced in the previous sections of this Report related to other Aboriginal Interests (e.g. hunting and trapping, fishing and marine harvesting, gathering).

Based on the current fee simple status of the proposed facility site, the assessment of residual and cumulative effects, the Proponents proposed mitigation measures, and proposed conditions of any EAC issued, EAO is of the view that the proposed Project may have some potential impacts on Aboriginal title claims in proximity to the proposed Project. EAO will review any information received on the draft of this Report to inform the conclusions on the degree of this potential impact in the final version of this Report that is presented to ministers.

18 Impacts to Aboriginal Interest by Aboriginal Groups and EAO's Conclusions

The following sections consider the information received from each Aboriginal Group through consultation efforts during the EA process, and summarize the consultation and accommodation of potentially affected Aboriginal Groups in relation to the proposed Project. Potential impacts of the proposed Project on Aboriginal Interests are characterized in general terms in section 17 of this Report. Below, EAO outlines issues identified during the EA, provides additional background information specific to each of the Aboriginal Groups, and lays out its considerations and conclusions on the seriousness of impacts to the Aboriginal Interests of each of the Aboriginal Groups.

18.1 Squamish Nation

18.1.1 Context

- Squamish Nation has 26 reserves, mostly located around Howe Sound and along the southern portions of the Squamish River.
- The population of Squamish Nation consists of 3,600 members living on Squamish Nation reserves.
- The proposed Project is located within Squamish Nation's asserted traditional territory.

18.1.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project, including both the proposed facility and marine shipping routes, is located in the asserted traditional territory of Squamish Nation.
- The proposed facility would be located on a brownfield site.
- Shipping activities would include transit of up to 40 LNG carriers per year (approximately 3-4 LNG carriers per month) to the proposed Project site along an established shipping route in Howe Sound, in the asserted traditional territory of Squamish Nation.
- On June 26, 2014, the Supreme Court of Canada released its decision in Tsilhqot'in Nation v. BC which clarified the test for Aboriginal title relating to the elements of sufficient and exclusive occupation at 1846. The available information identifies several historic Squamish village and temporary camp sites along the eastern shoreline of Howe Sound from Squamish harbour to the mouth of Howe Sound, in proximity to the proposed Project. EAO is of the view that Squamish Nation has a strong prima facie claim to Aboriginal title in the vicinity of the proposed Project footprint and has a strong prima facie claim to Aboriginal rights to engage in traditional harvesting activities (e.g. fishing, hunting, trapping and gathering) within the vicinity of the proposed Project and the coastal areas of Howe Sound.

- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Squamish Nation's Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Squamish Nation lies in the deeper end of the Haida spectrum.
- Squamish Nation is listed in Schedule B of the Section 11 Order.

18.1.3 Summary of Consultation

EAO provided $5,000 in capacity funding to Squamish Nation during the Pre-Application phase and $10,000 in capacity funding during the Application Review phase of the EA process to assist with costs associated with their participation in the EA. The Agency provided $52,600 in capacity funding to Squamish Nation to support their participation in the substituted EA.

In July 2014, the Proponent and Squamish Nation entered into an agreement that set out a process for how the Proponent and Squamish Nation would engage during the EA (the 'Squamish Process'). The Proponent provided capacity funding to Squamish Nation for the Squamish Process. The Proponent reported that Squamish Nation would provide the results and conclusions of the Squamish Process, including an analysis of the potential effects of the proposed Project on Squamish Nation's Aboriginal Interests. The Proponent provided to EAO a summary of the key engagement/milestones in the Squamish Process from July 2014 to July 2015, which is included as Table 18-1 below.

EAO met with Squamish Nation on April 3, 2014, July 10, 2014, August 19, 2014, October 2, 2014 and October 30, 2014 to discuss the EA process. Squamish Nation expressed concerns about the EA process and informed EAO broadly of the confidential parallel process agreed to between Squamish Nation and the Proponent. EAO indicated that there is flexibility in the provincial and federal process to ensure that the consultation and assessment for the proposed Project meets the needs of Squamish Nation and the requirements of the Crown's duty to consult.

In letters dated October 1, 2014 and October 27, 2014, EAO sought feedback from Squamish Nation on drafts of a proposed section 13 Order that would provide the Proponent with more time to engage with Squamish Nation in the Squamish Process while also ensuring the Crown's duty to consult would be met. EAO, Squamish Nation and the Proponent participated in meetings in the fall of 2014 to discuss the approach. On November 6, 2014, EAO issued a section 13 Order amending the procedural requirements for the Proponent related to consultation with Squamish Nation, in consideration of the comments received from Squamish Nation. The section 13 Order deferred aspects of the Proponent's reporting requirements related to Squamish Nation until day 105 of the Application Review Stage, at which time it was anticipated that information regarding Squamish Nation's Aboriginal Interests in the proposed Project area, the potential impacts of the proposed Project on Squamish Nation's Aboriginal Interests and any mitigation measures would be provided to EAO.

On November 28, 2014, Squamish Nation wrote to EAO to express satisfaction with the section 13 Order issued on November 6, 2014 and clarification that Squamish Nation

would assess the impacts of the proposed Project on their Aboriginal Interests in the Squamish Process as agreed between Squamish Nation and the Proponent. Squamish Nation also acknowledged that the Proponent is required to engage in the EA process as set out under the *Environmental Assessment Act*.

During the EA, EAO continued to seek to consult with Squamish Nation directly, including providing Squamish Nation with opportunities to participate in the EA process and seeking information regarding the potential impacts of the proposed Project on Squamish Nation's Aboriginal Interests and measures to avoid, mitigate or accommodate those Aboriginal Interests. EAO made several offers to meet directly with Squamish Nation to discuss any comments or concerns with the proposed Project EA.

Squamish Nation's technical representatives on EAO's Working Group, Pottinger Gaherty Ltd. (PGL), provided technical review comments on the Proponent's Application and participated in a Working Group meeting. At the direction of Squamish Nation, the scope of the comments provided by PGL was limited to technical review and did not include comments on Squamish Nation's Aboriginal Interests. Squamish Nation indicated that EAO should engage directly with PGL on the EA. EAO shared information with PGL during Application Review, including requesting PGL review and comment on supplemental memos. In addition, EAO provided PGL with the opportunity to review and comment on EAO's requests to the Proponent for supplemental information before issuing them to the Proponent. While PGL submitted comments on the Proponent's Application, PGL did not respond to EAO's requests for further comments on the Proponent's responses, on the supplemental reports, or on EAO's draft Assessment Report and referral package. EAO understands that PGL engaged with the Proponent through the Squamish Process, including requesting additional information that was provided by the Proponent.

Squamish Nation did not attend the Working Group meetings on May 12, 2014 or October 8, 2014. Squamish Nation's technical representatives, PGL, participated in the Technical Working Group Meeting on March 4 and 5, 2015, but were not able to participate in the Marine Transportation Working Group Meeting on April 13, 2015. PGL provided a letter to EAO on March 16, 2015 with technical comments.

On April 20, 2015, EAO wrote to Squamish Nation to seek clarification of the key issues raised by PGL from the technical review of the Application, to encourage Squamish Nation to provide further comments on the Application, supplemental materials, and the Proponent's responses to their comments, and to offer to meet. On April 23, 2015, Squamish Nation responded to reiterate that Squamish Nation was engaging in the Squamish Process, that the Squamish Process is on-going and expected to complete in mid-June, and to offer to meet with EAO to discuss the results of that process once it completed.

EAO continued to share information and make offers to meet with Squamish Nation during the EA. Squamish Nation continued to decline to meet with EAO or share any

information regarding their Aboriginal Interests, citing their engagement with the Proponent in the Squamish Process.

EAO has considered the comments provided by PGL on behalf of Squamish Nation on the technical aspects of the EA including wildlife, vegetation, and fish. PGL raised several concerns and requests for information during the Application Review phase, including:

- Assessment methodology;
- Potential effects associated with the seawater cooling system;
- Potential effects on fish and fish habitat;
- Potential effects of flaring;
- Potential effects of noise on marine mammals;
- Accidents and malfunctions; and
- Human health risk assessment.

Technical comments received from PGL are included and addressed in the relevant sections of Part B of this Report, are documented in the Issues Tracking Table and are reflected in the following sections of this Report.

On April 27, 2015, the Proponent submitted a letter to EAO responding to the requirements of the section 13 Order. The letter reflected that the Squamish Process was still underway and that Squamish Nation intended to conduct internal community consultation and take the results of the process to Chief and Council. From this letter, EAO understood that engagement occurring between the Proponent and Squamish Nation included:

- Meetings held at regularly scheduled intervals with Squamish Nation to discuss the proposed Project;
- Numerous email exchanges, telephone calls and letters relating to the proposed Project; and
- Sharing of Project information with Squamish Nation representatives.

In July 2015, Squamish Nation Chief and Council voted to establish conditions for the proposed Project (Squamish Conditions); Squamish Nation issued the Squamish Conditions to the Proponent. In July, Squamish Nation issued a document titled “PGL’s Environmental Report on Woodfibre LNG Proposal” (Squamish Nation Update, Issue 3), to Squamish Nation Community members. While the document was not provided by Squamish Nation to EAO, it was made available publically. This document provided information about the Squamish Process, issues identified by Squamish Nation in the Squamish Process, and the 25 Squamish Conditions to avoid or mitigate potential adverse effects. Of the 25 Squamish Conditions established, 13 pertain to this proposed Project. Four Squamish Conditions are directed towards the Province of BC and the remaining conditions are directed at the proposed Eagle Mountain-Woodfibre Gas Pipeline Project. On June 30, 2015, EAO’s Executive Director suspended the 180-day

time limit for Application review of the proposed Project at the request of the Proponent, in order to consider Squamish Nation's conditions and to fulfil the Section 13 Order requirements with respect to Squamish Nation's Aboriginal Interests.

On July 28, 2015, the Proponent provided EAO with a copy of its letter to Squamish Nation dated July 24, 2015 in which it responded to the Squamish Conditions. On July 28, 2015, the Proponent also provided EAO with a Supplemental Report with information to fulfil the requirements of the Section 13 Order, including responses to the Squamish Conditions, information about key engagement in the Squamish Process, and identification of the potential Aboriginal Interests related to each condition; the Proponent also requested that the 180-day review period timeline be resumed. EAO shared the information from the Proponent and the draft of Part C of this Report with Squamish Nation and requested comments from Squamish Nation on the information and on the Proponent's request to lift the timeline suspension. The timeline suspension was lifted on August 10, 2015 once EAO determined that this requirement was met.

While Squamish Nation chose not to provide any information related to Squamish Nation's Aboriginal Interests directly to EAO, EAO considered the information provided in the Proponent's Supplemental Report and all information available to EAO at the time of drafting this Report, including key issues, Squamish Conditions and the Proponent's responses, and EAO's own analysis. The Proponent reported that while Squamish Nation did not identify the Aboriginal Interests or VCs associated with each Squamish Condition, the Proponent considered both potential adverse effects to Aboriginal Interests, and measures to address the concerns of Squamish Nation or to avoid or mitigate potential adverse effects on those Aboriginal Interests. A table of the Squamish Conditions pertaining to this proposed Project, the corresponding key issues identified in the Squamish Process, related VCs and/or Aboriginal Interests (identified in the Proponent's Supplemental Report), the Proponent's commitments in relation to each Squamish Condition and EAO's Response, including proposed conditions for any EA Certificate issued, is provided below Table 18-1.

Table 18-1: Squamish Nation Conditions, Proponent's Response, and EAO's Response

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
1. Conduct further studies on the proposed sea-water cooling method that will prove to the satisfaction of the Squamish Nation that the biological impacts on marine life are acceptable to it and also that the method has lower overall environmental impact than alternative technologies. If the Proponent [WLNG] cannot provide conclusive evidence to demonstrate this, then WLNG will pursue an alternate method of cooling the natural gas that is acceptable to the Squamish Nation.	Seawater Cooling: We do not find that the proponent's conclusions of "negligible" impacts on herring and plankton (tiny fish, plants, marine insects, larval fish or shellfish) are sufficiently proven.	Fish, Marine Benthic, Marine Water Quality Current use of resources for traditional purposes Aboriginal rights (fishing)	Agree to condition to undertake studies, provide additional information and engage with Squamish Nation in respect of alternative technologies	During the EA, EAO required additional information regarding the effects of the seawater cooling system and the alternative assessment for the proposed seawater cooling system. EAO proposes a condition requiring the Proponent to design, build and operate the seawater cooling system intake to meet DFO's *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia* (1991). EAO also proposes a condition requiring the Proponent to develop and implement a marine fish and fish habitat management and monitoring plan, in consultation with Squamish Nation.

[17] "PGL's Environmental Report on Woodfibre LNG Proposal", Squamish Nation Update, Issue 3

[18] This column was provided to EAO with the Proponent's Supplemental Report (July 28, 2015) and updated by EAO through consideration of potential Project effects and assumptions made regarding Aboriginal Interests. EAO notes that this information was not informed by input from Squamish Nation.

[19] Responses provided to Squamish Nation in a letter dated July 24, 2015. This table includes a summary of the complete responses. This was also provided to EAO with the Proponent's Supplemental Report (July 28, 2015).

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
				Section 5.5 of this Report discusses seawater cooling in relation to marine fish and section 2.2.4 addresses the alternatives assessment.
2. Must also restore Mill Creek and adjacent area to a "green zone" designation. Formal recognition that the project is located in the former village of Swiy'a'at must also be in this green zone.	Mill Creek Stream Flows: We found that there is potential for low water flows during the summer months due to the project requiring water from the creek. This may impact salmon and trout. Also, the creek is not in its natural state as the former owner of the site made changes to the creek. There is still some contamination from the former mill site in the lands surrounding the creek, and the creek is contained in lock block walls instead of naturally vegetated banks.	Fish habitat, water quality, vegetation Current use for traditional purposes Aboriginal rights (cultural heritage)	Agree to establishing green zone re-vegetation, designating green zone area, and formally recognize the historic village site	EAO acknowledges the Proponent's commitment to meet the Squamish Nation Condition with the implementation of a green-zone and formal recognition of there being an historic village site at the proposed Project site. EAO has identified the proposed green zone in the Certified Project Description.
3. Must locate other water sources during critical stream flow periods if the necessary water flow amount is not met on Mill Creek.	Mill Creek Stream Flows: We found that there is potential for low water flows during the summer months due to the project requiring water from the creek. This may impact salmon and trout. Also, the creek is not in its natural state as the former owner of the site made changes to the creek. There is still some contamination from the former mill site in the lands surrounding the creek, and the creek is contained in lock block walls instead of naturally vegetated banks.	Freshwater fish and fish habitat Aboriginal rights (fishing)	Agree to establishing IFRs and seek alternate sources of water during critical flow times	EAO proposes a condition that would require the Proponent to prepare an Instream Flow Requirements (IFR) report for Mill Creek prior to construction that must include an interim IFR regime and a procedure for establishing a long-term IFR regime for Mill Creek. Section 5.3 of this Report contains EAO's assessment of the potential effects on freshwater fish and fish habitat.
4. Must fully fund a	Cumulative Impacts and Marine Use	Marine Transport;	Agree to support and	EAO required the Proponent to

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
Squamish Nation marine-use plan to help address cumulative impacts of industrial projects on the marine environment in Howe Sound. The province of BC must enter into government-to-government discussions with the Nation regarding a marine-use planning agreement. 22*. Government to Government discussions regarding a marine use planning agreement to address cumulative impacts of industry in the Howe Sound area.	Planning: We found that the development of this project adds to other industrial impacts on Howe Sound at a time when the waters are coming back to life.	Marine Fish and Mammals; Cumulative effects	provide funding for Squamish Nation marine use study	assess the potential cumulative effects for the proposed Project in its Application. EAO understands that the Proponent has committed to work with FLNR to participate in the Province-led Cumulative Effects Framework for the Howe Sound, by actively sharing Project data and information during construction and operations.
5. Must provide access to Squamish Nation members through the Controlled Access Zone to allow for Squamish Nation practice aboriginal rights.	Controlled Access Zone: The proponent is legally required to control access to the LNG facility ("Controlled Access Zone") by erecting fences surrounding the land portion of the project and creating a "no go" zone 400-500 metres offshore of the project. Squamish members hunt and fish in areas within and beyond the Controlled Access Zone.	Current practice of traditional uses, aboriginal rights	Agree to provide access to Squamish Nation members through Control Zone for practice of traditional aboriginal rights, subject to regulatory and safety requirements	EAO understands that the Proponent has agreed to allow access for Squamish Nation to practice traditional Aboriginal rights, in a manner that complies with regulatory requirements and ensures safety and security at the site. EAO has considered how the proposed Project could impact Squamish Nation's Aboriginal Interests based on the assessment

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
				of potential adverse effects on VCs and all available information on Squamish Nation's Aboriginal Interests, including from public sources as well as relevant technical issues raised by Squamish Nation's technical representatives, PGL. Sections 7.2 (land and resource use), 7.3 (marine transport), and Part C (Aboriginal Consultation Report) addresses EAO's assessment related to access.

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
6. Must partner with the Squamish Nation to co-manage the environmental management programs and the monitoring of the programs (including the funding of Squamish Nation participation).	Concerns with environmental performance/compliance: The proponents have committed to a number of management plans and monitoring of the plans in their respective Environmental Assessment applications. We found that most of the plans proposed by the proponents did not include Squamish Nation input and that there are not sufficient monitoring and enforcement mechanisms in place to implement the plans. There are plans proposed for issues of concern to the Nation such as impacts due to the flare tower, emptying of ballast in Howe Sound, clearing of vegetation and wildlife management to name a few. At present these plans are only conceptual. The overall environmental performance of the project depends on responsible development and implementation of these plans.	Environmental stewardship, socio-economic opportunities	Agree to partner with Squamish Nation to co-manage environmental management and monitoring programs	EAO proposes several conditions that would require the Proponent develop and implement, and submit for approval, several management, mitigation, and monitoring plans, in addition or complementary to other plans that would also be developed pursuant to regulatory requirements during permitting. The Proponent would be required to consult with Squamish Nation and regulatory agencies in the development and implementation of these plans, and final plans would be shared with Squamish Nation prior to construction or commencement of operations.
7. Must provide insurance coverage or form of bond to address personal loss and injury costs of members that may be impacted by an explosion caused by an accident or malfunction of project.	Explosions/Gas Leak: We found that there is low probability of explosions or gas leaks due to an accident or malfunction related to tankers, the facility or the pipeline, but that there is some risk that such an event could occur and may harm members and members' property.	Potential impact to safety of nearby aboriginal communities; Health; Accidents and Malfunctions	Agree to provide insurance or similar instrument to cover Squamish members in the event of explosion caused by a catastrophic event	The proposed Project would be designed for the safe and efficient handling of liquefied natural gas, both on land and on water. This includes standards set out in the BC Oil and Gas Activities Act and the associated Liquefied Natural Gas Facility Regulation, national and BC building codes, as well as national and international standards, guidelines and codes of practice where there are no applicable codes

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
				for BC. Accidents and malfunctions are assessed in section 10 of this Report.
8 ; 24*. There must be no future expansion of the project without Squamish Nation approval.	Expansion of Project: Members expressed concern that the project may be expanded immediately after it is approved at the current size.	Scope of assessment, potential impacts to current use of resources for traditional purposes.	Agree not to expand beyond authorized LNG export capacity without Squamish approval	If the proposed Project is issued an EA Certificate, the proposed Project would need to be constructed in accordance with the CPD and any conditions. If subsequent changes to the Project (including expansion) were proposed, the Proponent would need to undergo an amendment review process through EAO. Squamish Nation would be consulted on any proposed amendments and included in the amendment process to review and comment on any proposed changes.
9. Must be no fueling of LNG tankers with bunker fuel in Squamish territory.	Fueling of Tankers: LNG tankers will carry bunker fuel. Whereas LNG spills from a tanker have relatively little environmental impact, bunker fuel spills may have longer-lasting effects. The highest risk of bunker fuel spills occurs during re-fueling. The remaining risk is related to large-ship collisions or running aground. Given the safeguards that will be in place for this project, there is a very low probability of such an event.	Marine Water Quality, Marine Fish and Mammals; Accidents and Malfunctions; Aboriginal Interests associated with marine fishing and harvesting.	Agree not to engage in bunker fueling of LNG tankers in Squamish Nation territory without consent of Squamish Nation	Fueling or fueling infrastructure, has not been identified or included in the CPD, and therefore would not be permitted to occur under the EA Certificate.
10. Must contribute to further study on noise	Noise during construction and during operations: During construction, noise	Marine Mammals and impact of noise	Agree to undertake additional study and	EAO proposes a condition requiring the development of a marine

