EAO | Environmental Assessment Office

# Draft Assessment Report for Cedar LNG Project (Project)

**With respect to the application by Cedar LNG Partners LP for an Environmental Assessment Certificate pursuant to the *Environmental Assessment Act*, S.B.C. 2002, c. 43 and the *Impact Assessment Act*, 2019 as a substituted assessment**

**DRAFT: September 21, 2022**

BRITISH COLUMBIA

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| | |
|---|---|
| µg/m3 | micrograms per cubic metre |
| Act (2002) | *Environmental Assessment Act* (2002) |
| Act (2018) | *Environmental Assessment Act* (2018) |
| Agency | Impact Assessment Agency of Canada |
| AIA | Archaeological Impact Assessment |
| AIR | Application Information Requirements |
| Application | Application for an Environmental Assessment Certificate |
| AQO | B.C. Ambient Air Quality Objectives |
| BAT | Best Achievable Technology |
| BCWQG-FAL | B.C. Guidelines for Protection of Aquatic Life |
| B.C. | British Columbia |
| BMP | Best Management Practices |
| CAAQ | Current Canadian Ambient Air Quality Standards |
| CAC | Criteria Air Contaminants |
| CCG | Canadian Coast Guard |
| CCME | Canadian Council of Ministers of the Environment |
| CDC | Conservation Data Centre |
| CEBP | Coastal Environmental Baseline Program |
| CEMP | Construction Environmental Management Plan |
| CEMS | Cumulative Effects of Marine Shipping |
| CMT | Culturally Modified Trees |
| CO | Carbon Monoxide |
| CO2 | Carbon Dioxide |
| CO2e | Carbon Dioxide Equivalents |
| COPC | Contaminants of Potential Concern |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CRI | Commercial, Recreational and Indigenous Fisheries |
| CSA | *Canada Shipping Act* |
| dAIR | draft Application Information Requirements |
| Db | Decibel |
| dBA | A-weighted decibel |
| DFO | Department of Fisheries and Oceans Canada |
| DWT | Dead Weight Tonnes |
| EA | Environmental Assessment |
| EAC Certificate | Environmental Assessment |
| EAO | Environmental Assessment Office |
| ECCC | Environment and Climate Change Canada |

| | |
|---|---|
| EMA | *Environmental Management Act* |
| EMSA | Enhanced Maritime Situational Awareness |
| EMP | Environmental Management Plan |
| ENV | Ministry of Environment |
| EPIC | EAO's Project Information Centre |
| EPMG | Environmental Protection and Management Guide |
| EPMR | Environmental Protection and Management Regulation |
| FEED | Front End Engineering Design |
| FLNG | Floating Liquified Natural Gas |
| FLNRO | Ministry of Forests, Lands and Natural Resource Operations |
| FSR | Forest Service Road |
| FTE | Full Time Equivalent |
| GBA | Gender Based Analysis |
| GDP | Gross Domestic Product |
| GHG | Greenhouse Gases |
| GIS | Geographic Information System |
| ha | hectare |
| HA | Highly Annoyed |
| HC | Health Canada |
| HCA | Heritage Conservation Act |
| HHRA | Human Health Risk Assessment |
| HNS | Hazard and Noxious Substances |
| HQ | Hazard Quotient |
| hr | hour |
| IAA | Impact Assessment Act |
| IBA | Impact Benefits Agreement |
| IGC | International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk |
| IMO | International Maritime Organization |
| IPCC | Intergovernmental Panel on Climate Change |
| IR | Indian Reserve |
| ISM | International Safety Management |
| Kg | kilogram |
| km | kilometre |
| km2 | square kilometer |
| kt | kilotonne |
| KTCAC | Kitimat Terrace Clean Air Coalition |
| kV | kilovolt |
| LAA | Local Assessment Area |
| LNG | Liquefied Natural Gas |
| LNG Canada | LNG Canada Export Terminal |
| LRMP | Land and Resource Management Plan |
| LSA | Local Study Area |
| LWRS | Ministry of Land, Water and Resource Stewardship |
| m | Metre |
| m2 | square metre |
| m3 | Cubic metre |

| | |
|---|---|
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MBCA | *Migratory Birds Convention Act* |
| mg/dm2/d | milligrams per square decimetre per day |
| mg/L | Milligrams per litre |
| mm | millimeters |
| MOTI | B.C. Ministry of Transportation and Infrastructure |
| MTPA | Million Tonnes per Annum |
| MW | megawatt |
| NEEC | National Environmental Emergencies Centre |
| NCD | Non-Classified Drainages |
| NH | Northern Health Authority |
| $NO_2$ | nitrogen dioxide |
| NOx | Nitrogen Oxides |
| NRCan | Natural Resources Canada |
| NSB | Northern Shelf Bioregion |
| °C | degree Celsius |
| OCP | Official Community Plan |
| OGAA | *Oil and Gas Activities Act* |
| OGC | Oil and Gas Commission |
| OPP | Oceans Protection Plan |
| OPRC | International Convention on Oil Pollution Preparedness, Response and Co-operation |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PJ | Petajoule |
| PM | Particulate Matter |
| $PM_{2.5}$ | Particulate Matter 2.5 micrometres or smaller in diameter |
| PNC | Pacific North Coast Nations |
| PNCIMA | Pacific North Coast Integrated Management Area |
| PPA | Pacific Pilotage Authority |
| PSL | Permissible Sound Level |
| PVM | Proactive Vessel Management |
| QP | Qualified Professional |
| RAA | Regional Assessment Area |
| Report | The EAO's Assessment Report for the Cedar LNG Project |
| RCMP | Royal Canadian Mounted Police |
| RFA | Reconciliation Framework Agreement for Bioregional Oceans Management and Protection |
| RSA | Regional Study Area |
| SARA | *Species at Risk Act* |
| $SO_2$ | Sulphur dioxide |
| SOI | Summary of Issues |
| SOLAS | International Convention for Safety of Life at Sea |
| STCW | Standards of Training, Certification, and Watchkeeping for Seafarers |
| TC | Transport Canada |
| TDR | Technical Data Report |
| TEM | Terrestrial Ecosystem Mapping |

| | |
|---|---|
| TLUS | Traditional Land Use Studies |
| TMX | Trans-Mountain Expansion Project |
| TOC | Table of Conditions |
| TRV | Toxicity Reference Value |
| TSA | Timber Supply Area |
| TSS | Total Suspended Solids |
| TUS | Traditional Use Study |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UWR | Ungulate Winter Range |
| VC | Valued Component |
| VLI | Visual Landscape Inventory |
| VOC | Volatile Organic Compounds |
| WCMRC | Western Canada Maritime Response Corporation |
| WHA | Wildlife Habitat Area |
| WHO | World Health Organization |
| Working Group | The EAO's working group is made up of federal, provincial and local government and Indigenous nations representatives, with the mandates and skill sets relevant to the review of the Project |
| WMU | Wildlife Management Unit |
| WQG | Water Quality Guidelines |

# EXECUTIVE SUMMARY

**Overview**

Cedar LNG Partners LP, by its general partner Cedar LNG Partners (GP) Ltd. (Cedar), a Haisla Nation-led partnership with Pembina Pipeline Corporation, proposes to construct, operate and decommission the Cedar LNG Project (Cedar LNG), located within the District of Kitimat, British Columbia (B.C.) approximately 10 kilometres (km) southwest of the town centre and approximately 3 km west across the Kitimat Arm from Kitimaat Village. Cedar LNG would include a floating liquefied natural gas (FLNG) export facility and marine terminal that would process and liquefy 11.3 cubic metres ($m^3$) or 400 million standard cubic feet per day of natural gas to produce approximately three million tonnes of LNG per year and include storage capacity for up to 250,000 $m^3$ of LNG. The approximately 88 hectares (ha) Cedar LNG Facility Area would contain the FLNG, marine terminal infrastructure, pipeline tie-in, warehouses, power substation, security building, access roads and parking. An approximately 8 km long transmission line would be constructed between the Facility Area and BC Hydro's Minette Substation to supply power to the project.