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
impacts of the Project on marine mammals, to ensure long-term operational practices minimize under-water noise disturbance as much as possible.	would be a short-term issue and with diligent focus, should result in negligible impacts. However if not properly addressed, this could cause permanent injury to a small number of individual mammals. During operations, impacts from project shipping are probably small, but may contribute to a larger cumulative problem. Operation-related noise may interfere with normal communication for mammals. This may lead to avoidance of preferred areas.	Aboriginal Interests associated with marine fishing and harvesting.	engage with Squamish Nation in respect of underwater noise and marine mammal management plans.	mammal management and monitoring plan for construction that would identify areas or periods of time when construction could cause injury or behavioural change to marine mammals, would identify time periods when elevated marine mammal occupancy is anticipated within areas of potential injury or behavioural change, and would specify construction activities that must be stopped if a marine mammal is sighted in the area. Squamish Nation would be consulted on the development and implementation of the plan. Marine mammals are assessed in section 5.5 of this Report.
11. Must only operate the facility for the liquefaction and export of natural gas. 21*. Not authorizing the transportation of oil through the pipeline.	Conversion to oil: Members raised concerns that the natural-gas line and associated LNG facility have the potential to be converted to transport crude or diluted bitumen.	Unforeseen impacts on the environment; Consultation with Squamish Nation	Agree not to operate the facility for any purpose other than liquefaction of natural gas and export of LNG without Squamish Nation's consent	If an EA Certificate is issued for the proposed Project, the Proponent would need to adhere to the legally-binding CPD. The CPD describes the components of the proposed Project, and specifically states that the proposed Project would process, liquefy, and ship natural gas. On January 6, 2015, the Province of British Columbia established a regulation under the *Oil and Gas Activities Act* to ensure pipelines

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
				built to support LNG facilities will not be permitted to transport oil or diluted bitumen. This measure follows a commitment made by the Province earlier last year to put a mechanism in place to ensure pipelines, built to supply LNG facilities, would not transport oil or bitumen. One of those pipelines identified in the regulation was the proposed Eagle Mountain-Woodfibre Gas Project.
12. Making certain mitigation measures proposed in its EA application that are considered voluntary measures legally binding under a Squamish Nation Certificate of Project Approval	Concerns with environmental performance/compliance: The proponents have committed to a number of management plans and monitoring of the plans in their respective Environmental Assessment applications. We found that most of the plans proposed by the proponents did not include Squamish Nation input and that there are not sufficient monitoring and enforcement mechanisms in place to implement the plans. There are plans proposed for issues of concern to the Nation such as impacts due to the flare tower, emptying of ballast in Howe Sound, clearing of vegetation and wildlife management to name a few. At present these plans are only conceptual. The overall environmental performance of the project depends on responsible development and implementation of these plans.	Consultation with Squamish Nation	Agree to enter into an agreement with Squamish Nation to make mitigation measures contractually binding under a Squamish Nation Certificate of Project Approval	EAO understands that Squamish Nation and the Proponent are negotiating an Environmental Agreement which, together with the Squamish Nation Certificate, would formalize the Proponent's obligations to satisfy the Squamish Nation Conditions. EAO proposes several conditions that require the Proponent develop and implement, and submit for approval, several management, mitigation, and monitoring plans, in addition or complementary to other plans that would also be developed pursuant to regulatory requirements during permitting. The Proponent would be required to consult with Squamish Nation and regulatory agencies in the development and

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
				implementation of these plans, and final plans would be shared with Squamish Nation prior to construction or commencement of operations.
25. Entering into an economic benefits agreement with the Squamish Nation that will be reflective of the Squamish Nation's aboriginal rights and title interests (Province of BC and Proponents)	If WLNG and the Province are agreeable to meeting the environmental, cultural and safety conditions Parties will commit to entering into economic benefits agreements.	Socio-economic impact, Aboriginal rights and title	Agree to enter into economic benefits agreement with Squamish Nation that will be reflective of Squamish Nation's aboriginal rights and title interests	While the EAO regulatory process does not set out economic benefits for First Nations, significant discussions have occurred between officials from MARR and Squamish Nation to set out a range of economic benefits from the proposed facility, pipeline and other related infrastructure required for the proposed Project to be operational. MARR has also provided some capacity funding to Squamish Nation to enable those discussions. EAO acknowledges that the Proponent and the Province are engaged in ongoing discussions of economic benefits to Squamish Nation.
23*. Must work with the Squamish Nation to develop an Emergency Response Plan for the Squamish Valley area.	Emergency response: Members are concerned that there is not an adequate emergency response plan currently in place in the project area to ensure Squamish members are safely evacuated in the case of an accident that poses health and safety risks to Nation members.	Emergency response; Accidents and Malfunctions; Consultation with Squamish Nation; health and safety of Squamish Nation members; Aboriginal	N/A	EAO required the Proponent to provide a supplemental memo (Supplemental Report on Accidents and Malfunctions, April 2015) to provide further information on potential accidents and malfunctions. In addition, the Proponent was required to provide

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
		rights and title.		an outline for the ERP. The Proponent's final ERP would involve all aspects of planning, training, and exercising emergency response and ongoing evaluation/quality assurance and would adhere to regulatory standards and procedures. The Proponent has committed to consulting with applicable government agencies, emergency service providers, and Aboriginal Groups, including Squamish Nation, in developing the ERP. The ERP is included in a condition that EAO propose for an environmental management plan in accordance with section 13.2 of the Application. The ERP would also be a component of the Safety Loss and Management Program (SLMP) prepared for the OGC prior to commissioning of the Project, in accordance with the Liquefied Natural Gas Facility Regulation (OGC 2014a). It would be developed in consideration of the guidance in the Emergency Program Management Regulation. Transport Canada TERMPOL for the Project includes a comprehensive risk assessment to

Squamish Nation Condition[17]	Squamish Nation Key Issues	Related VCs/ Aboriginal Interests[18]	Proponent's Response[19]	EAO's Response
				ensure safety of vessel transits from terminal to open ocean; development of recommendations to improve safety and minimize risk; and development of detailed safety procedures and emergency response plans. Accidents and Malfunctions are assessed in section 10 of this Report.

*indicates a Squamish Condition that Squamish Nation has directed to the Provincial government.

The Proponent's Supplemental Report also included a summary of key engagements and milestones in the Squamish Process. From July 2014, the Proponent engaged on a regular basis with Squamish Nation through meetings, calls and written correspondence. The Proponent provided information to address issues raised by Squamish Nation, including technical information. Squamish Nation conducted outreach with its community members.

EAO understands that the Squamish Process remains underway at the time of drafting this Report and that the Proponent and Squamish Nation continue to work together to reach final agreement on the Squamish Conditions.

EAO wrote to Squamish Nation on July 30, 2015 to request comments on the Proponent's request to resume the 180-day Application Review timeline, the Proponent's July 28 Supplemental Report, EAO's draft Aboriginal Consultation Report (Part C of the Assessment Report), and any other portions of the draft referral material.

On August 6, Squamish Nation wrote to EAO to indicate that the Squamish Process is on-going and that Squamish Nation has not submitted any information to EAO or the Proponent regarding its Aboriginal Interests for use in the EA and therefore, EAO's assessment is currently based on assumptions. Squamish Nation noted disagreement with EAO's assessment that Squamish Nation has been meaningfully consulted and accommodated. On August 13, 2015, EAO wrote to Squamish Nation to provide Squamish Nation with a draft analysis, based on all information currently available to the Province regarding Squamish Nation's Aboriginal Interests, including information available from public documentation, for an opportunity to review and comment on this analysis to be included in EAO's draft Aboriginal Consultation Report (Part C of the Assessment Report), to ministers. On August 14, 2015, Squamish Nation wrote to EAO and sent a separate submission to the minister stating that the Squamish Process is on-going and that Squamish Nation expects to discuss the outcome of the Squamish Process with the Province prior to any decision by ministers. Squamish Nation reiterated their lack of agreement with EAO's determination that Squamish Nation has been adequately consulted.

EAO concludes that the proposed Project could have potential adverse effects on Squamish Nation's Aboriginal Interests, including those identified in Table 18-1. Through the Squamish Process and through the EAO-led EA process, efforts have been made to understand the nature of those potential adverse effects in order to ensure that appropriate avoidance, mitigation or other accommodation measures are considered. EAO understands that the Squamish Conditions applicable to this proposed Project reflect Squamish Nation's views of what is required to address the potential adverse effects on its Aboriginal Interests.

While Squamish Nation has not provided EAO with primary information related to Squamish Nation's use of the site and its vicinity, EAO has considered the following key information in this assessment:

- Information that the Proponent was able to provide related to the Squamish Process;
- Squamish Nation's proposed conditions;
- The Proponent's commitments to meet Squamish Nation's conditions;
- Information currently available to EAO regarding Squamish Nation's Aboriginal Interests, including information available from public documentation;
- Comments from Squamish Nation's consultants on technical aspects of the EA; and
- EAO's assessment of the potential effects of the proposed Project and experience from other LNG facility projects.

EAO has made reasonable efforts to meaningfully consult Squamish Nation, to understand the impacts of the proposed Project on Squamish Nation's Aboriginal Interests, and concludes that impacts to Squamish Nation's Aboriginal Interests have been adequately accommodated.

18.1.4 Potential Impacts of the Proposed Project to Squamish Nation's Aboriginal Interests

EAO considered all information available, including from public sources as well as relevant technical issues raised by Squamish Nation's technical representatives, PGL, in the following assessments of the potential impacts on the proposed Project on Squamish Nation's Aboriginal Interests. A discussion of the potential impacts of the proposed Project on Aboriginal Interests is provided in section 17 of this Report.

A summary of the information about Squamish Nation from available sources is described below. Since little site-specific information was available, EAO has assumed for this assessment that Squamish Nation historically exercised Aboriginal Interests in the Project area prior to the industrial development of the site, and potentially continued to do so to some degree while the Woodfibre pulp and paper mill was operating. The Proponent noted that since the closure of the mill in 2006, access to the site has been restricted.

EAO understands that for Squamish people, harvesting resources within their traditional territory is a key expression and component of their cultural identity and their heritage. EAO understands that Squamish Nation was likely utilizing areas throughout Howe Sound, including the various islands in the sounds, and assumes that Squamish Nation also utilized the proposed Project area. Many local place names are in the Squamish language and are indicative of the long living histories of Squamish use and occupation. The geographic reach of the traditional Squamish territory is described to include all of the islands in Howe Sound and the entire Squamish valley and Howe Sound drainages. The rivers on the west side of Howe Sound, the Squamish River valley, and Burrard Inlet supported runs of coho, chum, pink, and spring salmon, as well as cutthroat trout, which were likely fished by Squamish Nation members. The Squamish Nation is currently involved in supporting salmon stream enhancement and habitat restoration efforts on several waterways in the Greater Vancouver and Howe Sound areas. A

published map of the Squamish Nation territory in Howe Sound from the 1930s appears to indicate potential fishing was occurring in the area of the proposed Project.

Squamish Nation oral history and the archaeological record document longstanding patterns of trade, between Squamish villages and with other Aboriginal peoples. Trading took place via water and overland trails and, with the arrival of Europeans, expanded to include new markets.

EAO understands that certain areas in Howe Sound would be used for fishing, berry picking, or for stopping to rest when traveling by canoe. From available information, EAO also understands the traditional importance of the herring roe and Salmon in Howe Sound to the Squamish Nation, and the impacts that historical industrial development in Howe Sound has had on these resources and on cultural use of Howe Sound, such as canoeing.

Information in the public realm indicates that the proposed Project area is called Swig'a't by the Squamish Nation and that it was traditionally a village site and a sacred place for spiritual use. There is a Squamish story of an encounter that occurred between a man who had gone hunting and camped at *Swig'a't* (Woodfibre site) and a being thought to be a *Smaylilh* (wild person). Squamish Nation proposed a condition that would provide recognition of the former village site and access to the site for cultural purposes.

The *Esté-tiwilh/Sigurd Creek Conservancy Management Plan* contains general information that Squamish Nation cultural and traditional renewable resource harvesting activities include:

- Gathering traditional Squamish Nation foods;
- Gathering plants used for medicinal and ceremonial purposes;
- Hunting, trapping, and fishing;
- Cutting selected trees for ceremonial or artistic purposes;
- Conducting, teaching or demonstrating ceremonies of traditional, spiritual or religious significance;
- Seeking cultural or spiritual inspiration; and,
- Construction and use of shelters (such as camps and longhouses) essential to the pursuit of the above activities.

Squamish Nation is drafting the *Xay Temixw* (Sacred Land) Land Use Plan for managing forest and wilderness; however, the draft plan is not available to the general public and EAO is not aware of whether any of the areas identified overlap with the proposed Project area.

18.1.4.1 Harvesting Activities

<u>Hunting and Trapping</u>

Information available to EAO did not include information specific to Squamish Nation's exercise of its Aboriginal Interests related to hunting and trapping in the proposed Project area and its vicinity. Like other Coast Salish Aboriginal Groups, Squamish

Nation are understood to have hunted and trapped a variety of wildlife species including deer, elk, black bear, mountain goats, and waterfowl. Marine mammals would also have been hunted. Thus, EAO has assumed that Squamish Nation historically and currently undertake hunting and trapping activities of any available wildlife or bird species in the proposed Project area and its vicinity. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 17.1.1 of this Report. Sections 5.5 and 5.6 of this Report include the assessment on marine birds and marine mammals.

During the EA, PGL raised several technical concerns including:

- Terrestrial bird populations and potential for habitat fragmentation;
- Assessment methodology related to terrestrial birds;
- Cumulative effects on Band-tailed Pigeon habitat;
- Potential bird mortality or obstruction to bird movement due to flares and the effects of a pilot light to cause disorientation of migratory birds and/or potential reductions in night-time visual quality; and
- Underwater noise effects on marine mammals.

EAO has considered these comments and the Proponent's responses during the EA. Key issues raised by PGL are reflected in the appropriate sections of Part B of this Report.

In consideration of the information available to EAO, EAO's proposed conditions, the Proponent's commitment to meet Squamish Nation's conditions, and EAO's analysis of residual and cumulative effects to wildlife, EAO is of the view that the proposed Project is expected to result in minimal impacts to Squamish Nation's Aboriginal Interest associated with hunting.

Fishing and Marine Harvesting

Squamish Nation members are understood to have fished for all species of salmon as well as herring, herring spawn and halibut. Seafood including shellfish and prawns and crabs would also be harvested. Information available to EAO did not include information specific to Squamish Nation's exercise of its Aboriginal Interests related to fishing and marine harvesting in the proposed Project area and its vicinity. However, EAO has assumed that Squamish Nation historically and currently undertake fishing and marine harvesting activities in the proposed Project area and its vicinity. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with fishing is provided in section 17.1.2 of this Report. Sections 5.3, 5.4 and 5.5 of this Report include the assessments on freshwater fish, marine fish, and marine water quality and benthic habitat.

Freshwater Fish

There are two fish-bearing streams on the proposed Project site, Mill Creek and Woodfibre Creek. The lower segment of Mill Creek is under tidal-influence and is used by both marine and freshwater species. Both creeks are considered to be poor habitat for freshwater fish; Fish habitat within the lower 1.5 km section of Woodfibre Creek has been described as poor quality, due to high gradients and fish passage barriers. The lower reach of Mill Creek, within the cleared portion of the Woodfibre site, has limited riparian cover, little instream cover, low habitat complexity and is tidally influenced within its lower half. Juvenile coho salmon and rainbow trout, adult pink salmon, gunnel fish and sculpin were observed in the lower segment of Mill Creek. Woodfibre creek provides habitat for pink salmon, rainbow trout, Chinook salmon and sculpin. The proposed Project has the potential to affect fishing practices through disruption of fishing activities, alteration of access to fishing and areas and potential adverse effects to fish resources. During the EA, PGL noted that rainbow trout are present throughout Mill Creek. The Proponent agreed that given that rainbow trout are present 1.9 km upstream of Howe Sound, the species likely occurs throughout Mill Creek downstream of this point.

During the EA, PGL raised technical concerns including:

- Assessment methodology and baseline related to freshwater fish; and
- Minimum instream flow releases (IFRs) and water withdrawals from Mill Creek.

EAO has considered all of these comments and the Proponent's responses in the assessment. Key issues raised by PGL are reflected in the appropriate sections of Part B of this Report. The specific issues which were raised by PGL and the Proponent's responses are included in the Issues Tracking Table.

Marine Fish and Harvesting

The proposed Project has the potential to affect fishing and marine harvesting practices through disruption of fishing and harvesting activities, alteration of access to fishing and marine harvesting areas and potential adverse effects to fish and shellfish resources. Subtidal and intertidal marine habitat within the local study area serves as a migratory and juvenile rearing habitat for anadromous salmonid species and as feeding, migratory, and spawning habitat for other marine fish species such as Pacific herring, gunnel, sculpin, perch, greenling, eelpout and several species of flatfish. Dungeness crabs, tanner crabs, shrimps, sea cucumbers, urchins, anemones, and seastars were observed in the study area; however, the Proponent noted that compared to reference areas within Howe Sound, the marine benthic community biodiversity and abundance within the LAA is reduced in several areas, primarily due to degraded habitat quality and wood waste debris on the seafloor from the former Woodfibre pulp mill operations. High concentrations of dioxins and furans have historically been documented in marine sediments and shellfish in Howe Sound, resulting in the closure of some fisheries in the

area. Fisheries for harvesting all bivalve molluscs (e.g. clams, oysters, mussels) are closed in Howe Sound.

The proposed Project has the potential to result in the loss or alteration of marine fish habitat due to demolition of existing infrastructure and construction of marine facilities at the foreshore, including the FSO. These activities would have the potential to result in adverse changes to marine fish habitat quality due to seabed disturbances and re-suspension of sediment in the marine environment (including sediments that may contain contaminants from past site activities). These facilities would create some shading effect in the marine environment, which could impact intertidal and subtidal vegetation, resulting in potential loss of marine fish habitat. The Application stated that because the marine footprint would be located within low-productivity benthic habitat, loss of marine habitat productivity is considered unlikely.

The operation of the seawater cooling system has the potential to result in direct and indirect mortality of marine fish from impingement and entrainment at the seawater cooling system intake. Treated thermal water discharges to the marine environment from the seawater cooling system has the potential to result in fish mortality due to exposure to chlorine or changes to ambient water temperatures within the vicinity of the diffuser. During the EA, it was identified that there would be potential for adverse effects to larval and juvenile herring due to proximity to a herring spawn area to the proposed location of the seawater cooling system marine water intake.

Construction of the proposed FSO jetty and associated marine infrastructure would involve approximately five to six months of intermittent pile-driving activity, which would result in increased underwater noise with the potential to cause behavioural changes, injury or mortality to marine fish. Vessel noise may produce a localized behavioural response in fish, including avoidance of the area around vessels and the terminal in the LAA. The assessment determined that LNG carriers and escort tugs would not be expected to emit underwater noise at levels sufficient to cause injury to marine fish in the LAA.

During the EA, PGL raised several technical concerns including:

- Adequacy of baseline information regarding marine fish;
- Potential changes to marine fish behaviour and predation risk due to artificial night lighting on marine structures;
- Impacts of underwater noise on marine fish and mammals;
- Potential impacts from seawater cooling and alternative cooling systems; and
- Human Health Risk Assessment (HHRA) and the consumption of marine food items.

EAO has considered all of these comments and the Proponent's responses in the assessment. Key issues raised by PGL are reflected in the appropriate sections of Part B of this Report. The specific issues which were raised by PGL and the Proponent's responses are included in the Issues Tracking Table.

The proposed Project has the potential to affect fishing and marine harvesting practices through disruption of fishing and harvesting activities, alteration of access to fishing and marine harvesting areas and potential adverse effects to fish and shellfish resources, however there are no known marine fishing areas near the proposed Project area and the area of disturbance in the marine foreshore would be quite small and is not currently known to be used for fishing or marine harvesting. The disturbance to fishing and marine harvesting from LNG carriers would be infrequent and minor as 3-4 vessels would transit Howe Sound per month and at reduced speeds to minimize wake effects. The proposed marine traffic represents an incremental increase from the existing marine traffic in Howe Sound.

In consideration of the information available to EAO, EAO's proposed conditions, the Proponent's commitment to meet Squamish Nation's conditions, and EAO's analysis of residual and cumulative effects to fish, EAO is of the view that the proposed Project is expected to result in minimal impacts to Squamish Nation's Aboriginal Interest associated with fishing.

Gathering

Information available to EAO did not include information specific to Squamish Nation's Aboriginal rights to gathering in the proposed Project area and its vicinity. As a Coast Salish Aboriginal Group, Squamish Nation would have harvested plants including berries, fruit, nuts, roots, and bulbs. Thus, EAO has assumed that Squamish Nation historically and currently undertake gathering activities in the proposed Project area and its vicinity. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with gathering is provided in section 17.1.3 of this Report. Sections 5.6 of this Report include the assessments on vegetation.

Approximately 74 % (27 ha) of the proposed Project area is disturbed and is covered by old concrete and compact fill. The remaining 10 ha consists of vegetation in various stages of regeneration and is generally dominated by invasive Himalayan blackberry. A total of 13 species of invasive plants were observed on the site. Three small patches of mature western hemlock and western red cedar forest, and two patches of young forest exist in the Project area. The riparian area along Mill creek is considered a sensitive ecosystem and the mature forest adjacent to the creek is considered an important ecosystem. Site clearing and associated construction would result in the direct reduction in the extent of vegetation communities. Two hectares of mature forest (0.6 % of RAA) would be lost.

The proposed Project layout has been designed to reduce, to the extent practicable, additional forest fragmentation within the Project area. The proposed Project design includes the rehabilitation of the Green Zone which would result in a positive effect to riparian habitat.

Aerial deposition of contaminants on soil and plant surfaces (e.g., berries) was considered in the HHRA. Aerial deposition as a result of the proposed Project was

predicted to be low, resulting in minimal, if any impact to soil. Predicted soil concentrations were not expected to increase or were below applicable health-based screening criteria.

PGL did not provide any comments related to the terrestrial vegetation assessment or provide specific information related to the Squamish Nation gathering sites or resources in the proposed Project area.

In consideration of the information available to EAO, EAO's proposed conditions, the Proponent's commitment to meet Squamish Nation's conditions, and EAO's analysis of residual and cumulative effects to vegetation, EAO is of the view that the proposed Project is expected to result in minimal impacts to Squamish Nation's Aboriginal Interest associated with gathering.

Cultural Sites, Trails, and Travelways

Information available to EAO did not include information about specific trails or travelways in the proposed Project area and its vicinity. Information obtained by EAO indicates that the Woodfibre site is called *Swig'a't* by the Squamish Nation and that is was traditionally a sacred place. EAO has assumed that the Squamish Nation had trails or travelways within Howe Sound in the vicinity to the Proposed Project that continue to be utilized today, including for recreational (e.g. Tribal Journeys and canoe pulling/racing events), and resource harvesting purposes. In a meeting with EAO in April 2014, Squamish Nation expressed concern with the potential effects of the proposed Project on Squamish Nation members' access to canoeing routes. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with archaeology and cultural heritage interests is provided in section 17.1.4 of this Report.

The Proponent's Project Description (December, 2013) notes that the site was originally known as *Swig'a't* by the Squamish Nation and that a settlement existed on the site. In addition, the area was likely used as a site from which to hunt, fish, and gather foodstuffs as part of the Squamish people's traditional diet. According to a traditional Squamish Nation story, a hunter, while camping in a cave above *Swig'a't*, encountered and killed a *Smaylilh* (wild person or Sasquatch). The closest Indian Reserves to the property are under the administration of the Squamish Nation and include the following:

- Kaikalahun Indian Reserve No.25, on west shore of Howe Sound south of Port Mellon, 11.5 ha;
- Defence Island Indian Reserve No.28, in Howe Sound, northeast from Anvil Island (Hat Island, the easterly of two islands called Defence Islands), 1.7 ha; and
- Kwum Kwum Indian Reserve, the westerly of the two Defence Islands northeast of Anvil Island, 6.2 ha.

In consideration of the information available to EAO, EAO's conditions of any EA Certificate issued, the Proponent's commitment to meet Squamish Nation's conditions,

and EAO's analysis of residual and cumulative effects to heritage and archaeological resources the proposed Project is expected to result in minimal impacts on Squamish Nation's Aboriginal Interest associated with cultural sites, trails, and travelways in the area of the proposed Project.

18.2 Tsleil-Waututh Nation

18.2.1 Context

- Tsleil-Waututh Nation has three reserves – Burrard Inlet IR3 is the main residential reserve located on the north shore of Burrard Inlet; Inlailawatash IR 4 and Inlailawatash IR 4a are located at the mouth of the Indian River.
- The registered population of the Tsleil-Waututh Nation consists of 566 members, of which 279 live on Tsleil-Waututh Nation reserves.

18.2.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located approximately 45 km from the main Tsleil-Waututh Nation community in North Vancouver.
- The Tsleil-Waututh Nation Consultation Area included in 2009 Tsleil-Waututh Nation's Stewardship Policy encompasses the marine shipping route in Howe Sound associated with the proposed Project and the waters adjacent to the proposed Project area, but does not include the facility footprint itself.
- During consultation, in a letter to EAO dated December 12, 2014, Tsleil-Waututh Nation stated that while Tsleil-Waututh Nation's Consultation Area does not include the shoreline and terrestrial portion of the proposed Project area that the Tsleil-Waututh Nation traditional territory is broader and includes the shoreline of the proposed Project facility and beyond. It is noted that this is not reflective of the map shown in the Tsleil-Waututh Nation Stewardship Policy and was not put forth as a formal expansion of the Tsleil-Waututh Nation's asserted traditional territory.
- The Tsleil-Waututh Nation has Aboriginal Interests, including traditional fishing and marine harvesting activities, marine travel routes and cultural sites in Howe Sound, which may be impacted by the LNG carriers and other Project-related vessel traffic such as worker ferries.
- As articulated in a letter to Tsleil-Waututh Nation on February 14, 2014, EAO's view is that the information reviewed to date would support a moderate prima facie claim to Aboriginal rights to engage in traditional harvesting activities in the waters of Howe Sound (e.g. fishing) within the vicinity of shipping activity of the proposed Project.
- With respect to Tsleil-Waututh Nation's recent assertion that the proposed Project facility location falls within Tsleil-Waututh Nation's traditional territory the available information does not indicate use of this area by the Tsleil-Waututh Nation at the time of European contact (understood to be early 1790s) or around 1846. As such, Tsleil-Waututh Nation is assessed as having a weak prima facie claim of Aboriginal rights and title to the proposed facility location.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Tsleil-Waututh Nation's Aboriginal Interests, EAO is of the preliminary view that the duty to consult

Tsleil-Waututh Nation lies at the low to middle end of the Haida consultation spectrum.
- Tsleil-Waututh Nation is listed in Schedule C of the Section 11 Order.

18.2.3 Summary of Consultation

Tsleil-Waututh Nation was invited to review and provide comments on the draft VC selection document, the draft AIR, the draft Section 11 Order, the Proponent's Aboriginal Consultation Plan and Reports, the screening of the Application and on the Application and supplemental material. Tsleil-Waututh Nation was also provided with opportunities to attend Working Group meetings, site visits and to meet with EAO staff directly.

EAO provided $5,000 in capacity funding to Tsleil-Waututh Nation during the Pre-Application Stage and $10,000 in capacity funding during the Application Review Stage of the EA process to assist with costs associated with their participation in the EA review. The Agency provided $10,500 in capacity funding to Tsleil-Waututh Nation to support their participation in the substituted EA.

The Proponent began consulting with Tsleil-Waututh Nation in early 2014 following the issuance of the Section 11 Order. The Proponent met with Tsleil-Waututh Nation twice during the Pre-Application stage of the EA and once during Application Review to discuss the proposed Project, including with respect to capacity funding agreements, contract opportunities, concerns with cumulative effects, and conduct of traditional use studies. The Proponent signed a MOU with the Tsleil-Waututh Nation which included capacity funding with a provision of Traditional Knowledge and Traditional Use Information. Tsleil-Waututh Nation provided the *Tsleil-Waututh Nation Aboriginal Interests – In Relation to the Woodfibre LNG Project* (Tsleil-Waututh Traditional Land Use (TLU) Report) to the Proponent in March, 2015. This information was incorporated into an addendum report titled *Tsleil-Waututh First Nation Current Use and Aboriginal Interests Addendum Report* (May 2015).

Tsleil-Waututh Nation attended the VC selection Working Group meeting on May 12, 2014, the Application Review Working Group meetings on March 4-5, 2015, and the Marine Transportation Working Group meeting April 10, 2015. Tsleil-Waututh Nation participated in the site visit on January 28, 2015.

Tsleil-Waututh Nation sent letters to EAO on December 12, 2014, February 6, 2015, March 20, 2015, May 27, 2015 and May 28, 2015 outlining several concerns during the Application Review phase, which included:

- The assessment of human health including the scope of the LAA and the lack of inclusion of Tsleil-Waututh Nation receptors in the assessment;
- Scope of the marine transportation assessment of the proposed Project to Howe Sound and concerns related to cumulative effects, noise and marine mammals beyond Howe Sound;

- Timing of the TERMPOL process to occur after the EA is completed;
- Exclusion of ungulates and grizzly bear from the assessment;
- Inadequate assessment of baseline conditions;
- Accidents and malfunctions; and
- Inadequate cumulative effects and request for a holistic assessment of cumulative effects.

EAO met with Tsleil-Waututh Nation on January 30, 2015, March 26, 2015, and May 13, 2015 to discuss the issues listed above and other concerns raised during the EA and replied by letter to respond to the concerns raised. **Error! Reference source not found.** provides more information regarding the key issues raised by Tsleil-Waututh Nation and EAO's responses.

Tsleil-Waututh Nation introduced EAO to their proposed conditions at a meeting on May 13, 2015. In the meeting, EAO noted that several of the conditions and concerns could be addressed by the conditions EAO was considering. Tsleil-Waututh Nation sent a letter to EAO on May 27, 2015 that proposed nine conditions for EAO's consideration. Proposed conditions included an Aboriginal Consultation Plan and Reporting, Tsleil-Waututh Nation participation in environmental and archaeological monitoring, TERMPOL integration, Responsible Project Performance Program, and community development and socio-economic studies for Tsleil-Waututh Nation, activity notification and reporting, a fish and fish habitat plan, and requests for the Proponent to develop and implement various mitigation and monitoring plans in consultation with Tsleil-Waututh Nation.

The Proponent provided a response to the proposed conditions to Tsleil-Waututh Nation on July 10, 2015 and offered to meet to discuss, requesting further feedback from Tsleil-Waututh Nation. In response to EAO's request for comments on the draft Assessment Report and referral package, Tsleil-Waututh Nation submitted a letter on July 29, 2015 which raised several concerns including: review timelines, adequacy of the assessment of potential effects on various valued components, adequacy of the assessment of the potential impacts on Tsleil-Waututh Nation's Aboriginal Interests, consideration of the proposed Tsleil-Waututh Nation conditions, and specific comments on EAO's proposed conditions. In the letter, Tsleil-Waututh Nation also requested that EAO consider TUS information. Tsleil-Waututh Nation's proposed conditions, EAO's response and the Proponent's response are included in Table 18-2 of this Report. EAO continued to offer to meet with Tsleil-Waututh Nation to discuss the EA.

Tsleil-Waututh Nation provided the report *Tsleil-Waututh Nation Aboriginal Interests – In Relation to the Woodfibre LNG Project* to EAO on August 10, 2015. In this report, Tsleil-Waututh Nation notes the importance of Howe Sound to Tsleil-Waututh Nation territory. The report references that Tsleil-Waututh Nation traditional resource harvesting in Howe Sound includes fishing (including crabbing and shellfish harvesting) and hunting. As the proposed Project area for the facility is located outside of Tsleil-Waututh Nation's consultation area, the discussion in the report relates to off-site project effects on Tsleil-Waututh Nation's Aboriginal Interests. Information from this report has

been reviewed by EAO and is reflected in the sections below regarding Tsleil-Waututh Nation's Aboriginal Interests. On August 13, 2015, EAO provided a revised draft of the Aboriginal Consultation Report (Part C of this Report) for Tsleil-Waututh Nation's information to show how EAO had considered the information in the report.

On August 18, 2015, Tsleil-Waututh Nation provided a separate submission for the referral package for the ministers, which references many of the same concerns raised in Tsleil-Waututh Nation's July 29, 2015 letter. EAO believes that Tsleil-Waututh Nation's concerns raised in their separate submission have been addressed and considered through the EA.

Table 18-2: Tsleil-Waututh Nation Proposed Conditions

Proposed TWN condition	EAO Response	Proponent Response[20]
Project Studies: Outstanding Analyses The Holder must provide reports to EAO and Tsleil-Waututh Nation, prior to commencement of construction that contains the outstanding analyses and conclusions regarding: • The seawater cooling system (environmental impact of the Project's sea water cooling discharge system on marine life in Howe Sound). The study should include a comprehensive assessment of impacts of the intake system to the various life stages of fish and shellfish species, as well as the potential impacts of the discharge (i.e. warm, chlorinated water). The analysis provided previously was vague and did not provide significant rationale to determine the current design for the seawater cooling system was the best alternative. The comparison between all available technology and cost efficiencies were not developed and explained to their full potential as it could have been. • Forage fish assessment, including historic information, current population assessment, and analysis of Project impacts on forage fish populations in the short and long term. • Cumulative Impact assessment, inclusive of environmental effects and identified assessment gaps such as Aboriginal cultural health and impacts to the Aboriginal right to future and desired uses of the Project area, starting from a baseline of 1904, prior to development of the Britannia mine site and	EAO is of the view that the studies outlined in this proposed condition have been addressed in the Proponent's Application, Supplementary Materials provided during Application Review, and by the conditions that EAO proposes, which would be legally required if the Project received an EA certificate. A detailed Emergency Response Plan would be developed at the permitting stage of the Project, as required by regulatory agencies such as the Oil and Gas Commission and Transport Canada. EAO understands that the Proponent has stated that no bunkering would occur within Howe Sound.	*Seawater Cooling* Although Woodfibre LNG Limited believes that the information provided is sufficient for the environmental assessment phase of the Project, we will be conducting additional studies in support of the permitting phase and the long-term monitoring program. There would also be provincial and federal conditions associated with the seawater cooling system. Provincial condition #6 would require that Woodfibre LNG Limited develop a marine fish and fish habitat management and monitoring plan that includes a pre-construction evaluation of fish species, including juvenile herring drift movement near the intake, modelled velocity, and the area of influence around the intake for individual fish species based on maximum burst speeds. This condition would also require a post-construction monitoring program to verify actual intake velocity and evaluate the fate and behaviour of fish species near the intake screen. A requirement of the marine fish and fish habitat management and monitoring plan is that Woodfibre LNG Limited consult with Aboriginal groups, including Tsleil-Waututh Nation. Similarly, there would also be federal conditions that govern the design of the seawater cooling system (conditions 3.6, 3.7 and 3.8) and require the development of a long-term monitoring program

[20] Proponent responses to Tsleil-Waututh Nation's proposed conditions were provided to EAO on August 7, 2015

Proposed TWN condition	EAO Response	Proponent Response[20]
original Britannia West pulp and paper mill. • Acoustic disturbance impacts on marine mammals, including an assessment of any acoustic disturbance created by the seawater cooling system. • Determination of where the proposed vessels will be fueled, and an assessment of the potential effects of bunkering on marine fish, marine mammals, and the marine environment. • Development of a comprehensive emergency response management plan for all aspects of facility operation. The Holder must provide the reports to EAO and Tsleil-Waututh Nation no less than 90 days prior to the Holder's planned commencement of construction, to allow for 60 days review and comment, The Holder must not commence construction until the report/s have been approved by the EAO and Tsleil-Waututh. The Holder must implement the mitigation described in the approved report/s unless otherwise authorized by the EAO and Tsleil-Waututh.		(condition 3.14). These federal conditions require consultation with Aboriginal groups, including Tsleil-Waututh Nation. *Forage Fish* To supplement the publically-available information regarding forage fish, Woodfibre LNG Limited undertook herring spawn surveys at the Woodfibre site in winter and spring 2015. The results of these studies, including maps showing the areas where herring were found, were provided to the Working Group. In addition to the spawn surveys, Woodfibre LNG Limited conducted dive transects in the vicinity of the floating storage and offloading unit. These transects documented that the area has low biological diversity with few species observed and few individuals recorded – likely a result of the former uses of the site as a pulp and paper mill. Both the provincial and federal conditions require extensive pre- and post-construction studies with a particular focus on herring and the potential effects associated with the seawater cooling system. *Cumulative Effects* Cumulative Project-related effects were considered and reported on in both the Application for an Environmental Assessment Certificate and the subsequent Current Use Report for the Tsleil-Waututh Nation. The cumulative effects assessment for the valued components was completed adhering to the spatial and temporal boundaries and the methodology defined in the approved Application Information Requirements. Potential adverse effects to Aboriginal Interests, which are defined for the

Proposed TWN condition	EAO Response	Proponent Response[20]
		Project as "asserted Aboriginal rights, including title, or such determined Aboriginal or treaty rights" resulting from Project-related changes to the environment were assessed, including the following: • Health and socio-economic conditions; • Physical and cultural heritage; • Current use of lands and resources for traditional purposes; and • Any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance. Existing conditions were defined as conditions that exist prior to Project construction, operation and decommissioning and include the effects to date of other projects and activities that have been carried out. Since the interactions of the effects associated with past and existing projects are not expected to change over time, the effects of these projects are considered to be captured within the documentation of the existing conditions. The project or activity with the earliest start-date is the Howe Sound Pulp and Paper Corporation, which started operation in 1908. Historical data from before 1904 does not exist in entirety. Historical information was sought by Woodfibre LNG Limited primarily by secondary sources as well as a 2015 Tsleil-Waututh Traditional Land Use Report (TLU). The TLU indicated that information includes data collected from present time (referencing another TLU written in 2011) to the early 1900s. Although a specific time frame of information gathered was not provided, Woodfibre LNG Limited assumed that contemporary

Proposed TWN condition	EAO Response	Proponent Response[20]
		information provided by the TLU encompassed the living memory of respondents For the reasons outlined above, Woodfibre LNG Limited will not undertake the requested cumulative effects assessment at this time. Woodfibre LNG Limited commits to continue to work with Tsleil-Waututh Nation as the Project moves forward. *Underwater Noise* Both federal and provincial conditions would require specific mitigation for all construction activities where underwater noise levels are anticipated to cause behavioural or injury to marine mammals and marine fish. Specifically, the marine water quality management and monitoring plan (EAO Condition #7) will include mitigation measures for construction noise that will prevent or reduce behavioural change or injury to marine mammals. As part of the Working Group review of the Application, Woodfibre LNG Limited committed to retaining a contractor to perform continuous underwater acoustic monitoring pre-construction, during construction, and through early operation of the Project. The underwater monitoring program will collect ambient underwater sound levels (including vessel-generated noise) and record marine mammal presence (e.g., species present, their frequency and seasonality) through documentation of vocalizations. *Bunkering in Howe Sound* Woodfibre LNG Limited has committed publically as well as during the Application review that we have no plans to have LNG carriers bunkering in English

Proposed TWN condition	EAO Response	Proponent Response[20]
		Bay or Howe Sound. The LNG carriers used for the Project area will primarily use the boil off gas from the LNG that they are transporting for fuel. Although LNG carriers typically carry bunker fuel as a back-up fuel, the ships' operators will arrange for bunkering elsewhere, likely at overseas facilities. Woodfibre LNG Limited will be responsible for preparing emergency response plans in accordance with applicable legislation (e.g., the *Liquefied Natural Gas Facility Regulation*) and the required permits. Because these plans are already required by legislation, Woodfibre LNG Limited does not believe that a condition is required. The federal conditions do include requirements around reporting of accidents and malfunction and establishing communication protocols with Aboriginal groups, including the Tsleil-Waututh Nation. *Document Review* Woodfibre LNG Limited intends to continue to engage with Tsleil-Waututh through the life of the Project and, to the extent that activities may impact surrounding communities or the Tsleil-Waututh interests, will provide notice to Tsleil-Waututh of various specific activities. Materials provided for review (e.g., environmental management plans) will be provided to the Tsleil-Waututh a minimum of 30 days in advance. Given the time constraints associated with construction projects, Woodfibre LNG Limited does not believe that a 60-day review period is reasonable. However, whenever possible we will endeavor to provide additional review time and consider comments provided following the review period.