Cedar LNG would include shipping LNG between the marine terminal in Kitimat and the B.C. Coast Pilot Boarding Station located at or near Triple Island along the Marine Shipping Route. Cedar estimates an LNG carrier arriving at the marine terminal approximately 50 times annually, or approximately once every seven to 10 days. A typical LNG carrier calling on Cedar LNG would have an LNG cargo capacity of roughly 180,000 $m^3$ (approximately 70,000 to 100,000 dead weight tonnes), depending on commercial arrangements.

The National Energy Board (now the Canadian Energy Regulator) approved an Export Licence that allows Cedar to export up to 214 billion $m^3$ of natural gas over 25 years. However, Cedar may submit an application to amend the Licence to allow Cedar LNG to export natural gas for 40 years. Therefore, an operations period of up to 40 years has been considered throughout the environmental assessment (EA) and this Assessment Report.

Cedar LNG is subject to an EA under B.C.'s *Environmental Assessment Act* (2002) (the Act (2002)) and the *Impact Assessment Act* (IAA). On January 24, 2020, the federal Minister of Environment and Climate Change approved the substitution of the federal EA process to the Province of B.C. The substituted process administered by the B.C. Environmental Assessment Office (EAO) must meet the requirements of the IAA. In keeping with the Cooperation Agreement, the EAO considered the factors set out in subsection 22(1) of the IAA, provided opportunities for the public to meaningfully participate in the EA, conducted consultation with Indigenous nations that may be affected by Cedar LNG and provided opportunities for the Impact Assessment Agency of Canada (the Agency) to participate in consultation, and will provide an Assessment Report to the Agency that includes the findings and conclusions of the EA with respect to those factors.

The EAO prepared this Assessment Report in consultation with an advisory Working Group (Working Group), comprised of federal, provincial and local government representatives with mandates and skill sets relevant to the review of Cedar LNG, as well as representatives of Indigenous nations potentially affected by activities in the Facility Area and along the Marine Shipping Route (listed on Schedules B and C in the Section 11 Order). The Agency also provided advice to the EAO in relation to fulfilling the requirements related to the IAA.

The EAO undertook public consultation activities during the EA, including holding three public comment periods. All public comments, and Cedar and the EAO's responses to these comments, were considered in completing the EA.

In conducting this EA, the EAO considered potential environmental, economic, social, heritage and health effects, including cumulative effects. The EAO incorporated aspects of the *Environmental Assessment Act* (2018) (the Act (2018)) into the Application Information Requirements in recognition that the Act (2018) was passed in the legislature at the time the Cedar LNG EA was in its scoping phase. Cedar supported this inclusion and assessed certain Act (2018) matters in its Application. The EAO notes that should Ministers issue an EA certificate for Cedar LNG, the Project would be subject to the Act (2018) with respect to amendments, compliance and enforcement and post certificate administration provisions.

**Assessment of Effects**

The EAO assessed all information required by the Act (2002), effects within federal jurisdiction as required under the IAA, and certain assessment matters of the Act (2018), as described above. The assessment was informed by the Application and supplemental technical memos provided by Cedar as well as comments received from the Working Group, Indigenous nations, and the public.

The EAO assessed effects on the Valued Components (VCs) that were identified as potentially affected by Cedar LNG, specifically: air quality, acoustics, vegetation resources, wildlife, freshwater fish, marine resources, employment and economy, land and resource use, marine use, infrastructure and services, heritage, and human health. The EAO considered whether any adverse effects to these VCs would be significant.