Proposed TWN condition	EAO Response	Proponent Response[20]
Consultation Plan and Report - The Holder must develop an Aboriginal Consultation Plan for approval by the Environmental Assessment Office (EAO) and all relevant Aboriginal Groups including Tsleil-Waututh for post environmental assessment certificate issuance activities. This plan is separate and distinct from a public consultation plan. The plan must include: •A process for sharing information including the provision and obtainment of all relevant information and options for community involvement; • A timeline or proposed schedule of anticipated activities; • Progress reporting framework whereby the first report is finalized 18 months after construction commences, and the second report is finalized one year after operations commence. These Consultation reports are to be shared with Aboriginal Groups, Tsleil-Waututh Nation, EAO and OGC; and • Provisions for plan and report changes, issue resolution and capacity support.	EAO proposes a condition requiring the Proponent to engage Aboriginal Groups throughout construction and operations. Engagement must include information sharing and discussion of site-specific mitigation measures, including the development and implementation of social or environmental plans. The Proponent must provide an aboriginal consultation summary report to EAO two years after construction and one year after commencement of operations. The report must be shared with Aboriginal Groups for no less than 30 days review and comment prior to providing to EAO. EAO proposes a condition outlining basic requirements and expectations around consultation on the development of the proposed management plans.	Woodfibre LNG Limited acknowledges this condition and notes that it has prepared and filed an aboriginal consultation plan with the EAO, which Tsleil-Waututh provided comment on, and expects to submit aboriginal consultation reports to the EAO in accordance with that plan as the Project progresses. It is Woodfibre LNG Limited's view that this is captured within the scope of the EA process and anticipates that it will be a requirement captured as a condition to any environmental assessment certificate issued to Woodfibre LNG by the EAO.
Planning and Monitoring – The Holder must engage, through consultation or collaboration, Tsleil-Waututh Nation in the development, review and implementation of any management, mitigation and monitoring plans related to the project during any phase of the project's operable lifetime. The Holder must draft a Protocol Agreement, inclusive of project planning and monitoring, for review and approval by Tsleil-Waututh that includes the following: • A list (or reference to a finalized list) of all management, mitigation and monitoring plans	EAO proposes a condition requiring the Proponent to engage Aboriginal Groups throughout construction and operations. Engagement must include information sharing and discussion of site-specific mitigation measures, including the development and implementation of social or environmental plans. EAO proposes a condition requiring discussion with Aboriginal Groups, to seek to provide opportunities for members of Aboriginal Groups to participate in monitoring activities identified in the plans in the	Woodfibre LNG Limited is of the view that there are two elements to this proposed condition and that these elements are appropriately addressed in separate ways: (1) the engagement with and involvement of Tsleil-Waututh Nation in any management, mitigation and monitoring plans; and (2) the Protocol Agreement providing for specific opportunities to Tsleil-Waututh. (1) Woodfibre LNG Limited anticipates that it will engage with Tsleil-Waututh in the development of a variety of management, mitigation and monitoring plans and that the EAO conditions will address this

Proposed TWN condition	EAO Response	Proponent Response[20]
developed, or to be developed, including all relevant agencies/stakeholders, activity timelines, and associated responsibilities; • Opportunity for Tsleil-Waututh to participate in any or all environmental and archeological monitoring activities; and • Any other parameters as collectively agreed upon by Tsleil-Waututh and the Holder. The Holder must finalize the Protocol Agreement within 6 months of Environmental Assessment Certificate issuance; all plans herein must be completed within 12 months of Certificate issuance. Tsleil-Waututh requires a minimum of 30 days to review and provide feedback on each plan. The Holder must provide the plans, along with the relevant consultation records, to EAO.	Table of Conditions that are occurring within their asserted traditional territory.	commitment. Woodfibre LNG Limited notes that Tsleil-Waututh requests completion of all plans for the life of the project to be developed within the first 12 months of Certificate issuance. It is Woodfibre LNG's view that plans applicable to each phase of the Project will be better informed during the period closely preceding each such phase than in the first year following issuance of the Certificate and expects that EAO conditions addressing such plans will impose timelines that reflect this. (2) It is Woodfibre LNG's view that it would be more appropriate for the proposed Protocol Agreement and the various matters contemplated to be included in such an agreement to be addressed through separate discussions between Tsleil-Waututh and Woodfibre LNG Limited rather than treated as an environmental condition.
Fish and Fish Habitat - There are a number of organizations forming around the protection and restoration of Howe Sound. The Holder must provide Tsleil-Waututh with adequate funding to participate fully in these groups, and provide resources to implement important projects and/or planning initiatives to advance shared interests and goals for Howe Sound. Programs and initiatives for the funds may include: • Outreach and awareness programming for project personnel and recreational users regarding sensitive fish and fish habitat; • A mapping and inventory framework; • A list of sensitive times and areas to be considered, including associated project mitigations, for all concerned fisheries; Feedback monitoring framework;	EAO proposes a condition requiring the development and implementation of a marine fish and fish habitat management and monitoring plan, in consultation with DFO and Aboriginal Groups. Engagement with Aboriginal Groups is required for this proposed condition. Note that at permitting, if the Proponent receives an EA Certificate, DFO would require more detailed information of potential effects to fish and fish habitat based on final engineering design and construction plans to determine whether serious harm to fish could occur and whether a *Fisheries Act* authorization and Offsetting Plan would be required. If a *Fisheries Act* authorization is required, Aboriginal Groups would be consulted on permitting authorizations and offsetting plans required by	It is Woodfibre LNG's view that any funding to enable Tsleil-Waututh to participate in third party organizations or to engage in related activities would most appropriately be addressed in separate discussions between Tsleil-Waututh and Woodfibre LNG. Woodfibre LNG expects that the development and implementation of both a freshwater fish and aquatic life management and monitoring plan and a marine fish and fish habitat management and monitoring plan in consultation with DFO will be the subject of conditions imposed by the EAO, and that engagement with Aboriginal Groups will be part of such conditions. Regarding fish habitat compensation plans, Woodfibre LNG notes that the Application and supporting materials conclude that the Project is not likely to have a significant adverse

Proposed TWN condition	EAO Response	Proponent Response[20]
• Population and habitat restoration action plan; • Resource and stakeholder coordination plan; and • Ecological restoration projects which will provide net environmental benefit to Howe Sound. All plans must be developed and implemented to the satisfaction of EAO and Tsleil-Waututh. Funds are agreed to in principle by way of this condition, and will be explicitly established in a subsequent Tsleil-Waututh – Holder agreement. The Holder must also develop a compensation plan for any existing fish habitat disturbed or destroyed by the project. The compensation plan for any existing fish and habitat disturbed or destroyed by the project must be based on net habitat gain, and will require Tsleil-Waututh Nation approval. Tsleil-Waututh would consider approval of holistic compensation plans that take into account forage fish, shellfish and crustaceans, marine vegetation and other habitat, as well as marine mammals.	DFO.	impact on fish or fish habitat; accordingly, it is not expected that compensation will be required. Any future compensation requirements will be determined by DFO through a *Fisheries Act* authorization if serious harm to a commercial, recreational, or Aboriginal fishery is anticipated to occur.
Issue Resolution – **a.) Complaint Filing Procedure** Description: The Holder must develop a complaint filing procedure (the 'Procedure') to address all project-related grievances during construction, operation and decommissioning phases. The Procedure must be available to members of Aboriginal Groups and stakeholders at all times. The Procedure must include, at minimum: • An electronic complaint filing platform (i.e. link on Proponent's website) including making available Procedure information and instructions; • A phased complaint review approach inclusive of	EAO's Compliance and Enforcement Program was developed based on leading practices of other jurisdictions. Compliance and Enforcement officers within EAO work with other regulatory agencies that are responsible for subsequent permits to clarify inspection roles and responsibilities. Throughout construction, operation and decommissioning, EAO and compliance partners collaborate to ensure the project is constructed and operated according to the EAC. Each EA Certificate includes a set of conditions and a Certified Project Description. If the proposed Project were to be certified, EAO would co-ordinate	Woodfibre LNG Limited will provide means for Aboriginal groups and other stakeholders to contact us with their concerns. The protocols for communication between concerned Aboriginal groups and stakeholders and Woodfibre LNG Limited will be outlined in a Communications Plan that will be provided to Aboriginal groups for review. In addition to EAO Condition #21, which requires Woodfibre LNG Limited to continue to engage with Aboriginal groups, there are federal conditions that require communication protocols be established with Aboriginal groups regarding marine use (Condition 6.1) and accidents and malfunctions (Condition 9.4).

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an informal review, formal review and appeals process; • Published procedural rules, process, definitions, timelines, and responsible authorities; • A 2 day acknowledgement of complaint period; • A 14 day initial response period (Proponent must respond to the complaint within 14 days of complaint submission); • A maximum of 60 days to achieve complaint resolution inclusive of the informal and formal review phases. The appeals process is limited to a further 30 days; • Publicly available complaint matrix outlining basic details and status of logged complaints; • All complaint documentation and records kept for the full duration of the project's operable lifetime and a minimum of 7 years post-decommissioning. This information must be publically accessible under the Freedom of Information and Protection of Privacy Act; and Automatic complaint forwarding to the Dispute Resolution Mechanism if unresolved after 91 days from submission date, unless otherwise agreed upon in writing by the parties. **b.) Dispute Resolution Mechanism** Description: If a complaint, registered and processed first under the Complaint Filing Procedure, cannot be settled within 90 days of submission, the dispute shall be referred to and finally resolved by arbitration. In the absence of any written agreement otherwise, the place of arbitration shall be Vancouver, British Columbia.	compliance management efforts with other ministries to ensure that EAO is independently satisfied that the Certificate conditions are met. Any reported issues of non-compliance are assessed to determine if an inspection, investigation or enforcement action may be warranted. EAO conducts proactive and reactive inspections of certified projects. On an annual basis, projects are selected for inspection based on prioritization criteria developed based on best practices. Additional inspections and/or investigations are conducted to respond to complaints or to follow-up where instances of non-compliance are noted. If a project is found to be in non-compliance, EAO and partner agencies use their professional judgement to determine the most appropriate enforcement response based on the relative severity of the non-compliance. Potential responses include advisories, warnings, and a range of potential sanctions set out in the Act. These sanctions include Minister's order to cease construction or operations or to remedy non-compliance through specific mitigation. The Minister may suspend, cancel or amend a Certificate. The nature of the non-compliance and the likelihood of achieving compliance with the selected enforcement tool are factors considered by staff when determining the appropriate enforcement action to take or to recommend to the Minister.	

Proposed TWN condition	EAO Response	Proponent Response[20]
Tsleil-Waututh: Activity Notification and Reporting – The Holder must provide Tsleil-Waututh Nation the schedule of construction activities, reports and/or results provided to EAO, and notification (minimum 30 days in advance), of operations activities causing disturbance to land, vegetation, and watercourses. This schedule is distinct from any public communications on project scheduling and activities.	EAO proposes a condition requiring the Proponent to engage Aboriginal Groups throughout construction and operations. Engagement must include information sharing and discussion of site-specific mitigation measures, including the development and implementation of social or environmental plans. Materials provided for review (e.g., environmental management plans) will be provided to Tsleil-Waututh Nation a minimum of 30 days in advance.	Woodfibre LNG intends to continue to engage with Tsleil-Waututh through the life of the Project and, to the extent that activities may impact surrounding communities or the Tsleil-Waututh interests, will provide notice to Tsleil-Waututh of various specific activities. Materials provided for review (e.g., environmental management plans) will be provided to the Tsleil-Waututh a minimum of 30 days in advance.
Compliance Monitoring: Qualified independent environmental monitors (IEM), Tsleil-Waututh archeology monitors, and an independent environmental inspector (IEI) – Qualified independent environmental monitor/s, Tsleil-Waututh Archeology Monitors, and an Independent Environmental Inspector) must be retained by the Holder to: 1) evaluate and report on compliance with the Certified Project Description (CPD) and the Table of Conditions (TOC); 2) monitor the effectiveness of mitigations specified in all plans designated herein; and 3) identify to the responsible agency and the Holder, corrective measures that would improve the effectiveness of mitigation. The Holder must consult with Tsleil-Waututh in the selection process of the IEI inclusive of developing the terms of engagement, assessing the top candidates, and selecting the final candidate. Specific to the IEI, the Holder must ensure that the terms of engagement require the IEI to: 1) conduct site inspections at a schedule that is acceptable to the responsible agency; and	EAO proposes a condition requiring the Proponent to retain the services of a Qualified Professional as an Environmental Monitor through the construction phase of the proposed Project. The Proponent must give the Environmental Monitor the authority to stop Project work if the Environmental Monitor determines that the Holder has not, or may have not, complied fully with the Certificate requirements and the Environmental Monitor determined that stopping work is necessary to prevent or reduce significant harm. Proposed management and monitoring plans include the requirement that a Qualified Professional must develop the plan and supervise the implementation of the plan. EAO also proposes a condition requiring discussion with Aboriginal Groups, to seek to provide opportunities for members of Aboriginal Groups to participate in monitoring activities identified in the plans in the Table of Conditions that are occurring within their asserted traditional territory.	Woodfibre LNG anticipates that both the retention of qualified professional environmental monitors with appropriate responsibilities and authority, and the development and implementation of environmental management and monitoring plans will be the subject of conditions imposed by the EAO. It is Woodfibre LNG's view that the retention of Tsleil-Waututh monitors and inspectors, including the degree of involvement by Tsleil-Waututh in the method of selection and the scope of work assigned to such individuals would most appropriately be addressed in separate discussions between Tsleil-Waututh and Woodfibre LNG.

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2) submit reports on the inspection results directly to the responsible agency, the Holder, Tsleil-Waututh Nation and EAO. The submitted reports must be provided in a format, frequency and nature of content acceptable to the responsible agency, and contain the IEM's observations regarding the Holder's compliance with the (CPD) and the TOC, and the effectiveness of the mitigation that has been implemented. The Holder must implement corrective measures and additional mitigation as required by the responsible agency.		
Support to Community Development and Socio-Economic Studies for Tsleil-Waututh – The Holder must provide capacity funding to Tsleil-Waututh for the purpose of carrying out and implementing a labour market study and strategy for the community, including: • A labour market study and implementation strategy; • Hiring designated support staff within the Department of Community Development, i.e., a Project Manager for Training and Employment; and • Funding for a training and employment program, including: a) life skills training b) funding for student partnerships with educational institutions Funds are agreed to in principle by way of this condition, and will be explicitly established in a subsequent Tsleil-Waututh – Holder agreement. **Socio-Cultural Expression Plan and reporting** –	EAO has proposed a condition to require the Proponent to design and develop programs to support local and Aboriginal employment and contracting opportunities, skills training and education.	Woodfibre LNG recognizes the importance to Tsleil-Waututh of the initiatives proposed in these conditions and is of the view that the conditions described by Tsleil-Waututh in the conditions relating to Community and Economy would more appropriately be addressed in separate discussions between Tsleil-Waututh and Woodfibre LNG.

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The Holder must provide capacity funding to Tsleil-Waututh with the purpose of designing a Socio-Cultural Expression Plan and subsequent programming in relation to the proposed project, and applicable to restoring the broader Tsleil-Waututh connection to Howe Sound. The plan will include, but is not limited to: • A socio-cultural study to enhance knowledge of Tsleil-Waututh's past, present and future potential social and cultural connections to Howe Sound; • Infrastructure and equipment needs for watershed cultural activities; • Language training; • Cultural education; • Archeological and cultural heritage studies and initiatives; and • Any other activities designed to restore the connection between Tsleil-Waututh and Howe Sound. Funds are agreed to in principle by way of this condition, and explicitly established in a subsequent Tsleil-Waututh – Holder agreement. The plan must be finalized within 18 months of project construction commencement. Programming will be informed by the results of the plan directives, and must be initiated within 24 months of project construction commencement. Any infrastructure procurement and installation assigned by the plan must be finalized prior to project operation.		
Project Expansion Approval - The Holder must not pursue any future project expansion without the direct consultation of Tsleil-Waututh in the process. Any expansion must have	If the proposed Project is certified, it may only be constructed and operated in accordance with the EA Certificate, including attached conditions and the CPD. Any changes to the project design not	If Woodfibre LNG Limited pursues an expansion of the Woodfibre LNG Project, we would be required to obtain the regulatory approvals and permits required for such an expansion. Woodfibre LNG Limited

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Tsleil-Waututh approval.	captured by an EA Certificate would likely require an amendment through the EAO, including consultation with Aboriginal Groups.	acknowledges that consultation with the Tsleil-Waututh Nation would form an important part of obtaining those approvals and permits.
Cumulative Effects: Responsible Project Performance Program (RPPP) – The Holder must develop a Responsible Project Performance Program for the full duration of project's operable lifetime (from substantial start to de-commissioning). The purpose of this program is twofold; firstly, to lead, in partnership with First Nations, the Canadian LNG market in responsible business practices. Secondly, to demonstrate full transparency and accountability in social and environmental stewardship objectives and activities related to the project. This Program must include: • A collaboratively established program directive, informed by the Global Reporting Initiative (GRI) and Canada's Enhanced Corporate Social Responsibility Strategy, (2014), which defines the program governance structure, values, vision, mission, goals, objectives, targets with measurable indicators, resources (social and financial capital), timelines, theory of change, roles and responsibilities, and a communication strategy; • Development of a committee as part of the governance structure that: a) is mandated to fulfill and amend (with unanimous consensus) the abovementioned program directive; b) communicates activities via designated webpage (and any other agreed upon medium), inclusive of public comment/feedback tool, hosted by WLNG; c) holds primary responsibility as chief author/s of a WLNG Annual Sustainability Report to be submitted	EAO believes these proposed conditions are more appropriate for an agreement with the Proponent. Note that the Proponent would be required to submit reports to EAO in compliance with any EA certificate issued and that the project, if approved, would be subject to compliance oversight.	Woodfibre LNG acknowledges the amount of detailed, thoughtful attention that this condition has been given, and notes that it contains a number of useful proposals for industry accountability and sustainability. Woodfibre LNG is of the view that this condition is outside the scope of the EA process and that it proposes activities beyond the scope of this Project. However, Woodfibre intends to participate in any Province or industry led initiatives and is prepared to bring the suggestions proposed by Tsleil-Waututh forward in such forums.

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to the Global Reporting Initiative at minimum B Application level (mandatory minimum guidance to be followed see G3.1 Sustainability Reporting Guidelines: Oil and Gas Sector Supplement, and G4 inclusive of Supply Chain related Standard Disclosures); d) shares a draft WLNG Annual Sustainability Report with Aboriginal Groups 60 days, and again at 30 days before final submission to GRI. All reasonable feedback must be incorporated to the final Annual Report submission; and e) reserves at least one seat for interested Aboriginal Groups representation at all times where the level of participation is the prerogative of interested Aboriginal Groups, supported by WLNG capacity funding where necessary. Funds are agreed to in principle by way of this condition, and will be explicitly established in a subsequent Tsleil-Waututh – Holder agreement.		
Navigable Waters: TERMPOL Integration – The Holder must share the final WLNG TERMPOL report with Tsleil-Waututh, no later than 14 days after its completion. The Holder must be available to discuss this report, and the process used in its development, as requested by Tsleil-Waututh anytime thereafter with a maximum 30 day request-response window. The Holder must observe and abide by all recommendations provided by the TERMPOL assessment report. The Holder must establish a temporary working group, inclusive of interested Aboriginal Group representatives, to respond to (better understand and resolve) any inconsistencies or overlaps between TERMPOL recommendations and the completed Environmental Assessment	EAO proposes conditions requiring the development of a marine transportation plan for construction and operations. To be included in the operational transportation plan is a requirement for the Proponent to identify methods to inform the public, marine user groups, and Aboriginal Groups about the results of the TERMPOL process.	Woodfibre LNG intends to share the results of the TERMPOL process with Aboriginal groups and anticipates that sharing this information will the subject of a condition imposed by the EAO. In addition, Woodfibre LNG has committed in its Application to implement the TERMPOL recommendations as a mitigation measure (M7.2-7).

Proposed TWN condition	EAO Response	Proponent Response[20]
Certificate Table of Conditions.		
Project Studies: Operationalizing Study Results – The Holder must implement the results of all studies mentioned herein and otherwise developed in association with the Project, conducted from post-certificate issuance to final decommissioning. Implementation of study results must achieve at least one of the following functions: • Inform project design, pre-construction, construction, operation, management, decommissioning; • Mitigate project impacts; and • Actively exercise and promote stewardship as expressed in Tsleil-Waututh's Stewardship Policy (2009). Where appropriate, implementation of study results must occur in consultation or collaboration with relevant stakeholders and Aboriginal Groups. If consultation or collaboration is deemed unnecessary or otherwise not possible, a rationale must be provided to interested stakeholders and Aboriginal Groups. All studies involving Tsleil-Waututh must be developed and implemented to the satisfaction of Tsleil-Waututh.	The Proponent would be required to prepare, submit for approval by EAO, and finalize all management, mitigation, and monitoring plans pursuant to conditions imposed by EAO. Materials provided for review (e.g., environmental management plans) will be provided to Tsleil-Waututh Nation a minimum of 30 days in advance.	Woodfibre LNG anticipates that the implementation of studies and plans will be a requirement imposed by the conditions to any Certificate issued by the EAO.
Related Projects: Aboriginal Rights, Title and Interests Prior to substantially engaging with any related projects (e.g. FortisBC Eagle Mountain – Woodfibre Pipeline Gas Project, BC Hydro Woodfibre Interconnection Project), the Holder must seek and obtain formal confirmation from the related project proponent, appropriate regulatory authorities, and affected Aboriginal groups that the related project/s at issue:	All proposed Projects undergoing an EA process and requiring an EA Certificate in order to construct are required to engage in Aboriginal Consultation as required by the section 11 Order and as directed by EAO. The proposed projects mentioned in Tsleil-Waututh Nation's proposed conditions are undergoing separate regulatory processes from the proposed Woodfibre LNG project.	Both the FortisBC Eagle Mountain – Woodfibre Pipeline Gas Project and the BC Hydro Woodfibre Interconnection Project are outside the scope of the Project's environmental assessment. It is Woodfibre LNG Limited's view that the proponents of the projects referenced are responsible for ensuring the adequacy of consultation for their respective projects through the appropriate regulatory processes.

Proposed TWN condition	EAO Response	Proponent Response[20]
• Is/are not currently, and is/are not reasonably expected to be in the foreseeable future, subject to judicial review or any other legal proceedings; and • Has directly and explicitly demonstrated, as confirmed by all directly and indirectly affected Aboriginal Groups, that there will be no adverse impacts to Aboriginal rights, title, and interest which are not remedied, and agreed to by Aboriginal Groups, by appropriate mitigation and/or compensation measures.		
Tsleil-Waututh: Howe Sound Shoreline Archaeology Study The Holder must provide adequate funding for Tsleil-Waututh to conduct a Howe Sound Shoreline Archeology Study. This will enable Tsleil-Waututh and Aboriginal Groups to better understand the impact of development and use in Howe Sound on shell middens. Funds are agreed to in principle by way of this condition, and will be explicitly established in a subsequent Tsleil-Waututh – Holder agreement.	EAO is of the view that the studies outlined in this proposed condition have been addressed in the Proponent's Application, Supplementary Materials provided during Application Review, and by the conditions that EAO proposes, which would be legally required if the project received an EA certificate. EAO proposes a condition to require verification of the wake effects and including an adaptive management plan to address the effects of Project wake on marine and shoreline users in the event (i) those effects on marine and shoreline users are not mitigated to the extent identified in the Application, or (ii) effects on marine and shoreline users occur that were not predicted in the Application.	In support of the Application, Woodfibre LNG Limited conducted modelling of LNG carrier wakes. This modelling showed that LNG carriers travelling at 10 knots or less, the speed of LNG carriers in Howe Sound, may not produce a noticeable wake. During the Application review period, Woodfibre LNG Limited conducted additional modelling to examine wake effects associated with LNG carriers being escorted by tugs and the worker ferry. This modelling also examined the potential for a cumulative interaction between an LNG carrier wake and a BC Ferry wake. The modelling demonstrates that the wakes from such Project-related vessels are likely to be comparable to naturally-occurring waves within Howe Sound and lower than wakes from vessels currently travelling in Howe Sound. The modelling report goes on to state that because wakes from Project vessels are comparable to naturally occurring waves within Howe Sound, vessel wakes are not likely to adversely affect the use of Howe Sound for boat-based activities such as fishing or cultural activities. Because the waves will behave in the same way as natural waves, shore-based activities such as harvesting in the intertidal zone are not likely to be adversely affected in terms

Proposed TWN condition	EAO Response	Proponent Response[20]
		of disruption. Similarly, shoreline erosion would not be expected to increase as a result of the LNG carriers. Because there is no pathway of effect that could result in effects to cultural heritage, we do not believe that a comprehensive archaeological study of Howe Sound is required. Both the provincial and federal conditions would require a wake verification program. The federal condition requires that Woodfibre LNG Limited develop and implement the follow-up program in consultation with Aboriginal groups, including the Tsleil-Waututh Nation. The approach to this monitoring program will be to validate the model used to predict the wake effects from the LNG carriers, which would validate the conclusions reached by Woodfibre LNG Limited in the Application. If the wake verification program shows that the modelling was inaccurate, additional mitigation measures will be implemented.

A summary of the Proponent's engagement activities with Tsleil-Waututh Nation and the Proponent's proposed mitigation to issues raised is provided in the Application and in the Proponent's Aboriginal Consultation Reports.

18.2.4 Potential Impacts of the Proposed Project to Tsleil-Waututh Nation's Asserted Aboriginal Interests

18.2.4.1 Harvesting Activities

Hunting

Howe Sound is understood to be an important part of Tsleil-Waututh Nation's asserted traditional territory and traditional harvesting in Howe Sound, as part of a 'seasonal round', included hunting waterfowl. Tsleil-Waututh Nation's TLU Report indicates that waterfowl were a significant component of traditional Tsleil-Waututh Nation peoples' diets, but that due to urban development of across much of their territory, there remain relatively few areas where Tsleil-Waututh people can presently hunt waterfowl. Historically, Tsleil-Waututh Nation people also hunted marine mammals including seals, sea lions, and porpoises. Marine mammal harvests were prized and considered a delicacy, and the oil produced from the animal was used for dipping other food items such as dried berries and roe. While it is assumed that Tsleil-Waututh Nation traditionally hunted terrestrial wildlife and gathered terrestrial items from locations around Howe Sound, site specific information about terrestrial uses was not provided by Tsleil-Waututh Nation during the EA. It is understood that maintaining access to terrestrial resources around Howe Sound is important to Tsleil-Waututh Nation.

The Tsleil-Waututh Nation TLU Report indicates that there are opportunities for hunting waterfowl over a large portion of Howe Sound, and especially west of West Vancouver, and from Potlatch Creek to Watts Point and just west of West Vancouver where seasonal congregations of larger flocks tend to occur. The Report identifies that bird hunting areas are located near the proposed Project area (but are not within the control zone containing marine infrastructure). Tsleil-Waututh Nation identified that many of the bird hunting locations are within or adjacent to the proposed marine shipping route in Howe Sound.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with hunting is provided in section 17.1.1 of this Report. The proposed Project has the potential to affect Aboriginal hunting rights through a disruption of hunting activities. Species that are hunted by Tsleil-Waututh Nation, including waterfowl, could be impacted by the proposed Project through habitat loss or alteration, sensory disturbance, or mortality risk. The proposed Project would result in potential alterations of terrestrial bird habitat, sensory disturbance (i.e., noise and light) and fragmentation of habitat. There is the potential for injury or mortality of some marine bird species as a result of disorientation from nighttime lighting; however, lighting would be restricted to the Project footprint and light shields would be used to reduce effects. Construction of the proposed Project would require clearing of near-shore vegetation and removal and alternation of shoreline habitat, resulting in direct losses of breeding, nesting, foraging

and staging habitat for marine birds. Access to the proposed Project area including the shoreline would be restricted for safety and security reasons, preventing hunting and other activities from taking place. Marine shipping could temporarily disturb marine mammals and birds and limit access by other vessels for short periods, impacting hunting by Tsleil-Waututh Nation members along the proposed shipping route. Given the availability of multiple potential bird hunting locations within Howe Sound and the low frequency and short duration of disruption to some identified hunting areas as a proposed Project vessel passes through an area, the potential effects to Tsleil-Waututh Nation ability to hunt birds are expected to be negligible. EAO has proposed a condition that would require the Proponent to develop a marine transport management plan, which would include actions to inform affected Aboriginal Groups of potential interference with marine navigation as a result of project activities during construction and operations.

During the EA, Tsleil-Waututh Nation identified the following concerns related to their asserted Aboriginal right to hunt:

- Potential effects to ungulates, black bears, cougars and wolves; and
- Potential effects to marine birds and concerns about the baseline assessment provided in the Application.

During the EA, Tsleil-Waututh Nation inquired about potential effects to ungulates, black bears, cougars and wolves from the proposed Project.

- During Pre-Application the Proponent provided a technical memo, *Woodfibre LNG – Valued Component Selection Methods – Terrestrial Biology* (September 11, 2014). The memo identified that the Project area would not provide unique or limiting habitat for ungulates or medium to large carnivores and concluded that Project-related effects on these wildlife species would not be anticipated. These species were not scoped into the EA.
- During Application Review the Proponent submitted a *Tsleil-Waututh First Nation Current Use and Aboriginal Interests Addendum Report*, which indicated that, based on terrestrial wildlife in the VC selection process, the proposed Project would not be likely to result in Project-related effects to the current use of terrestrial wildlife species by Tsleil-Waututh Nation. This would be due to the proposed mitigation measures and design considerations, including perimeter fencing and management of human-wildlife contact to address potential Project-related effects to ungulates, black bear, cougar and wolf.

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to wildlife, marine birds and marine mammals and as discussed in section 17.1.1 the proposed Project is expected to result in negligible impacts to Tsleil-Waututh Nation's asserted Aboriginal right to hunt.

<u>Fishing and Marine Harvesting</u>

Tsleil-Waututh Nation traditional harvesting in Howe Sound includes shellfish harvesting (crabs, prawns, and oysters) and fishing (salmon, smelt, cod, and flounder). Marine resources were and remain central to Tsleil-Waututh Nation for subsistence and cultural life. Salmon has always been a food staple, with sockeye being the most favoured, and is supplemented by the harvest of the full range of shellfish, including bivalves and crustaceans, sturgeon, a variety of groundfish (e.g., halibut, cod, flounder, lingcod, and rockfish), eulachon, herring, and smelt, as well as aquatic plants such as seaweeds. Salmon and other fisheries remain a key source of income for several Tsleil-Waututh Nation families. Shellfish and crabs were important parts of the traditional Tsleil-Waututh Nation peoples' diet and are preferred foods for many current Tsleil-Waututh Nation people. Tsleil-Waututh Nation reports that because of the extensive industrialization and pollution of Burrard Inlet and Howe Sound, there are presently few suitable locations for Tsleil-Waututh people to harvest these resources. The Tsleil-Waututh Nation TLU Report indicates that the resources and areas around these two historic facilities have been identified as amongst the least attractive resource harvesting sites for most of the 20th century. Prior to industrialisation in the area, Tsleil-Waututh Nation indicates that use in the vicinity would have been higher. Tsleil-Waututh Nation also indicate an interest in the ability to fish and harvest marine resources in the future.

Under a Comprehensive Fisheries Agreement with DFO Tsleil-Waututh Nation holds a communal licence to provide for a food, social, and ceremonial (FSC) fishery for sockeye, pink, chum, chinook, and coho salmon. The identified fisheries subareas in which the salmon fishery may take place do not extend into Howe Sound and do not overlap with the proposed Project. Tsleil-Waututh Nation also has FSC allocations for crab and prawns under the Salish Seas joint venture with Musqueam and Sliammon First Nations. Prawn harvesting occurs around the entrance to Howe Sound around Bowen Island and much of southern Howe Sound has been identified as a priority harvest area for prawns. The proposed marine shipping route passes through the prawn harvesting area. The absence of an established DFO agreement for areas within Howe Sound does not preclude Tsleil-Waututh Nation from harvesting or obtaining new licences for fisheries resources from the waters of Howe Sound.

Tsleil-Waututh Nation TLU Report did not identify any specific fishing or marine harvesting areas within the control zone or the area affected by the marine facilities. However, the TLU Report describes several fishing areas around much of Howe Sound, especially around the Squamish River estuary and just south of Watts Point and indicates that the transiting LNG carriers would pass through several reported fishing locations. The TLU Report describes shellfish harvesting at several locations in Howe Sound. This includes several instances of crab harvesting, one instance of oyster harvesting, and one instance of prawn harvesting in Howe Sound. The described prawn harvesting area and one of the described crab harvesting areas appear to be within the proposed marine shipping route.
During the EA, Tsleil-Waututh Nation identified the following key issues and concerns related to their asserted Aboriginal right to fishing and marine harvesting:

- Questions about the proposed seawater cooling system, including the potential effects from the intake and the discharge on fish including herring and other larval species;
- Desired future use to access herring fisheries in Howe Sound if the population reaches sustainable levels for future generations;
- Method of removing the existing creosote pilings;
- Use of biodegradable, vegetable-based hydraulic oil;
- Effects of underwater noise of marine mammals;
- Effects of shading to juvenile salmon or forage fish;
- Effects of artificial lighting on fish; and
- Water quality monitoring for Mill Creek.

During the EA, Tsleil-Waututh Nation requested additional information about the proposed seawater cooling system and about the analysis of alternative cooling systems and expressed concerns about the potential effects on fish. The Proponent provided three supplemental memos that responded to these concerns:

- *Woodfibre LNG – Response to Seawater Cooling System Discharges Information Request* (April 2015);
- *Woodfibre LNG – Response to Seawater Cooling Intake Information Request* (April 2015); and
- *Assessment of Alternative Cooling Methods – Response to EAO Supplemental Information Request* (April 2015).

In consideration of the information available to EAO, EAO's proposed conditions, and EAO's analysis of residual and cumulative effects to marine fish, and marine benthic habitat and as discussed in section 17.1.2 of this Report, the proposed Project is expected to result in negligible to minor impacts to Tsleil-Waututh Nation's asserted Aboriginal right to fish.

18.2.4.2 Cultural Sites, Trails, and Travelways

Tsleil-Waututh Nation has explained that all areas used for traditional purposes, such as fishing, hunting, or gathering, are considered sacred. The Tsleil-Waututh TLU Report indicates that Howe Sound holds substantial meaning and significance to Tsleil-Waututh Nation. The Tsleil-Waututh TLU Report describes one settlement and several overnight campsites along the shores of Howe Sound, which were used during resource harvesting, including south of Watts Point and at the Defence Islands; however none of the sites identified are located near the proposed Project area. The Tsleil-Waututh TLU Report describes many registered archaeological sites in Howe Sound as shell middens. Erosion of shell midden sites has the potential to disturb the resting places of ancestors as they may be the locations of burials. The Tsleil-Waututh TLU Report expresses concern that rising sea levels and increased shipping traffic could accelerate the erosion of coastal shell middens. Thirty of the approximately 125 registered archaeological sites in Howe Sound are identified as being on lands adjacent to, or within one kilometre of, the marine shipping route. None of the identified archaeological sites, overnight sites, or cultural sites overlap with the proposed Project area.

Features associated with culturally significant landscapes include named places, village sites, travel routes, transformer sites, rock art locations, and wild spirit places. Several landforms in Howe Sound are associated with powerful spirit beings, and many landscape features are used in traditional ritual practices. Tsleil-Waututh Nation reports that members are involved with on-going traditional Coast Salish religious and cultural practices that are specifically linked to particular locations in and around Howe Sound. These traditional practices are often predicated on solitude and Tsleil-Waututh Nation report there to be few places in the lower mainland left undisturbed for Tsleil-Waututh Nation to practice these traditions.

Waterways within Tsleil-Waututh Nation territory were the principal means of accessing these and other places within the seasonal round. The Tsleil-Waututh TLU Report states that protected harbours and inlets were preferred by Tsleil-Waututh Nation as routes for travel between sites, between summer camps, and as hunting, fishing, and gathering locations. These waterways still serve as important travel corridors for the harvesting of marine resources. Members of Tsleil-Waututh Nation (Burrard IR No.3) would travel up Howe Sound to reach the Squamish Valley. The Tsleil-Waututh TLU Report notes several canoe routes from Burrard Inlet to Squamish, where Tsleil-Waututh Nation travelled to the Squamish estuary via their preferred travel routes, typically following the shoreline. As the traditional canoe routes would usually follow the shoreline, they do not overlap with the established shipping route to the proposed Project Area. However, a point of intersection with the marine traffic route was identified with a traditional canoe route that crossed in the Strait of Georgia just outside of the mouth of Howe Sound.

During the EA, Tsleil-Waututh Nation identified the following issues and concerns related to cultural sites, trails, and travelways:

- Wake effects on shell midden sites along the shores of Howe Sound.

During Application review the Proponent conducted additional modelling to examine wake effects associated with LNG carriers being escorted by tugs and the worker ferry. The modelling demonstrates that the wakes from such Project-related vessels are likely to be comparable to naturally-occurring waves within Howe Sound and therefore, vessel wakes are not likely to adversely affect the use of Howe Sound for activities such as fishing or cultural activities and shoreline erosion would not be expected to increase.

EAO proposed a condition to require verification of the wake effects and including an adaptive management plan to address the effects of Project wake on marine and shoreline users in the event (i) those effects on marine and shoreline users are not mitigated to the extent identified in the Application, or (ii) effects on marine and shoreline users occur that were not predicted in the Application.

A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with archaeology and cultural heritage interests is provided in section 17.1.4 of this Report.

In consideration of the information available to EAO, EAO's conditions of any EA Certificate issued, and EAO's analysis of residual and cumulative effects to heritage and archaeological resources the proposed Project is expected to result in negligible impacts on Tsleil-Waututh Nation's identified cultural sites, trails, and travelways in the area of the proposed Project.

18.2.5 Other Matters Raised by Tsleil-Waututh Nation

During the EA process, Tsleil-Waututh Nation raised a number of additional concerns with the proposed Project. Concerns raised by Tsleil-Waututh Nation and responses from EAO, are outlined below in **Error! Reference source not found.**.

Table 18-3: Other Key Issues Raised and EAO's Response

Key issues raised	EAO response
Concerns related to EA methodology, inadequate baseline information, and VC selection.	The adequacy of baseline information for a particular VC has been examined in EAO's assessment in each VC section of this Report. Concerns raised by Aboriginal Groups relating to EA methodology and VC selection were considered by EAO during Pre-Application. If an EA Certificate is issued and the proposed Project proceeds to permitting, the Proponent would be required to complete additional baseline and field studies to fulfill permitting requirements. In addition, EAO proposes a number of conditions that would entail additional study prior to permitting. In addition, EAO proposes a condition requiring the Proponent to continue to engage with Aboriginal Groups in the development of the EMP, various management and monitoring plans, and conditions.
Inadequate assessment of cumulative effects of multiple projects	EAO considered the potential cumulative impacts of multiple proposed projects, along with past, current and reasonably foreseeable future projects (listed in the Proponent's Application), on Aboriginal Interests when assessing the seriousness of impacts on Aboriginal Interests. EAO drew on relevant information provided by the Proponent regarding the cumulative effects assessment of VCs, as well the potential impacts of a proposed Project on Aboriginal Interests. Cumulative effects are examined and assessed in each VC section of Part B of this Report.
TWN requests that Aboriginal communities, including Tsleil-Waututh Nation, are included in the assessment on health and well-being. Aboriginal use areas appear to be excluded in the Human Health Risk Assessment (HHRA) — only	EAO assessed the Health effects of the proposed Project. EAO understands that Tsleil-Waututh Nation communities are not within the LAA. Tsleil-Waututh Nation members residing in communities in the LAA were considered in the assessment. The Proponent reviewed the Tsleil-Waututh Nation TLU study and the locations of the traditional use sites identified by the

Key issues raised	EAO response
Aboriginal residences are included as receptor sites. With TK/TU information from affected Aboriginal communities, additional receptor sites should be identified. TWN requests that Aboriginal use areas are included as receptor sites in the HHRA. For the HHRA, a country foods survey was not conducted, which results in an incomplete baseline. In addition, there is not enough information on the adverse effects of Aboriginal peoples who consume country foods.	Tsleil-Waututh Nation. The majority of the Tsleil-Waututh Nation traditional use sites fall within the RAA used for the HHRA. 45 locations were assessed as part of the HHRA and could be considered surrogate locations for other areas, including potential locations of interest to the Tsleil-Waututh Nation. A "worst-case" location (i.e., maximum point of impingement) was included in the risk assessment, which occurred at the Project area boundary. The potential for human health risks were not identified beyond the Project boundary as this is considered the "worst-case" location scenario; therefore, risk identification was not necessary at the other locations assessed. Accordingly, health risks associated with the Project are not anticipated at locations of interest to the Tsleil-Waututh Nation because potential locations of interest are likely away from the "worst-case" Project area boundary location. As no Project-related changes to soil and water quality were predicted (and subsequently impacts to the quality of country food items were not anticipated), the Proponent did not identify the need to conduct a multimedia assessment, including a country foods survey). EAO required the Proponent to provide updated information for the HHRA assuming a higher consumption of country foods, including seafood, by Aboriginal people as compared to the general public. For more information see section 9.1 of this Report.
Scope of the marine transportation assessment of the proposed Project beyond Howe Sound and timing of the TERMPOL process with the EA process	Effects of the Project from shipping activities were not scoped beyond Howe Sound, as Project-related vessels outside of Howe Sound would account for only an approximate 0.001% increase in vessel activity. The marine shipping route from Howe Sound to the open ocean is also highly regulated. EAO has included a requirement to share the results of the TERMPOL process with the public and Aboriginal Groups in the marine transport condition. The Proponent committed to implementing the recommendations resulting from the TERMPOL review.
Mitigation of archaeological sites through excavation is typically viewed as less desirable than project redesigns that avoid impact. Controlled excavation of significant sites (especially those containing burials) is not viewed as a culturally appropriate mitigation measure.	EAO notes that no archaeology sites were identified in the proposed Project area, which is primarily located on a previously disturbed brownfield site. Archaeological sites in BC are protected under *the Heritage Conservation Act* (HCA). Section 13 of the HCA specifies that an individual (or corporation) must not "damage, excavate, dig in or alter, or remove any heritage object" from a heritage site, unless under a permit issued by the Minister pursuant to sections 12 and 14. For the proposed Project, OGC would issue any section 12 site alteration permits.

Key issues raised	EAO response
	Refer to section 8 of this Report (Heritage section) for EAO's assessment on heritage resources.
Request for more information on seawater cooling system in order to scientifically assess the impact and cumulative effects of seawater cooling system on Howe Sound	EAO assessed the potential impacts of the proposed seawater cooling system on marine water quality and marine fish in sections 5.4 and 5.5, respectively. During Application Review, EAO required supplemental information on the seawater cooling system marine water intake, including a review of currently operational industrial seawater cooling systems that have used similar or proven technology and engineering design, with effectiveness monitoring and validation of modelling results. EAO also required a more detailed description of the evaluation of alternative cooling methods. All of the supplemental information provided from the Proponent on the proposed seawater cooling system was made available to the Working Group, including Tsleil-Waututh Nation, during Application Review. DFO identified that based on the proposed location of the intake, herring spawning locations and anticipated larvae movement, entrainment of juvenile herring is unlikely to result in population level impacts, and advised EAO that sufficient information was provided for the purpose of the EA. EAO proposes a condition requiring the Proponent, in consultation with DFO and Aboriginal Groups, to establish a marine fish and fish habitat management and monitoring plan, which would set out the means by which the mitigation measures in the Application and the Herring Survey Summary Report would be implemented; would identify reduced work windows and the work that would occur within these windows; and measures to monitor the effectiveness of the mitigation measures used for the intake, which would include a pre-construction evaluation of fish species and a post-construction monitoring program to evaluate the fate and behaviour of fish species near the intake screen. If certified, the final design of the outlet pipes and diffuser (to be completed during detailed design) would be evaluated using detailed modelling as part of the *Environmental Management Act* permitting process for the seawater cooling system discharge. The modelling would examine the fate of both thermal and chlorine discharges to verify that the temperature and chlorine concentration meet or exceed the water quality guidelines and the level of effect documented in the Application. A key consideration in the final choice of a dechlorination agent would be ensuring the compound does not become a

Key issues raised	EAO response
	contaminant in the discharge water. The compounds and dosing would be determined during detailed design, and provided to MOE as part of the permitting process.