For all Indigenous nations potentially affected by Cedar LNG, the EAO assessed the potential effects of Cedar LNG on the asserted or established Aboriginal rights and title, as recognized and affirmed by Section 35 of the *Constitution Act, 1982* as well as on any broader interests related to an Indigenous nation (collectively, "Indigenous Interests"). See the section on Indigenous Consultation below for further details.

The assessment also considered other assessment matters as required under the IAA and pertaining to the Act (2018) including: risks and uncertainties associated with effects, interactions between effects, the risks of malfunctions and accidents, disproportionate effects on distinct human populations, effects on biophysical factors that support ecosystem functions,

effects on current and future generations, contributions to sustainability, consistency with land use plans, greenhouse gas emissions, alternative means for carrying out the project, and potential changes to the project that may be caused by the environment.

Key issues raised by the Working Group, Indigenous nations, and the public on the assessment included effects of the FLNG facility on noise, air quality, wildlife and marine resources; greenhouse gas emissions; effects of marine shipping, including malfunctions and accidents; and regional socio-economic effects, in particular on housing and health care services.

Cedar proposed mitigation measures to avoid or minimize the adverse effects of Cedar LNG that considered the effects of the Project and the feedback received during Application Review. In consideration of Cedar's proposed mitigation measures and the comments received, the EAO is proposing 16 provincial conditions, each of which includes measures to mitigate the effects of Cedar LNG. If provincial Ministers issue an Environmental Assessment Certificate (EAC), they may establish these conditions as legally binding requirements. The EAO has also recommended Mitigation Measures under the IAA to inform federal conditions and required Follow-up Programs. Federal conditions and Follow-up Programs are also proposed by the Agency for consideration by the federal Minister of Environment and Climate Change as legally binding conditions in an IAA Decision Statement, should Cedar LNG be approved to proceed.

The following mitigations are among those that are included in the provincial conditions the EAO proposes to provincial Ministers:

- A construction environmental management plan, including measures for wildlife monitoring, reporting and mitigation, and mitigation measures for potential effects on vegetation and wetlands;
- A greenhouse gas reduction plan, requiring Cedar to conduct an analysis of best available technologies, practices and processes to minimize GHG emissions and implement those which are technically and economically feasible;
- A community feedback process for Cedar to receive, address, and report on community concerns from the Project;
- A marine transportation communication report, requiring communication processes between Cedar and Indigenous nations related to Cedar LNG activities that may affect marine use, as well as a reporting mechanism for Indigenous nations and marine users to report any concerns;
- A health and medical services plan with mitigation measures to reduce impacts to health and medical services in the area; and
- A socioeconomic management plan, requiring measures to prioritize local hiring, gender equity and diversity employment, and measures to limit effects to local infrastructure and services.

The EAO is recommending Mitigation Measures under the IAA, intended to inform federal conditions, including the following:

- Freshwater fish mitigations, including reducing sediment erosion, limiting riparian clearing and requiring that stormwater discharges meet water quality guidelines;
- Marine resources mitigations, including avoiding in-water pile installation, using vibratory pile driving methods if a small craft jetty is built, and designing project lighting to reduce risk of injury or mortality and change in movement for wildlife and marine resources;
- Wildlife mitigations, including delineating clearing boundaries and buffers prior to site preparation, avoiding clearing, grubbing and grading within bird nesting periods, western toad breeding and post-breeding dispersal periods, and additional mitigation measures for coastal tailed frog, if their habitat is affected;
- Air quality mitigations, including regular maintenance of project equipment, controlling fugitive dust emissions, and implementation of a community feedback process;
- Marine use mitigations, including development and implementation of marine communication procedures that include: LNG carrier shipping schedule notification processes for Indigenous nations; reporting mechanisms for Indigenous nations and marine users to report on any concerns related to LNG carrier interference with marine use; and methods for regular communication on operation activities with marine users;
- Employment and economy mitigations, including prioritizing local and Indigenous hiring, providing on the job training programs and apprenticeship opportunities, implementing procurement policies and practices to provide opportunities to local businesses and contractors, and working with the local community to increase opportunities for Indigenous and local community members to obtain training required for project participation;
- Infrastructure and services mitigations to reduce potential effects to local health and social infrastructure and services; and
- Human and community well-being mitigations, including development and implementation of a gender equity and diversity policy, a drug and alcohol policy, and workplace violence, bullying and discrimination processes that contain gender appropriate and gender- and sexuality-specific policies and processes.