18.3 Musqueam Nation

18.3.1 Context

- Musqueam Nation is made up of three communities, Musqueam IR 2, Musqueam IR 4 and Sea Island IR 3 located south of the proposed Project.
- The registered population of the Musqueam Nation consists of 1,339 members, of which 635 live on Musqueam Nation reserves.
- It is EAO's understanding that Musqueam Nation is also referred to as Musqueam Indian Band.

18.3.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located approximately 50 km from the main Musqueam Nation community, on the north side of the north arm of the Fraser River in south Vancouver.
- The proposed shipping route through the mouth of Howe Sound runs along the periphery of a small section of Musqueam Nation's asserted traditional territory.
- The Province acknowledges that Musqueam Nation has a proven Aboriginal right to fish as established by the Supreme Court of Canada decision in R. v. Sparrow.
- There is little available information indicating Musqueam historical use of the waters in Howe Sound, but given the proximity of that area to areas of known Musqueam historic use, EAO is of the view that Musqueam has a moderate prima facie claim to of Aboriginal rights to harvest marine and terrestrial resources (e.g. gathering, fishing, hunting and trapping) in the vicinity of the proposed shipping activity in the area overlapping with Musqueam Nation's asserted traditional territory, in Howe Sound.
- Proposed LNG vessel activity within designated shipping routes in the mouth of Howe Sound, anticipated to be approximately 3-4 trips per month, may minimally impact Musqueam Nation's Aboriginal Interests by potentially altering access to traditional fishing grounds and marine harvesting areas.
- Given the nature and location of the proposed Project, and the minimal potential impacts of the proposed Project on Musqueam Nation's Aboriginal Interests, EAO is of the view that the duty to consult Musqueam Nation lies at the low end of the Haida consultation spectrum.
- Musqueam Nation is listed in Schedule D of the Section 11 Order.

18.3.3 Summary of Consultation

Musqueam Nation was provided notification of key milestones, such as the issuance of the AIR, acceptance of the Application for review, and timing of public comment periods (including open houses). Musqueam Nation was also invited to review and comment on the draft Assessment Report and was provided with opportunities to meet with EAO directly.

EAO did not provide capacity funding to Musqueam First Nation. The Agency provided $10,500 in capacity funding to Musqueam Nation to support their participation in the substituted EA.

Musqueam Nation wrote to EAO on January 28, 2015 to request to be moved from Schedule C to Schedule B of the Section 11 Order. It was unclear from the email whether Musqueam Nation was referring to the proposed Woodfibre Project (on which they are listed on Schedule D) or the proposed Woodfibre-Eagle Mountain Gas Pipeline Project, also under review and EAO replied to request clarification. Musqueam Nation did not respond to this request, despite EAO's subsequent efforts to request a response. EAO has provided Musqueam Nation with the opportunity to comment on the Section 11 Order and the initial assessment to inform the depth of consultation on October 2, 2013, and received no response. EAO reconsidered the information regarding the initial strength of claims assessment and responded confirming the assessment regarding the level of consultation and requesting more specific information from Musqueam Nation. No further information was provided. EAO provided a draft of this Report to Musqueam Nation on July 9, 2015 and offered to meet. EAO met with Musqueam Nation on July 15, 2015. While the main purposed of the meeting was to discuss another proposed Project, Musqueam did raise concerns about the potential impacts of marine shipping in Howe Sound and cumulative effects of marine shipping on Musqueam Nation's right to fish. EAO requested more information to better understand how Musqueam Nation use the area and the potential impacts of the proposed Project. EAO encouraged Musqueam Nation to submit comments to EAO on the draft of this Report.

On November 19, 2014, EAO advised the Proponent that the Application Part C (Aboriginal Consultation) requirements and the analysis of environmental effects related to all factors outlined in section 5(1)(c) of CEAA 2012 must be completed for each Aboriginal Group named in the Section 11 Order, regardless of the depth of consultation. The Proponent was encouraged to engage with Aboriginal Groups listed on Schedule D of the Section 11 Order to obtain information for the analysis. The Proponent met with Musqueam Nation on two occasions to present proposed Project related information.

Musqueam Nation did not provide site-specific information related to the potential effects on Aboriginal Interests from the proposed Project.

A summary of the Proponent's engagement activities with Musqueam Nation is provided in the Proponent's Application and in the Aboriginal Consultation Reports.

Only the marine shipping areas of the proposed Project around the mouth of Howe Sound would overlap with the periphery of Musqueam Nation's asserted territory, an area that lies at a distance from the traditional territory ethnographers historically attribute to Musqueam. Musqueam Nation's asserted territory lies outside of the study areas for terrestrial-based VCs (e.g. vegetation). Therefore, it is not expected that adverse effects from the proposed facility would extend into Musqueam Nation's

asserted territory and affect Musqueam Nation's Aboriginal rights to hunt, trap, and gather or to affect cultural heritage sites. The analysis, below, is therefore focused on the potential effects of the marine shipping component of the proposed Project. Marine shipping associated with the proposed Project could temporarily affect Musqueam Nation's access by ocean to resource harvesting areas for short durations. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping, gathering and cultural heritage interests is provided in section 17 of this Report.

18.3.4 Potential Impacts of the Proposed Project to Musqueam Nation's Aboriginal Interests

Fishing and Marine Harvesting

The specific species currently harvested by Musqueam Nation and harvesting locations in the proposed Project area are not known at this time; however, Musqueam Nation have indicated that fishing was the basis of its economy. The species historically fished by Musqueam Nation members in their traditional territory included all five species of Pacific salmon, steelhead trout, rockfish (rock cod, red snapper), herring and herring spawn, smelt, halibut, eulachon, and sturgeon, which were important foods for their people and their economy. The marine mammals utilized in their traditional territory included harbour seal, sea lion, and porpoise. Musqueam Nation also harvested intertidal benthic species that included clams, chitons, cockles, mussels, crabs, octopus, sea urchins, abalone, scallops, barnacles, crayfish and sea weed. Musqueam Nation has FSC allocations for crab and prawns under the Salish Seas joint venture with Tsleil-Waututh Nation and Sliammon First Nations. Prawn harvesting occurs around the entrance to Howe Sound around Bowen Island and much of southern Howe Sound has been identified as a priority harvest area for prawns.

Marine shipping could temporarily disturb marine mammals and fish and limit access to fishing or marine harvesting areas for short periods of time while a vessel is in transit, impacting fishing by Musqueam Nation members along the proposed shipping route. Up to 40 LNG carriers per year (3-4 per month) are expected to transit to the proposed Project site.

EAO does not have additional information on specific sites used by Musqueam Nation in proximity to the proposed Project footprint or proposed Project shipping route for fishing, the frequency of any such fishing, what times of year different species are fished, or the proportion of Musqueam Nation members involved in fishing. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with fishing is provided in section 17.1.2 of this Report.

Musqueam Nation raised a concern about the safety of fishermen during the EA. Section 7.3 (Marine Transport) and section 10 (Accidents and Malfunction) contains assessment of the effects of marine traffic including on fishing and safety.

In consideration of the information available to EAO, the Proponent's proposed mitigation measures, proposed conditions of any EA Certificate issued, and EAO's analysis of residual and cumulative effects to marine fish and marine mammals – as discussed in section 5.5 of this Report – the proposed Project is expected to result in negligible impacts to Musqueam Nation's Aboriginal Interests associated with harvesting marine resources, including fish, in the area of the proposed Project.

18.4 Hul'qumi'num Treaty Group

On Vancouver Island, the Hul'qumi'num Treaty Group (HTG) is comprised of Halkomelem speaking Central Coast Salish groups: Stz'uminus First Nation, Cowichan Tribes, Lake Cowichan First Nation, Lyackson First Nation, Halalt First Nation, and Penelakut Tribe. In the ethnographic and historic sources all of the Aboriginal Groups who are members of the HTG were often referred to as "Cowichan". Occasionally "Cowichan" was also used to refer to a broader group that included all of the Central Coast Salish or Halkomelem speaking people. This lack of clarity in the information means it is sometimes difficult to attribute historical references of "Cowichan" use to individual Hul'qumi'num Treaty Group members.

Each of the six First Nations of the HTG were listed on Schedule D of the Section 11 Order.

HTG First Nations' asserted traditional territory as shown on the Statement of Intent filed with the BC Treaty Commission (BC Treaty Commission 2009), is represented by two areas identified as core Aboriginal title lands and traditional fishing territory. The traditional fishing territory includes the areas at the mouth of Howe Sound and around Bowen and Keats Island which overlaps a portion of the marine shipping route of the proposed Project. The asserted core Aboriginal title lands for the HTG First Nations lie at a distance from the proposed facility site and outside of the study areas for terrestrial-based VCs (e.g. vegetation). Therefore, it is not expected that adverse effects from the proposed facility would extend to the asserted traditional territory of the HTG First Nations or affect asserted Aboriginal rights to hunt, trap, and gather or affect cultural heritage sites of HTG First Nations.

EAO is of the view that there is little information currently available that supports a *prima facie* claim by the HTG First Nations to Aboriginal rights to engage in traditional harvesting activities within the vicinity of shipped activities associated with the proposed Project.

The analysis below is focused on the potential effects of the marine shipping component of the proposed Project that could overlap with HTG First Nations' asserted traditional fishing territory. Marine shipping associated with the proposed Project could temporarily affect HTG First Nations' access by ocean to marine resource harvesting areas for short durations. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with trapping, gathering and cultural heritage interests is provided in section 17 of this Report.

18.4.1 Summary of Consultation

HTG First Nations were provided notification of key milestones, such as the issuance of the AIR, acceptance of the Application for review, and timing of public comment periods (including open houses). HTG First Nations were also invited to review and comment on the draft Assessment Report and referral package, and were provided with opportunities to meet with EAO directly.

EAO did not provide capacity funding to Aboriginal Groups listed on Schedule D of the Section 11 Order. The Agency offered $10,500 in capacity funding to each of the HTG First Nations to support their participation in the substituted EA; this funding was accepted by all except Penelakut Tribe.

On November 19, 2014, EAO advised the Proponent that the Application Part C (Aboriginal Consultation) requirements and the analysis of environmental effects related to all factors outlined in sections 5 (1)(c) of CEAA 2012 must be completed for each Aboriginal Group named in the Section 11 Order, regardless of the depth of consultation. The Proponent was encouraged to engage with Aboriginal Groups listed on Schedule D of the Section 11 Order to obtain information for the analysis.

Cowichan Tribes First Nation and Halalt First Nation informed the Proponent that they would defer to the Squamish Nation in the EA process and therefore did not meet with the Proponent. The Proponent met with Stz'uminus First Nation and Lyackson First Nation on May 13, 2015.

EAO offered to meet with each of the HTG First Nations several times during the EA, but no meetings were held.

None of the HTG First Nations provided site-specific information related to the potential effects on Aboriginal Interests from the proposed Project.

A summary of the Proponent's engagement activities with HTG First Nations is provided in the Proponent's Application, in the Aboriginal Consultation Reports, and in the Current Use Reports for each of the Schedule D Aboriginal Groups prepared by the Proponent for the EA.

The sections below provide information about each of the HTG First Nations followed by EAO's analysis of potential effects on HTG First Nations' Aboriginal rights to fish, hunt and harvest marine resources.

18.4.2 Cowichan Tribes First Nation

18.4.2.1 Context

- The Cowichan Tribes First Nation has nine reserves located on southeast Vancouver Island.
- The registered population of Cowichan Tribes First Nation consists of 4,784 members, of which 2,455 live on Cowichan Tribes First Nation reserves.

18.4.2.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located approximately 105 km from the nearest reserve.
- Given the nature and location of the proposed Project, and the minimal potential impacts of the proposed Project on Cowichan Tribes First Nation's Aboriginal Interests, as discussed below, EAO is of the view that the duty to consult Cowichan Tribes First Nation lies at the low end of the Haida consultation spectrum.
- Cowichan Tribes First Nation is listed in Schedule D of the Section 11 Order.

18.4.3 Halalt First Nation

18.4.3.1 Context

- The Halalt First Nation has two reserves located on Vancouver Island. The largest reserve is located adjacent to the Chemainus River.
- The registered population of Halalt First Nation is 210 members, of which 86 reside on Halalt First Nation's reserves.

18.4.3.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located approximately 92 km from the largest reserve.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Halalt First Nation's Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Halalt First Nation lies at the low end of the Haida spectrum.
- Halalt First Nation is listed in Schedule D of the Section 11 Order.

18.4.4 Lake Cowichan First Nation

18.4.4.1 Context

- The Lake Cowichan First Nation has a single reserve located on Vancouver Island, along the north shore of Cowichan Lake.
- The registered population of the Lake Cowichan First Nation consists of 18 members, of whom 12 live on the reserve.

18.4.4.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located approximately 110 km from the Lake Cowichan First Nation reserve.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Lake Cowichan First Nation's Aboriginal Interests as

discussed below, EAO is of the view that the duty to consult Lake Cowichan First Nation lies at the low end of the *Haida* spectrum.
- Lake Cowichan First Nation is listed in Schedule D of the Section 11 Order.

18.4.5 Lyackson First Nation

18.4.5.1 Context

- The Lyackson First Nation has three reserves on Valdes Island, BC.
- The registered population of Lyackson First Nation consists of 208 registered members, of which 16 live on Lyackson First Nation reserves.

18.4.5.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located approximately 70 km from the main reserve.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Lyackson First Nation's Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Lyackson First Nation lies at the low end of the *Haida* spectrum.
- Lyackson First Nation is listed in Schedule D of the Section 11 Order.

18.4.6 Penelakut Tribe

18.4.6.1 Context

- The Penelakut Tribe is comprised of four reserves on the central east side of Vancouver Island. The main reserve is located on Penelakut Island (formerly known as Kuper Island) BC.
- The registered population of Penelakut Tribe consists of 931 members, of which 517 live on Penelakut Tribe reserves.

18.4.6.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be approximately 82 km from the main reserve.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Penelakut Tribe's Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Penelakut Tribe's lies at the low end of the *Haida* spectrum.
- Penelakut Tribe is listed in Schedule D of the Section 11 Order.

18.4.7 Stz'uminus First Nation

18.4.7.1 Context

- The Stz'uminus (Chemainus) First Nation has four reserves on Vancouver Island.

- The registered population of Stz'uminus First Nation consists of 1,223 registered members, of which 678 live on Stz'uminus First Nation reserves.

18.4.7.2 Aboriginal Interests and EAO's Strength of Claim Assessment and Depth of Consultation

- The proposed Project would be located 80 km from the main Stz'uminus First Nation reserve.
- Given the nature and location of the proposed Project, and the potential impacts of the proposed Project on Stz'uminus First Nation's Aboriginal Interests as discussed below, EAO is of the view that the duty to consult Stz'uminus First Nation lies at the low end of the *Haida* spectrum.
- Stz'uminus First Nation is listed in Schedule D of the Section 11 Order.

18.4.8 Potential Impacts of the Proposed Project to HTG First Nation's Asserted Aboriginal Interests

<u>Fishing and Marine Harvesting</u>

The marine traditional territory asserted by member Aboriginal Groups of the HTG overlaps with the marine carrier route for shipping at the mouth of Howe Sound, as it includes the areas at the mouth of Howe Sound and around Bowen and Keats Island.

Traditional use and access characteristic of Coast Salish Aboriginal Groups includes the hunting of waterfowl and gamebirds. Protected harbours and inlets were used by Aboriginal Groups as travelways between sites. These waterways may still be used by Aboriginal people to access fishing or harvesting areas.
Stz'uminus First Nation, Cowichan Tribes, Penelakut Tribe, and Halalt First Nation have a Fisheries Agreement with DFO that encompasses the Cowichan Lake watershed and the marine waters surrounding Saltspring, North Pender, Saturna, Mayne and Galiano Islands and extending into the Strait of Georgia towards Point Roberts and Lulu Island. The DFO Fisheries Agreement Area does not extend into Howe Sound.

Lyackson Fist Nation members traditionally harvested salmon, halibut, herring, lingcod, dogfish, flounder, smelts, perch, sculpin, skate and ratfish in and around Valdes Island. Pacific herring was also harvested from the Gulf Islands and sockeye salmon in the Fraser River during summer months. Along with fish, Lyackson First Nation traditionally harvested seals and porpoises and seafood such as cockles, mussels, oysters, clams, chitons, purple snails, sea cucumbers, barnacles, crabs and sea urchins. EAO anticipates that other HTG First Nations' members would harvest fish and marine resources similarly.

Prawn harvesting occurs around the entrance to Howe Sound around Bowen Island and much of southern Howe Sound has been identified as a priority harvest area for prawns.

Marine shipping could temporarily disturb marine mammals and fish and limit HTG First Nations' members access to fishing or marine harvesting areas for short periods of time

while a vessel is in transit, impacting fishing by HTG First Nations' members along the proposed shipping route. Up to 40 LNG carriers per year (3-4 per month) are expected to transit to the proposed Project site.

EAO does not have additional information on specific sites used by HTG First Nations in proximity to the proposed Project footprint or proposed Project shipping route for fishing, the frequency of any such fishing, what times of year different species are fished, or the proportion of HTG First Nations' members involved in fishing. A discussion on the potential impacts of the proposed Project on Aboriginal Interests associated with fishing is provided in section 17.1.2 of this Report.

In consideration of the information available to EAO, the Proponent's proposed mitigation measures, proposed conditions of any EA Certificate issued, and EAO's analysis of residual and cumulative effects to marine fish and marine mammals – as discussed in section 5.5 of this Report – the proposed Project is expected to result in negligible impacts to HTG First Nations asserted Aboriginal rights to fish and harvest marine resources in the area of the proposed Project.

18.5 Métis Nation

18.5.1 Context

- The Métis Nation British Columbia (MNBC) has six geographical divisions with 35 chartered communities and provides services to Métis across BC. There are several lower mainland MNBC chartered communities.

18.5.2 EAO's Approach to Consultation

- British Columbia consulted MNBC on behalf of the Government of Canada pursuant to the *Memorandum of Understanding between the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office on Substitution of Environmental Assessments* (2013). Consultation with MNBC is not an acknowledgement on the part of British Columbia that it owes a duty of consultation or accommodation to MNBC under Section 35 of the *Constitution Act, 1982*.

18.5.3 Summary of Consultation

- MNBC was provided notification of key milestones, such as the issuance of the AIR, acceptance of the Application for review, and timing of public comment periods (including open houses). MNBC was also invited to review and comment on the draft Assessment Report and was provided with opportunities to meet with EAO directly.

EAO did not provide capacity funding to MNBC. The Agency provided $10,500 in capacity funding to MNBC to support their participation in the substituted EA.

On February 23, 2015, the Proponent met with MNBC to discuss issues and concerns and to discussion provision of MNBC site-specific current use information.

On March 20, 2015, EAO and MNBC met via teleconference to discuss the proposed Project and the opportunities for MNBC to participate in the process and review the draft Assessment Report. MNBC advised EAO that many Métis citizens reside in and around the proposed Project area.

On March 23, 2015, MNBC provided comments to EAO on the Application. MNBC identified the following issues and concerns:

- Additional reference sites recommended for marine water quality;
- Concern about the use of proxy species such as olive-sided flycatchers as an indicator for management of sooty grouse and barn swallow for common nighthawk, as there are notable differences in habitat requirements and behaviour between the proxies. MNBC recommended that upland game birds, if a concern, should be addressed through their own management program, or linked to the band-tailed pigeon;;

- Confirmation of how the Proponent determined that no cave or karst formations are present in the study area;
- Early out-migrating salmon fry should be monitored for time of departure from the stream to ensure that water withdrawals and stream-side activities do not influence migration schedules. Identifying habitat use (or lack thereof) by rearing juveniles of anadromous fish important for monitoring purposes; and
- Request for comprehensive research to fully understand how Métis may be impacted by the proposed project through detailed Use and Occupancy Mapping.

A summary of the Proponent's engagement activities with MNBC and the Proponent's proposed mitigation to issues raised is provided in the Proponent's Application and in the Aboriginal Consultation Reports.

18.5.4 Potential Impacts of the Proposed Project on MNBC's Asserted Aboriginal Interests

Hunting and Trapping

In a January 6, 2014 letter to the Agency, shared with EAO, MNBC indicates that MNBC members rely on coastal black-tailed deer and mule deer for sustenance located within the proposed Project area. MNBC also reports current traditional harvesting activities are occurring in the proposed Project area.

The MNBC raised concerns that the use of proxy species, such as band-tailed pigeon for sooty grouse and barn swallow for common nighthawk.

A number of candidate terrestrial bird species of concern were considered and subsequently excluded during the VC selection process, including sooty grouse and common nighthawk. A number of technical memos were submitted during pre-Application, which provided rationale for the exclusion of these species of concern. The Proponent provided a technical memo, *Assessment of Potential Effects to Sooty Grouse at the Woodfibre LNG Project site* (April 9, 2015) to address any information gaps which may have occurred because band-tailed pigeon was used as a proxy species. Habitat that would be cleared during construction would not be anticipated to provide high quality nesting or foraging habitat for sooty grouse. The memo identified that indirect habitat effects from changes in lighting and fragmentation would likely be negligible for sooty grouse. The analysis provided in the memo did not result in any additional proposed mitigations or a change in the conclusion on the potential for significant adverse effects to terrestrial wildlife. The Proponent also provided additional rationale to support the utilization of barn swallow for common nighthawk.