The EAO is also recommending federal Follow-Up Programs under the IAA. Follow-up Programs require monitoring to verify the predictions in the EA as well as the development and implementation of modified or additional mitigation measures if results of the monitoring demonstrate that additional mitigation measures are required to mitigate adverse federal effects. Proposed Follow-Up Programs relate to the following VCs and considerations:

Targeting Facility Area effects:

- Air quality
- Acoustic
- Wetlands
- Marine resources (related to water quality)
- Infrastructure and services (related to employment and health effects from the increased workforce

- Gender Based Analysis (GBA) Plus (related to the workforce)

Targeting both Facility Area and Marine Shipping Route effects:

- Wildlife
- GHG emissions

Targeting Marine Shipping Route effects:

- Marine use (related to wake and wake effects from marine shipping)

In addition to the requirement for an EAC, Cedar also requires various permits, approvals and authorizations which relate primarily to disturbance of land, water, fish and fish habitat, and disruption to marine navigation. Prior to construction, Cedar LNG must obtain provincial permits under the *Environmental Management Act,* the *Oil and Gas Activities Act* and the *Wildlife Act*. Cedar LNG is also subject to federal legislation, including the *Canada Shipping Act,* 2001, *Marine Transportation Security Act, Marine Liability Act, Fisheries Act, Canadian Navigable Waters Act,* and *Pilotage Act.*

In consideration of the mitigation measures that would be required of Cedar LNG, either in an EAC or federal decision statement should Cedar LNG be approved, or in subsequent regulatory processes, the EAO concludes that Cedar LNG would result in residual adverse effects that include:

- Changes to air quality and increased GHG emissions resulting primarily from the process of liquefying natural gas and exhaust from LNG carriers and tugs;
- Increases in noise from the construction of infrastructure in the Facility Area and the transmission line, and operation of the FLNG Facility and marine shipping activities;
- Human health effects from changes in air quality and noise;
- Effects on vegetation and wildlife from clearing and construction of the transmission line, FLNG facility and related infrastructure;
- Changes to marine water quality, changes to marine habitat, and effects on marine organisms from construction and operation of the FLNG facility and marine shipping;
- Changes to private property, tenured, and non-tenured land use;
- Changes to marine navigation and marine fisheries and other uses;
- Changes in infrastructure and services, accommodation availability, and transportation infrastructure;
- Effects on human and community well-being through effects on social determinants of health; and
- Effects on biophysical factors that support ecosystem function via effects on habitat diversity and structural complexity, habitat connectivity, and water.

In addition to the effects listed above, the EAO concluded that Cedar LNG would result in residual adverse effects to the following IAA factors:

- Effects on Current Use of Lands and Resources for Traditional Purposes (IAA 2(c)(ii)) through effects to fishing and marine harvesting, traditional hunting, trapping and plan gathering, and the access and experience of these activities;
- Effects on cultural heritage (IAA 2(c)(i)) through changes to access and sensory disturbance; and
- Effects to the health, social or economic conditions of the Indigenous peoples of Canada (IAA (2(d)) through changes to air quality, acoustics, social and economic conditions, infrastructure and service and health and well-being.

The EAO predicts that none of the potential adverse effects of Cedar LNG would be significant.

The EAO also concluded that Cedar LNG would further advance reconciliation because Haisla Nation would directly own and participate in a major industrial development in their territory and would leverage resources to pursue community goals and build for future generations. The Project is also expected to result in net positive residual effect to the regional employment, regional business and regional economy.