A discussion on the potential impacts of the proposed Project associated with hunting and trapping is provided in section 17.1.1 of this Report.

EAO is of the view that the concerns raised by MNBC regarding potential impacts to hunting have been adequately addressed.

Fishing and Marine Harvesting

MNBC has reported that MNBC use fresh water and marine species in the proposed Project area. The specific species harvested by MNBC and the location of these harvests are not known at this time. However, MNBC indicates that they have strong concern over the potential for impacts to Dungeness crabs, tanner crabs, kelp crabs, squat lobsters, and shrimp in the proposed Project area.

MNBC commented that early out-migrating salmon fry should be monitored for time of departure from the stream to ensure that water withdrawals and stream-side activities do not influence migration schedules. Identifying habitat use (or lack thereof) by rearing juveniles of anadromous fish important for monitoring purposes. The Proponent committed to collect additional information regarding the number of pink salmon juveniles out-migrating in spring 2016.

A discussion on the potential impacts of the proposed Project associated with fishing is provided in section 17.1.2 of this Report.

EAO is of the view that the concerns raised by MNBC regarding potential impacts to fishing have been adequately addressed.

Gathering

MNBC reports that traditional harvesting for food and medicine occurs in the proposed Project area but did not raise any specific concerns in this regard.

A discussion on the potential impacts of the proposed Project associated with gathering is provided in section 17.1.3 of this Report.

19 Weighing Impacts on Aboriginal Interests with Other Interests

The Crown has a responsibility to weigh the potential impacts and accommodations on Aboriginal Interests with other societal interests, including the social, environmental and economic benefits of the proposed Project. This evaluation is an important component informing the Ministers' decision regarding whether to approve the proposed Project. In weighing the proposed Project benefits with the impacts on Aboriginal Interests, EAO holds the view that the following factors regarding the proposed Project are relevant to consider:

- Importance of the proposed Project to the local, regional, and provincial economy;
- Nature of the proposed Project;
- Resources or values that may no longer be available for future generations; and
- Benefits of the proposed Project to affected Aboriginal communities.

EAO has summarized the estimated Project benefits during construction and operations in section 2.3 and 19.3 of the Report. The nature of the proposed Project including the Project components and activities are described in section 2.2 of this Report.

19.1.1 Project Importance to the Provincial Economy

The BC government set its vision for an LNG industry in B.C. in September 2011 with the release of *Canada Starts Here: The BC Jobs Plan*. The government saw an opportunity for unprecedented economic growth and jobs for British Columbians and set a goal of three LNG facilities in operation by 2020.

According to the Ministry of Natural Gas Development, LNG-related projects have the potential to bring tens of billions of dollars in investment to BC between 2014 and 2022. As many as 100,000 jobs to construct and operate these plants could be created, injecting more than $1 trillion into our province. This will lead to long term jobs and contracting opportunities for Aboriginal Groups and communities.

The proposed Project would provide a key link between natural gas produced in Canada and growing global LNG markets. It also offers an opportunity for provincial economic growth and job creation. Over the construction phase, the Proponent proposes to spend up to $341 million dollars in BC.

The Proponent estimates that in BC, construction would create approximately 1715 person years (PYs) of direct employment and anticipates contributing $45.4 million to provincial government revenue including PST.

19.2 Resources or Values That May No Longer Be Available for Future Generations

The scope of the proposed Project relates to the processing and transport of natural gas, rather than involving primary resource extraction. Traditional subsistence activities, such as hunting, fishing, gathering and trapping and access to areas where these activities are conducted may be altered as a result of the proposed Project, which could manifest itself through changes to local harvesting locations, behavioural alteration or sensory disturbance of environmental resources.

Although EAO believes there could be potential impacts to resources or values of importance to Aboriginal Groups, the majority of this disturbance and impact would be expected to be negligible to low in magnitude. EAO is of the view that the Proponent has made efforts to demonstrably avoid high value areas for Aboriginal Groups, by building on existing industrial lands, minimizing clearing wherever possible, and providing appropriate mitigation measures to reduce the potential effects of Project shipping. The volume of proposed LNG carrier traffic in Howe Sound is expected to be relatively low at up to 40 trips per year compared to other marine traffic in the same area. The Proponent has elected to use electricity from BC Hydro instead of natural gas to power the facility in order to reduce air emissions and greenhouse gasses.

19.3 Benefits of the Project to Affected Aboriginal Communities

For Aboriginal Groups, the proposed Project would have the potential to provide important economic opportunities, including capacity-building initiatives to support employment, contracting and business development through identifying economic opportunities tailored and specific to each Aboriginal Group under agreements with the Proponent that would remain confidential.

The Proponent has provided and would continue to provide economic benefits to support capacity-building opportunities specific to Aboriginal Groups prior to and during the construction phase of the Project. These opportunities include:

- Providing capacity funding to support meaningful participation in consultation activities with the Proponent and in the regulatory process;
- Identify training and capacity building partnerships or other arrangements for potentially affected Aboriginal Groups and local communities that will increase opportunities for participation;
- Encouraging and supporting the use of Aboriginal and local businesses by encouraging suppliers and subcontractors to adopt local procurement;
- The Proponent would continue to communicate its employment and subcontracting opportunities that are available;
- The proponent is actively engaged with the Aboriginal Groups to ensure that local First Nation communities benefit directly from the Project. These benefits include opportunities related to employment, training and contracting and form

part of an overall commitment by the proponent to engage local First Nation communities on an ongoing basis in the Project; and

- As part of the request for proposal process, contractors have to provide a local implementation plan as part of their bid. This will describe how they will employ local businesses and suppliers, including Aboriginal businesses.

PART D – CONCLUSIONS

Based on:

- Information contained in the Proponent's Application and the supplemental information provided during Application review;
- The Proponent's and EAO's efforts at consultation with Aboriginal Groups, government agencies, including local governments, and the public, and the Proponent's commitment to ongoing consultation;
- Comments on the proposed Project made by Aboriginal Groups and government agencies, including local governments, as members of EAO's Working Group, and the Proponent's responses to these comments;
- Comments on the proposed Project received during the public comment period, and the Proponent's responses to these comments;
- Issues raised by Aboriginal Groups, including through the Squamish Process, regarding potential impacts of the proposed Project and the Proponent's responses and best efforts to address these issues;
- The design of the proposed Project as specified in the proposed Schedule A (Certified Project Description) of the EA Certificate to be implemented by the Proponent during all phases of the proposed Project; and,
- Mitigation measures identified as proposed conditions in Schedule B (Table of Conditions) of the EA Certificate to be undertaken by the Proponent during all phases of the proposed Project.

EAO is satisfied that:

- The EA process has adequately identified and assessed the potential adverse environmental, economic, social, heritage and health effects of the proposed Project, having regard to the proposed conditions set out in Schedule B (Table of Conditions) to the EA Certificate;
- Consultation with Aboriginal Groups, government agencies, and the public, and the distribution of information about the proposed Project have been adequately carried out by the Proponent and that efforts to consult with Aboriginal Groups will continue on an ongoing basis;
- Issues identified by Aboriginal Groups, government agencies, including local governments, and the public, which were within the scope of the EA, were adequately and reasonably addressed by the Proponent during the review of the Application;
- Practical means have been identified to prevent or reduce any potential adverse environmental, social, economic, heritage or health effects of the proposed Project such that no direct or indirect significant adverse effect is predicted or expected;
- The potential for adverse effects on the Aboriginal rights and title of Aboriginal Groups has been avoided, minimized or otherwise accommodated to an acceptable level;

- The provincial Crown has fulfilled its obligations for consultation and accommodation to Aboriginal Groups relating to the issuance of an EA Certificate for the proposed Project.

The provincial Minister of Environment and the Minister of Natural Gas Development will consider this assessment report, the summary assessment report and other accompanying materials in making their decision on the issuance of an EA Certificate to the Proponent under the Act.

Appendix 1: Summary Assessment of Alternatives

Table A 1: Alternative Site Locations

Evaluation Criteria		Terminal Forest Products	Woodfibre Property
Public Safety and Visual Quality	Ability to restrict public access	• Readily accessible by road.	• Only accessible by water or air.
	Proximity to population areas	• Located within 3 km of Langdale, BC. • Residential properties near site and overlooking site.	• No nearby residential properties.
Proximity to existing gas infrastructure	Proximity to existing gas pipeline	• Natural gas pipeline upgrade would be longer than pipeline to Woodfibre property.	• Natural gas pipeline upgrade would be shorter than the pipeline to the Terminal Forest Products site.
Protection of aquatic resources	Existing freshwater fisheries values	• Fish hatchery at the site. • High-value salmonid habitat. • Large area of estuarine fish habitat.	• Mill Creek has been heavily modified through previous industrial activity. • No riparian vegetation through the former mill site. • Small area of estuarine fish habitat.
Surface water availability	Availability of freshwater	• Water supply potentially limited.	• Existing water licences for industrial use.
Suitability for construction	Accessibility for construction	• Site accessible by road but construction workforce separated by ferry. • Construction services located nearby. • Minimal laydown areas for construction.	• Site accessible only by ferry. • Construction services located nearby.
Suitability for marine terminal	Suitability	• Sufficient water depth for deep sea berth. • Long jetty required. • Turning basin near site.	• Sufficient water depth for deep sea berth. • Shorter jetty required. • Turning basin near site. • Additional marine infrastructure required.

Evaluation Criteria		Terminal Forest Products	Woodfibre Property
Suitability for marine navigation	Suitability	• Shorter ship transit times. • Close proximity to ferry terminal. • Long pilotage required. • Sheltered water and sufficient water depth and channel. • Escort tugs required.	• Longer ship transit times. • Close proximity to ferry terminal. • Longer pilotage required. • Sheltered water and sufficient water depth and channel. • Escort tugs required.
Selection		No	Yes

Table A 2: Alternative Shipping Routes within Howe Sound

Evaluation Criteria	East Route – Follows Queen Charlotte Channel east of Bowen Island	West Route – Follows Collingwood Channel west of Bowen Island
TC's criteria for two-way vessel operation: navigable channel width a minimum of seven times that of the ships' beam width	Yes	Yes
Level of marine vessel traffic volumes	Similar to the west route	Similar to the east route
Environmental considerations	Similar to the west route	Similar to the east route
Route Length	More direct	Less direct
Selection	Yes	No

Table A 3: Alternative Site Layouts – LNG Storage

Evaluation Criteria	Land-based	On water, south of Mill Creek	On water, north of Mill Creek
Requirements for ground improvements	Existing geotechnical and seismic conditions would require extensive ground improvements. Existing soil contamination may necessitate additional remediation.	Expected to have deeper bedrock requiring longer pile lengths and requiring more ground improvement.	Expected to have shallower bedrock requiring shorter pile lengths and require less ground improvement
Length of cryogenic lines			Requires the shortest cryogenic LNG lines from the plant to the FSO
Vessel access		Vessel access is more constrained than north of Mill Creek and would require a longer jetty and associated utilities	Vessel access is less constrained than south of Mill Creek permitting a shorter jetty
Capital costs and contract-to-delivery time	Higher capital costs and longer contract-to-delivery time compared to floating LNG storage.	Floating LNG storage offers a viable alternative to land-based storage tanks due to lower capital costs and shorter contract-to-delivery time	Floating LNG storage offers a viable alternative to land-based storage tanks due to lower capital costs and shorter contract-to-delivery time
Decommissioning		Following decommissioning, floating LNG storage can be relocated to other sites	Following decommissioning, floating LNG storage can be relocated to other sites
Selection	No	No	Yes

Table A 4: Alternative Site Layouts – LNG Facility

Evaluation Criteria	Land-based, south of Mill Creek	Land-based, north of Mill Creek	On water
Underwater noise/visual quality	Land-based facilities reduce underwater noise.	Land-based facilities reduce underwater noise.	Does not address concerns regarding potential effects of underwater noise on marine mammals or visual quality.
Facility footprint	Insufficient land area available to install modules in their current configuration while maintaining a 50 to100 m setback from the Howe Sound shoreline and maintaining the Green Zone.	Offers more flat, disturbed land to accommodate the LNG facility modules and ancillary equipment. Allows for greater separation between process components and worker activities.	
Ground improvements	Option would require extensive earthwork and rock blasting to level the site and cut into the slope to the north.	With ground improvements, the area can meet the 2,475-year seismic event requirements.	
Accomodation of floating LNG Storage		Provides a broader shoreline with steeper drop to deep water to accommodate floating LNG storage.	
Selection	No	Yes	No

Table A 5: Alternative Site Layouts – Administrative Facilities

Evaluation Criteria	South of Mill Creek	North of Mill Creek
Distance between control of access and operational features.	Allows the greatest separation from and control of access to operational features, facilitated by the physical barrier posed by Mill Creek	Proximal to process facilities. Insufficient room without additional site clearing
Selection	Yes	No

Table A 6: Alternative Construction Methods

Evaluation Criteria		Modular Construction	Construction Onsite
Environmental	New clearing on the Woodfibre Property	• Smaller footprint because modular construction does not require as much laydown and materials storage space	• Larger footprint because more area is required for laydown and materials storage space
	Boat traffic during the construction phase	• Fewer materials delivered to the Woodfibre site by boat and barge • Less waste generated at the Woodfibre site	• More materials delivered to the Woodfibre site by boat and barge • More waste generated at the Woodfibre site
Socio-economic and public safety	Employment of local work force	• Site preparation and construction of foundations, installation of modules, and installation/upgrade of supporting infrastructure can be carried out using local labour	• As BC does not have an LNG-experienced labour force, construction of the LNG facility onsite would require the import of labour from other markets where the skills and capacity exist
Quality	Quality assurance and quality control	• Greater quality assurance/quality control • Modules are fabricated , assembled, and tested at the manufacturing facility • Deficiencies addressed at the manufacturing facility by the design-build team	• Construction onsite generally has fewer controls than manufacture in existing plant • LNG facility tested at the Woodfibre site
Economic	Project schedule	• Fabrication of modules can occur concurrently with site preparation	• Construction of the LNG facility couldn't begin until after completion of site and foundation preparation
Selection		Yes	No

Table A 7: Alternative Energy Supply

Evaluation Criteria		Gas-fired Power Generation	Electric Power
Environmental	GHG Emissions	• Burning natural gas for energy during operation would produce GHG emissions	• The selection of electric power would reduce GHG emissions by 80% over gas powered facilities
	Air Quality	• Burning natural gas for energy during operation would result in local air quality effects	• The selection of electric power would reduce air quality contaminants of concern by up to 90%
Public Safety	Safety	• One of two known explosions at operating LNG plants was as a result of the steam boilers, which is not required when electric drives are used	• Operational upsets leading to flaring are minimized as reliability of electrical motors is much higher than that of other driver systems (e.g. gas turbines)
Economics	Project cost	• Lower initial operating cost • More commonly used technology	• Using electric drive conserves the gas pipeline supply for production of LNG • Higher efficiency and availability
Selection		No	Yes

Table A 8: Alternative Cooling Technologies

Evaluation Criteria		Air Cooling	Evaporative Cooling	Seawater Cooling
Environmental Effects	Aquatic and marine habitat	• Lowest potential to affect aquatic habitat	• Requires the addition of water treatment chemicals to avoid scaling, biofouling, and corrosion and mitigate against Legionellosis	• Diversion of approximately 17,000 m^3/h of seawater from Howe Sound • Discharged seawater must meet applicable water quality guidelines
Public interests	Visual effects	• Potential for a steam plume and fog associated with air cooling • Large modules required • A minimum of 7 m of clearance under bays	• Approximately 1,000 m^2 to 3,200 m^2 of area required for cooling modules • Potential for additional clearing	• Reduced visual effects as there are no large air cooler banks
	Noise reduction	• High levels of atmospheric noise	• Less noise than air coolers	• Less noise than air coolers
	Safety	• Leaks are difficult to detect	• The cooling tower and cooling water option allows the refrigerant volume to be reduced and localized to the liquefaction module, with cooling water delivered from remote cooling towers, representing a significant improvement in safety	• Seawater cooling is considered safer than air coolers. • Hydrocarbon leaks are less hazardous since they are confined in a closed-pressure vessel and piping system, instead of being vented to open air
Selection		No	No	Yes

Appendix 2: Key Issues Raised by the Public and EAO's Responses

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
Project location/siting – Concerns that the proposed Project would be located close to communities along the Sea-to-Sky and in a waterway with high recreational boating use.	• Implement a marine transport management plan prior to construction activities, which would include communication measures and additional consultation with key stakeholders to identify areas of concerns and additional mitigation; • Implement a Squamish harbour vessel traffic plan that would include strategies, best management practices and guidelines to avoid and minimize Project-related disruption of marine-based recreational activities in the Squamish Harbour; • Prohibit mooring or anchoring of LNG carriers anywhere in Howe Sound; and • LNG carriers would transit at low speeds in Howe Sound.	The Proponent's Application for an EA Certificate included an analysis of alternative siting locations and shipping routes within Howe Sound for the proposed Project. The proposed Project would be located at an industrially-zoned, fee simple, brownfield site with a deep-water harbour and access to the site is by air and water only. During Application Review, EAO requested additional information on potential combined wake effects under both typical and severe weather conditions and at a range of travelling speeds and vessel configuration resulting from: an LNG carrier accompanied by 3 escort tugs, an LNG carrier with escort tugs and a BC Ferry and the largest worker ferry. The supplemental information concluded that the wake generated by the carriers in normal conditions would be less than 10 cm at 50 m away from the LNG carrier, which is less than the wind-generated waves typically encountered in Howe Sound. Wake generated from Project vessels was estimated to be smaller than the wake generated by BC Ferries and other vessels currently transiting to Squamish Harbours because Project vessels would transit at lower speeds and travel as far from shore as practicable. EAO assessed Project-related effects to marine transportation in **Section 7.3** of this Report.	EAO proposes a condition that would require the Proponent to develop and implement a **visual quality management plan (Condition 20)**. EAO proposes conditions that would require the Proponent to develop and implement **marine transport management and monitoring plans** for both construction and operation of the proposed Project. The plans would be developed in consultation with relevant agencies and local governments and Aboriginal Groups (**Conditions 16 and 17**). EAO proposes a condition that would require the Proponent to develop and implement a **vessel wake verification plan** for Operations along the Certified Marine Route (**Condition 18**).
Public Safety – Concerns about accidents and malfunctions and risks to public safety.	• Ensure that two BC Coast Pilots are on board transiting LNG carriers at all times, from Victoria throughout the passage in Howe Sound; • Establish a safety awareness zone around transiting LNG carriers in Howe Sound using a minimum of three escort tugboats; • Prohibit mooring or anchoring of LNG carriers anywhere in	EAO assessed scenarios for potential accidents or malfunctions, according to the likelihood of the scenario arising and the potential consequence or severity of the scenario arising. During Application Review, EAO requested a supplemental memo to provide more information regarding the assessed risk from unplanned events and assessment of additional scenarios requested by the Working Group and the public. EAO assessed Accidents and Malfunctions in **Section 10** of this Report.	EAO proposes conditions that would require the Proponent to develop and implement **marine transport management and monitoring plans** for both construction and operation of the proposed Project (**Conditions 16 and 17**).

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
	Howe Sound; • LNG carriers would transit at low speeds in Howe Sound; • Develop and implement Emergency Responses Plans; and • Use of firefighting equipment and suppression systems on board each vessel and implementation of control procedures to reduce potential effects.	The Proponent is currently undertaking a Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL) for the proposed Project and is anticipating submission of its application in September 2015. TERMPOL is a voluntary review process that may be requested by proponent involved in building and operating a marine terminal system for bulk handling of oil, chemicals and liquefied gases. It focuses on the marine transportation components of a project and examines the safety of tankers entering Canadian waters, navigating through channels, approaching berthing at a marine terminal and loading or unloading oil or gas. The review is led by Transport Canada (TC) and can involve other federal departments and other stakeholder representatives. The movement of Hazardous and Noxious Substances (HNS), such as LNG, in and out of Canadian ports occurs every day, and LNG has been safely shipped in Canada's Atlantic region since 2009. There is a suite of legislation and regulations that govern vessel safety, including construction standards, crew certification, navigation, vessel traffic management, pilotage, and inspections.	
Tourism and recreation, property values, and the 'Squamish Brand' – Concerns that the presence of an industrial facility in Squamish would have negative effects on tourism, recreation, property values, and the perception of Squamish as a wilderness/ recreational destination	• Maximize the use of existing disturbed areas and minimize removal of vegetation; • Reduce the level of contrast by finishing, re-finishing and maintaining the external surfaces of buildings with low glare materials and natural colours; • Provide additional temporary or permanent vegetative screening of land-based infrastructure not currently screened by existing vegetation; • Monitor and maintain natural screening to limit visibility of infrastructure and activity during operations; and • Continue to work with Sea-to-Sky Gondola representatives and other stakeholders to minimize visual quality impacts at the gondola and highway viewpoints as the Project	EAO assessed the potential social and economic effects of the proposed Project in **Sections 6 and 7** of this Report, respectively. EAO is satisfied that potential residual effects of the proposed Project on the labour market and sustainable economy would be negligible. EAO is satisfied that the proposed Project would not have significant adverse effects on infrastructure and community services, land and resource use, marine transportation and visual quality and potential effects on community and community quality of life would be negligible. The proposed Project would be located at the former Woodfibre Pulp and Paper Mill site, a fee simple, industrially-zoned and brownfield site, which can only be accessed by air or water. The Proponent would continue to undertake remediation efforts at the site, including demolition of derelict buildings and structures, removal of approximately 3,000 creosote-treated piles and creation of a green zone area of approximately 23,000 m^2 along the	EAO proposes a condition that would require the Proponent to develop and implement a **visual quality management plan** in consultation with relevant agencies, Tourism Squamish and the Sea-to-Sky Gondola and Aboriginal Groups (**Condition 20**). EAO proposes conditions that would require the Proponent to develop and implement **marine transport management and monitoring plans** for both construction and operation of the proposed Project. The plans would be developed in consultation with relevant

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
	design progresses; • Develop a local hiring strategy to minimize the number of non-local workers requiring temporary housing and accommodation; • Use a housing and accommodation advisor during construction and the initial operations stage to serve as a resource for non-local workers seeking accommodation in the LAA; • Develop and implement a marine transport management plan, which would include communication measures to ensure all vessel traffic is aware of Project activities and further consultation with key stakeholders to identify areas of concern and additional mitigation measures; • Develop and implement a Squamish harbour vessel traffic management plan that would specify means to avoid or reduce Project-related disruption of marine-based recreation activities in the Squamish Harbour area; and • Prohibit mooring or anchoring of LNG carriers within Howe Sound.	lower reaches of Mill Creek. The annual increase in shipping traffic within Howe Sound would be less than 1 %, consisting of 3 or 4 LNG carriers per month. There are no permanent residences or private properties within several kilometres of the proposed Project site, which is already zone for industrial use.	agencies and local governments and Aboriginal Groups (**Conditions 16 and 17**).
Air quality and human health – Concerns about emissions from the proposed Project and potential effects on the local airshed and human health.	The proposed Project would be powered by electricity provided by BC Hydro, reducing the emission of air quality contaminants of concern by up to 90 % compared to gas-fired power generation. Other key mitigations include: • Limit the use of power generators during operations; and • Provide shore power for berthing LNG carriers equipped to use shore power.	EAO assessed the potential residual adverse effects on air quality and human health from the proposed Project in **Sections 5.1 and 9.1** of this Report, respectively. EAO concluded that the proposed Project would not have significant adverse effects on air quality or human health. The proposed Project would require a waste discharge permit under the *Environmental Management Act* to authorize emissions of Criteria Air Contaminants. Provincial and federal Ambient Air Quality Objectives would guide permit development and provide the framework for evaluating observed or predicted air contaminant concentrations.	EAO proposes a condition requiring the development of an **air quality mitigation and monitoring plan**, which would include measures to monitor facility air emission impacts to air, procedures for reporting of the effects from facility air emissions, and an adaptive management plan (**Condition 4**).

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
Economic benefits – Concerns that the amount of tax revenues and creation of jobs were insufficient compared to the potential for adverse effects of the proposed Project. Questions about the financial viability of the LNG industry in BC.	• Undertake a local hiring strategy and a local training strategy, to enhance the likelihood that LAA residents would be well-positioned to secure employment opportunities; • Monitor the progress of the local hiring strategy and the local training strategy; and • Issue an annual report on hiring and training results for the construction and operation phases of the proposed Project.	EAO assessed potential economic effects of the proposed Project in section 6.1 of this Report. EAO also summarized the potential economic benefits of the proposed Project in **Section 2.3** of this Report. EAO concluded that the residual adverse effects of the proposed Project on the labour market and sustainable economy would be negligible.	EAO proposes a condition requiring the Proponent to design and deliver programs to support local and Aboriginal employment and contracting opportunities, skills training and education (**Condition 13**).
Health of Howe Sound – Concerns that Woodfibre LNG would jeopardize ongoing restoration and the overall health of Howe Sound through industrial discharges to the marine environment.	Key measures that would mitigate potential effects to marine water quality are: • The effluent diffuser and outfall pipes would be installed within low-productivity benthic habitat; • All diffusers would be designed and operated to meet discharge criteria in accordance with conditions of Waste Discharge Authorizations and would meet CCME and BC Water Quality Guidelines for the Protection of Aquatic Life; • Monitoring of seawater cooling discharge to assess the effectiveness of mitigation and confirm the results of the assessment.	EAO assessed potential effects of the proposed Project on marine water quality and benthic habitat in **Section 5.4** of this Report. EAO concluded that the proposed Project would not have significant adverse effects on marine water quality and benthic habitat. All discharges into Howe Sound would require compliance with Waste Discharge Authorizations, including mitigation and monitoring to ensure the receiving environment meets BC and CCME Water Quality Guidelines for Protection of Aquatic Life. In consideration of remediation work completed for the Certificates of Compliance, including removal of wood waste debris from the seafloor and historically contaminated marine sediment from previous pulp mill operations, along with the proposed removal of approximately 3,000 creosote-treated pilings and mitigation measures identified in the marine works management plan, the proposed Project would be anticipated to result in an overall positive effect and long-term improvement in marine benthic habitat quality compared to pre-existing conditions.	EAO proposes conditions that would require the Proponent to develop and implement a **marine water quality management and monitoring plan** for both construction and operation of the proposed Project. The plans would be developed in consultation with relevant agencies and Aboriginal Groups (**Condition 6 and 7**).
Marine fish – Concerns that the marine water intake and treated thermal discharges from the seawater cooling system would impact local	Key measures that would mitigate potential effects to marine water quality are: • The effluent diffuser and outfall pipes would be installed within low-productivity benthic habitat;	EAO assessed potential effects of the proposed Project on marine fish in section 5.5 of this Report. EAO concluded that the proposed Project would not have significant adverse effects on marine fish. If approved, the proposed Project may require a *Fisheries Act* authorization	EAO proposes conditions that would require the Proponent to develop and implement a **marine water quality management and monitoring plan** for

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
populations of marine fish, especially Pacific herring and salmonids.	• All diffusers would be designed and operated to meet discharge criteria in accordance with conditions of Waste Discharge Authorizations and would meet CCME and BC Water Quality Guidelines for the Protection of Aquatic Life; • Monitoring of seawater cooling discharge to assess the effectiveness of mitigation and confirm the results of the assessment. A key mitigation measure that would minimize potential marine fish morality due to impingement and entrainment from the seawater cooling system by designing the marine water intake to meet Best Management Practices for approach velocity and screen size, as outlined in the DFO's *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia*.	for serious harm to fish (including death of fish or permanent alteration or destruction of fish habitat). The requirement for an authorization would be determined following permitting applications with a Request for Review to DFO based on final engineering design and mitigation measures. If DFO determines an authorization is required, an Offsetting Plan may be required to offset impacts and maintain the ongoing productivity of fisheries. During Application Review, EAO requested supplemental information on the seawater cooling system marine water intake. EAO also requested a review of currently operational industrial seawater cooling system that have used similar or proven technology and engineering design, with effectiveness monitoring and validation of modelling results. The Proponent also provided additional information on site-specific utilization of the site by Pacific herring in a Herring Survey Summary Report. Additional information related to the assessment of potential effects on marine fish can be found in **Section 5.5** of this Report.	construction and operation of the proposed Project. The plans would be developed in consultation with relevant agencies and Aboriginal Groups (**Conditions 6 and 7**). EAO proposes a condition requiring the Proponent to establish a **marine fish and fish habitat management and monitoring plan**, which would specify measures to monitor the effectiveness of the mitigation measures used for the intake, which would include a pre-construction evaluation of fish species and a post-construction monitoring program to evaluate the fate and behaviour of fish species near the intake screen. The plan would be developed in consultation with DFO and Aboriginal Groups (**Condition 8**).
Impacts to marine mammals – Concerns that underwater noise and collisions with LNG carriers would have negative effects on marine mammal populations.	Key measures that would mitigate effects on marine mammals from underwater noise are: • An underwater noise management plan would be prepared and implemented; • Works in the marine environment would be conducted during the least-risk fisheries work window; • Vibrational pile driving would be used were practical and feasible; • An Environmental Monitor would be responsible for monitoring noise and potential effects to wildlife, and implementing correction mitigation measures (including stopping the activity if required);	EAO assessed potential effects of the proposed Project on marine mammals in **Section 5.5** of this Report. EAO concluded that the proposed Project would not have significant adverse effects on marine mammals.	EAO proposes a condition requiring the Proponent to develop and implement a **marine mammal management and monitoring plan** for construction, which would identify the geographic areas and times when construction could cause injury or behavioural change to marine mammals; identify time periods when elevated marine mammal occupancy is anticipated; specify the role of a Qualified Professional in observing and reporting marine mammals in the area; and specify the construction activities that must stop or not start if a marine

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
	• A marine mammal management plan would be prepared and implemented and would include the requirement for a qualified marine mammal observer to monitor during impact pile driving activities; and • LNG carrier speed would be restricted along the proposed shipping route in Howe Sound.		mammal is sighted in the area (**Condition 9**).
Hydraulic fracking, greenhouse gas emissions and climate change – Concerns about the potential environmental impacts of upstream gas production and associated pipelines. Concerns about the greenhouse gas emissions from Woodfibre LNG and potential effects to climate change.	The in addition to using electricity to power the Project, which would result in a major reduction in GHG emissions, other key mitigation measures in the Application include: • Develop and implement a leak detection and repair program; and • Minimize the amount of flared and vented gases, and select chemicals that minimize contributions to global warming;	Combining the review for separate projects (e.g., upstream natural gas facilities or natural gas pipelines) is not permissible under the Act; however, EA does consider cumulative effects from past, current and reasonably foreseeable future projects and activities that would likely interact with proposed Projects. In the case of the proposed Project, the Application assessed the potential for cumulative effects from past industrial activities and future projects in Howe Sound, such as the BC Hydro substation and transmission line upgrades and the proposed BURNCO and Eagle-Mountain – Woodfibre Gas Pipeline projects, for example. EAO reviewed and considered potential cumulative effects of the proposed Project during the EA. EAO assessed potential effects of the proposed Project on greenhouse gas management in **section 5.2** of this Report. EAO concluded that the proposed Project would not have significant adverse effects on greenhouse gas management. In November 2014, BC passed the *GHG Industrial Reporting and Control Act* that puts in place a GHG emissions intensity benchmark for LNG facilities of 0.16 tonnes of CO_2e per tonne of LNG produced (t CO_2e/t LNG). LNG facilities can use offsets and a technology fund to reach the benchmark, and facilities below the benchmark can receive a credit that they can sell.	No specific conditions related to upstream gas development or greenhouse gas emissions are proposed by EAO.
Government oversight, regulation, compliance and enforcement – Apprehension that under the		Throughout the life of a project, EAO and compliance partners collaborate to ensure that it is constructed and operated according to the EA Certificate. The Agency also ensures compliance and enforcement with respect to any decision statement issued under CEAA 2012.	The proposed EA Certificate conditions would become legally enforceable if the proposed Project is certified by Ministers.

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
current regulatory regime there is insufficient government oversight and regulation of LNG facilities and shipping of LNG in BC. Concern that there would be a lack of compliance by the Proponent and limited enforcement capability by the regulators to ensure compliance.		If the proposed Project is certified, the Proponent would still have to apply for a number of permits in order to construct and operate an LNG facility. The primary regulator for construction and operation of LNG facilities in BC is OGC. Marine shipping is the jurisdiction of the federal government. As the key regulator of marine shipping, Transport Canada promotes efficient marine transportation and safe, secure and sustainable marine practices, oversees marine infrastructure, regulates the safe transportation of dangerous goods by water and helps protect the marine environment.	
EA process – Comments and questions related to the rigour of the EA process such as, technical review, neutrality of EAO and transparency.		EAO's advisory Working Group is the principal forum for the technical review of proposed projects undergoing an EA. The Working Group provided advice to EAO and the Proponent on technical issues which fell within each Working Group member's mandate. The Working Group is made up of provincial, federal and local government staff with the mandates and skills relevant to the review of a proposed project and representatives of potentially affected Aboriginal Groups. During Application Review EAO requested additional reference materials and supplemental information from the Proponent to support the review of the Proponent's Application for an EA Certificate. EAO's requests were primarily driven by concerns raised and requests submitted by the public, Working Group and Aboriginal Groups. Notably, EAO issued a request for additional information on vessel wake effects, the seawater cooling system and accidents and malfunctions on April 10, 2015. All of the supplementary information provided by the Proponent to EAO during the EA was made available on EAO's website at www.eao.gov.bc.ca.	EAO proposes a condition that would require the Proponent to continue to engage the public for the life of the proposed Project. Consultation and engagement must include information sharing and discussion of site-specific mitigation measures, including the development and implementation of plans and the proposed EA Certificate conditions (**Condition 24**). EAO proposes a condition that would require the Proponent to establish and maintain for the life of the proposed Project a dedicated publicly available Project website. The website must be used for communicating information on Project status in order promote public awareness of ongoing activities and construction schedules, and to ensure general safety in and surrounding the Project area (**Condition 25**).

Key Issue	Proposed Key Mitigations from the Application	Key Actions or Regulatory Requirements	Environmental Assessment Certificate Condition
Public consultation process – Request for extension of the public comment period. Questions and comments about the format and locations of the open house events. Concerns that the public comments would not be considered in the decision by the Ministers.		At the request of the Proponent, EAO extended the public comment period during Application Review from 45 days to 60 days. EAO provided additional responses to comments and concerns raised by the public related to the EA process in a public response document, which is available on EAO's website. EAO has considered all public comments received during the public comment periods and the Proponent's responses in the environmental assessment of the proposed Project. EAO has conducted public consultation in accordance with the Public Consultation Regulation pursuant to the *Environmental Assessment Act*.	

Appendix 3: List of Working Group Members

Provincial Government
BC Oil and Gas Commission
Ministry of Aboriginal Relations and Reconciliation
Ministry of Community, Sport and Cultural Development
Ministry of Environment – Environmental Protection Division
Ministry of Environment – Climate Action Secretariat
Ministry of Forests, Lands and Natural Resources Operations
Ministry of Health
Ministry of Jobs, Tourism and Skills Training
Ministry of Transport and Infrastructure
Vancouver Coastal Health

Federal Government
Department of Fisheries and Oceans Canada
Environment Canada
Health Canada
Natural Resources Canada
Transport Canada

Local Government
Bowen Island Municipality
District of Squamish
District of West Vancouver
Islands Trust
Municipality of the Village of Lions Bay
Squamish-Lillooet Regional District
Sunshine Coast Regional District

Aboriginal Groups
Squamish Nation
Tsleil-Waututh Nation

Appendix 4: Residual Effects Characterization Definitions

Characterization	General Description	Assessment Report Chapters								
		Air Quality	Greenhouse Gas Management	Vegetation Communities Terrestrial Wildlife & marine birds Freshwater Fish and Fish Habitat	Marine WQ & Marine Benthic Habitat Marine Fish & Marine Mammals	Labour Market Sustainable Economy Infrastructure & Community Services Land and Resource Use Community Health & Wellbeing CEAA 2012: 5(1)(c)	Marine Transport	Visual Quality	Heritage Resources	Public Health
Context	The current and future sensitivity and resilience of the VC to change caused by the project. Context draws on the descriptions of the existing conditions for the VC, which reflect cumulative effects of other projects and activities that have been carried out, and especially information about the impact of natural and human-caused trends in the condition of the VC.	**Low –** The indicator has low resiliency or is acutely sensitive to existing conditions **Moderate –** The indicator has moderate resiliency or is mildly sensitive to existing conditions **High –** The indicator has high resiliency or is generally not sensitive to existing conditions								
Magnitude	The expected size or severity of the residual effect. Considers the proportion of the VC affected within the spatial boundaries and the relative effect (e.g., relative to natural annual variation in the magnitude of the VC or other relevant characteristics).	**Negligible**—Project would likely have no measurable change **Low**—Residual effect would be within normal variability of baseline conditions **Moderate**—Residual effect would likely increase or decrease with regard to baseline but within regulatory levels and objectives **High**—The Project would singly, or as a substantial contribution in combination with other sources, cause exceedances of objectives beyond the Project boundaries	**Low –** No measurable change in provincial, national and global GHG emissions **Moderate –** Although, measureable, based on CEA Agency guidance (2003), professional judgement, and the industry profile, relatively small changes would be expected in provincial, national, and global GHG emissions. **High –** Based on CEA Agency guidance (2003), professional judgement, and the industry profile, a relatively high change would be expected in provincial emissions and a notable change in national emissions while change to global emissions would be small.	**Negligible –** Project would likely result in no change in measured endpoint **Low –** Residual effect would likely result in no measurable effect, or result in a minor measurable effect to the VC **Moderate –** Residual effect would likely result in a clearly defined change to the VC, but remain below a level of effect that could exceed the resilience and adaptability limits of the population **High –** Residual effect would likely be sufficiently large that it approaches or falls within the range of effects that could exceed the resilience and adaptability of the population	**Negligible –** Project would likely have no measurable effect on the relative abundance of fish populations or the function of fish habitat **Low –** Residual effect would result in measurable changes in abundance of fish populations but would be within the range of natural variability or loss of non-critical fish habitat **Moderate –** Residual effect would likely result in detectable changes in abundance of fish populations or occasional or temporary disruption of critical activities, individual mortality, or loss of moderate or high-quality fish habitat **High –** Residual effect would likely result in large effects on fish abundance occurring at a population level, or measureable effects, including mortality, on provincially listed or *SARA*-listed fish species, or loss of habitat for provincially-listed or *SARA*-listed fish species	**Negligible –** Project would likely have no measurable change **Low –** Residual effect would likely not be distinguished from baseline case conditions **Moderate –** Residual effect would likely result in demonstrable change, but remain within regulatory criteria or historic norms **High –** Residual effect would likely results in changes that are beyond regulatory criteria or historic norms	**Negligible –** Project would have no measureable change **Low –** Residual effect would likely result in a minor measurable change to navigation or potential for interaction with other marine users **Moderate –** Residual effect would likely result in a moderate measurable change to navigation or potential for interaction with other marine users **High –** Residual effect would likely result in a high measurable change to navigation or potential for interaction with other marine users	**Low –** Residual effect would not likely be visible or there would be minimal change in the baseline visual condition **Moderate –** Residual effect would likely be visible with a change in the baseline visual condition beyond Modification and the alteration would not be considered uncharacteristic within the LAA **High –** Residual effect would likely be highly visible with a change in the baseline visual condition and the alteration would be considered uncharacteristic within the LAA	The amount of physical alteration or destruction of a heritage resource that can be expected. The resultant disturbance measured either in the amount or degree of disturbance (adapted from Archaeology Branch 1998) as follows: **Low –** minimal effects to resources of low, moderate, or high heritage value **Moderate –** moderate to high effects to resources of low or moderate heritage value **High –** moderate to high effects to resources of high heritage value	*(Non-carcinogenic substances)* **Negligible –** No change from baseline case, below applicable guidelines, or a hazard quotient rating of less than or equal to one **Low –** Hazard quotient rating of greater than one or less than or equal to five **Moderate –** Hazard quotient rating of greater than five or less than or equal to ten **High –** Hazard quotient rating of greater than ten
Extent	The spatial scale over which the residual effect is expected to occur.	**Project area/ Site-specific** – Residual effect is restricted to the Project area or a specific area of the LAA **Local** – Residual effect is restricted to the LAA **Regional** – Residual effect is restricted to the RAA **Beyond Regional –** Residual effect extends beyond the RAA **Global** – Residual effect extends globally (i.e., Greenhouse gas emissions)								
Duration	The length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect).	**Short-term –** Residual effect is restricted to the construction, decommissioning or reclamation phases **Long-term** – Residual effect last throughout the operational phase **Permanent** – Residual effect is not likely to recover to baseline **Temporary –** Effect lasting only for a limited period of time.								
Frequency	How often the residual effect occurs and is usually closely related to the frequency of the physical work or activity causing the residual effect.	**Single/ Rare** – Residual effect occurs one time or rarely occurs **Infrequent** – Residual effect occurs infrequently at multiple times **Frequent/ Regular** – Residual effect occurs frequently, at regular intervals **Continuous** – Residual effect occurs continuously								
Reversibility	Whether or not the residual effect on the VC can be reversed once the physical work or the activity causing the disturbance ceases.	**Reversible –** Residual effect is reversible **Irreversible** – Residual effect is permanent								

Appendix 5: Working Group Comments Tracking Table - Including Aboriginal Groups

1. Application Review -Working Group Tracking Table and attachments, August 2015.

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39267.html

2. Application Review - Supplemental Information Working Group Tracking Table and attachments August, 2015.

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39268.html

Appendix 6: Public Comments Tracking Table

Application Review Public Comment Tracking Table with Proponent Responses

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39160.html

Appendix 7: Proponent Responses to Stakeholder Letters

Proponent responses to stakeholder letters received during Application Review

http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_408_39076.html