**Indigenous Consultation**

Potential effects from Cedar LNG would occur in the traditional territories of the following Indigenous nations (listed alphabetically), with whom the EAO consulted deeply throughout the EA:

- Gitga'at First Nation
- Gitxaała Nation
- Haisla Nation
- Kitselas First Nation
- Kitsumkalum First Nation
- Lax Kw'alaams Band
- Metlakatla First Nation

In addition, the EAO consulted with Haida Nation and Métis Nation British Columbia on behalf of the Agency, as part of the substituted assessment. The EAO engaged Haida Nation on aspects of Cedar LNG related to marine shipping and engaged Métis Nation British Columbia at the lower end of the consultation spectrum.

Many Indigenous nations raised concerns during the EA related to cumulative effects from marine shipping, including increased noise and disturbance of marine use and traditional activities and the potential for marine malfunctions and accidents, as well as regional cumulative social and -economic effects.

The EAO engaged collaboratively and sought consensus with Indigenous nations on the assessment of project effects to Indigenous Interests and proposed provincial conditions and federal Mitigation Measures under the IAA. The EAO worked with those Indigenous nations who were interested in doing their own assessment to provide their own section of this Report.

These nation-led assessments were based on their nation-specific Indigenous Interests using the information provided by Cedar in its Application and each Indigenous nation's own Indigenous knowledge. The sections that the EAO drafted for Indigenous nations were shared with those Indigenous nations to work together on a final version for this Report.

**Conclusions**

The EAO concludes that, considering the analysis and implementation of the proposed provincial conditions, and the recommended Mitigation Measures and Federal Follow-Up Programs under the IAA, Cedar LNG would not result in significant residual adverse effects. The Project has the potential for adverse effects on VCs and on the Indigenous Interests of Indigenous nations. Cedar LNG also has the potential for positive effects on the economy and Haisla Nation's community and development goals.

# PART A - INTRODUCTION AND BACKGROUND

## 1.0 PURPOSE OF THE ASSESSMENT REPORT

The purpose of this Assessment Report (report) is to summarize the procedures and findings of the Environmental Assessment (EA) conducted by the British Columbia (B.C.) Environmental Assessment Office (EAO) for the Cedar LNG Project (Cedar LNG). Cedar LNG Partners LP., by its general partner Cedar LNG Partners (GP) Ltd. (Cedar) submitted its Cedar LNG Project's Application for an Environmental Assessment Certificate (Application) and the formal Application Review commenced on February 4, 2022.

The EAO prepares this Report as the Assessment Report for provincial Ministers who are responsible for making a decision on the Project under Section 17 of the *Environmental Assessment Act* (2002) [the Act (2002)][1]. For Cedar LNG, the deciding provincial Ministers are the Minister of the Environment and Climate Change Strategy and the Minister of Energy, Mines and Low Carbon Innovation.

Cedar LNG is assessed under the Act (2002). However, the EAO incorporated aspects of the *Environmental Assessment Act* (2018) [the Act (2018)] into the Application Information Requirements (AIR) in recognition that the Act (2018) was passed in the legislature at the time Cedar LNG was in its scoping phase and Cedar supported this inclusion and assessed certain matters of the Act (2018) in its Application. Matters of the Act (2018) are identified in the report, where they are described. The EAO notes that should Ministers issue an EA certificate for Cedar LNG, the Project would be subject to the Act (2018) with respect to amendments, compliance and enforcement and post certificate administration provisions.

On January 24, 2020, the federal Minister of the Environment and Climate Change substituted the conduct of the federal impact assessment to the B.C. EA process. The substituted process must meet the requirements of the *Impact Assessment Act* (IAA). The approval was granted with the understanding that the assessment would be conducted by the EAO in the spirit of the Impact Assessment Cooperation Agreement between Canada and British Columbia (Cooperation Agreement) (2019) entered into by the Impact Assessment Agency of Canada (the Agency) and the EAO. The Agency provided guidance and information directly to the EAO regarding the substituted process and federal requirements under the IAA. In keeping with the Cooperation Agreement, the EAO considered the factors set out in subsection 22 (1) of the Agency, provided opportunities for the public to meaningfully participate in the EA, conducted consultation with Indigenous peoples that may be affected by the Project and provided opportunities for the Agency to participate in consultation, and will provide an Environmental

[1] If Cedar is issued an environmental assessment certificate, this would be governed by the *Environmental Assessment Act* (2018) [the Act (2018)], Section 78 (3) where all environmental assessment certificates under the Act (2002) are continued as an environmental assessment certificate under the Act (2018).

Assessment Report to the Agency that includes the findings and conclusions of the EA with respect to those factors. The EAO assessed Cedar LNG consistent with the Notice of Substitution Approval[2] under the IAA. Ultimately, substitution results in a single assessment process designed to support Indigenous, provincial, and federal decision makers.

This Report will be submitted to the Agency and will inform the federal Minister's decision-making under the IAA.

This Report:

- Describes Cedar LNG, the substituted EA process, and consultation undertaken during the EA;
- Documents work undertaken by the EAO to consult and accommodate Indigenous nations;
- Describes the engagement and collaboration with Indigenous nations including collaborating on their respective Indigenous nation section of the EAO's assessment and consensus seeking including on the referral materials;
- Documents procedural aspects of consultation with Indigenous Groups, including Métis Nation B.C. on behalf of Canada;
- Identifies the potential environmental, economic, social, heritage and health effects of Cedar LNG, including cumulative effects and how Cedar proposes to mitigate adverse effects;
- Identifies effects of the Project on Indigenous nations, including impacts on Aboriginal rights;
- Assesses other assessment matters based on IAA requirements and considerations of the Act (2018) including: risks and uncertainties associated with effects, interactions between effects, the risks of malfunctions and accidents, disproportionate effects on distinct human populations, effects on biophysical factors that support ecosystem functions, effects on current and future generations, contributions to sustainability, consistency with land use plans, greenhouse gas emissions, alternative means for carrying out the project, and potential changes to the Project that may be caused by the environment;
- Identifies the residual adverse effects after mitigation;
- Identifies the conditions proposed by the EAO;
- Recommends mitigation measures[3] and under the IAA (Mitigation Measures) and Follow-up Programs (Appendix 1); and

[2] Notice of Substitution Approval available at: https://www.projects.eao.gov.bc.ca/api/public/document/5e585defa0087300223bfd68/download/Cedar%20LNG_Federal%20Response%20to%20Request%20for%20Substitution%20Approval%20Under%20the%20Impact%20Assessment%20Act_2020 -01-24.pdf

[3] The EAO has recommended Mitigation Measures to mitigate potential adverse effects related to IAA because Cedar LNG is undergoing a substituted EA process. The EAO led consultation on the Mitigation Measures to inform the development of the

- Sets out conclusions based on Cedar LNG's potential for significant adverse residual effects with respect to both the Act and the IAA.

In the preparation of this Report, the following information has been considered:

- The Application and supplemental information provided by Cedar;
- Information contained in the Joint Permitting / Regulatory Coordination Plan;
- Advice provided on the Application and supplemental information by the Working Group and Indigenous nations; and
- Input received from members of the public.

The Application, supplemental information, comments from the Working Group and Indigenous nations, and public comments are posted to the EAO's Project Information Centre (EPIC)[4].

# 2.0 PROJECT OVERVIEW

## 2.1 PROPONENT DESCRIPTION

The Cedar LNG Project is proposed by Cedar LNG Partners LP, by its general partner Cedar LNG Partners (GP) Ltd. (Cedar), a Haisla Nation-led partnership with Pembina Pipeline Corporation. Cedar LNG would be owned and operated by Cedar. Cedar provides updates on Cedar LNG at https://www.cedarlng.com/.

## 2.2 PROJECT DESCRIPTION AND SCOPE

### 2.2.1 PROJECT DESCRIPTION AND LOCATION

Cedar proposes to construct, operate, and decommission Cedar LNG, a floating liquefied natural gas (FLNG) export facility and marine terminal that would process and liquefy 11.3 cubic meters (m3) or 400 million standard cubic feet per day of natural gas to produce approximately 3 million Tonnes of LNG per year and include storage capacity for up to 250,000 m3 of LNG. The Cedar LNG Facility Area contains the FLNG, marine terminal infrastructure, pipeline tie-in, warehouses, power substation, security building, access roads and parking, and the total area of the Facility Area is estimated to be approximately 88 hectares (ha).

federal Conditions. Recommended federal conditions are not included in the Assessment Report and, under the Coordination Agreement, the Agency and the EAO will jointly review potential conditions for the decision statement under the IAA and the EA certificate under the Act to minimize duplication and regulatory burden, and to align reporting and notification requirements, terminology and definitions, and deadlines, to the extent possible. The EAO understands that the Agency is proposing conditions that have been informed by the Mitigation Measures recommended by the EAO.

[4] https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

One of the off-site components of Cedar LNG is an approximately 8 kilometers (km) long, 287 kilovolt (kV) transmission line between BC Hydro's Minette Substation and the Facility Area. It is expected that the right-of-way will be approximately 45 meters (m) wide, and the total area of the transmission line right-of-way is estimated to be approximately 32.5 ha. Cedar has identified two potential alignments for the transmission line, and the final alignment will be confirmed during Front End Engineering Design (FEED).

Shipping LNG along the route between the marine terminal in Kitimat and the BC Coast Pilot Boarding station located at or near Triple Island (Marine Shipping Route) is a Project activity within the scope of the assessment (see Figure 1 below). Beyond this scope of assessment boundary, in Canadian waters from the international boundary, LNG carriers travel through Dixon Entrance north of Haida Gwaii and through Hecate Strait between Haida Gwaii and the mainland. BC Coast Pilot(s) are on the LNG carriers between the Triple Island Pilot Boarding Station and the marine terminal. LNG carriers traveling to and from the marine terminal to the pilot boarding station would follow a route through Browning Entrance, Principe Channel, Nepean Sound, Otter Channel, Squally Channel, Lewis Passage, Wright South and Douglas Channel. Cedar estimates an LNG carrier arriving at the marine terminal approximately 50 times annually, one every 7 to 10 days. A single carrier would travel both in and out along the Marine Shipping Route, resulting in 100 transits. The typical LNG carrier calling on Cedar LNG would have an LNG cargo capacity of roughly 180,000 $m^3$ (approximately 70,000 to 100,000 dead weight Tonnes (DWT)), however, the size of the LNG carriers would be dependent on commercial arrangements.

The National Energy Board (now the Canadian Energy Regulator) approved Export Licence GL-327 that allows Cedar to export up to 214 billion m3 of natural gas, in the form of liquified natural gas, over 25 years. However, Cedar may submit an application to amend the Licence to allow Cedar LNG to export natural gas, in the form of liquified natural gas, for 40 years. Therefore, an operations period of up to 40 years has been considered throughout the EA and this Report.

Cedar LNG would be located primarily on Haisla Nation owned, fee simple land within the Haisla Nation's traditional territory. The Cedar LNG facility is within the District of Kitimat, B.C., approximately 10 km southwest of the town centre and approximately 3 km west across the Kitimat Arm from Kitimaat Village. The facility site and surrounding lands are designated for industrial and port development use by the District of Kitimat. Access to the on-site Facility Area components will be from the Bish Creek Forest Service Road that runs through the property.

Cedar LNG involves the on-site Facility Area and off-site facilities. The on-site facility portion would be located on land (District Lot 99, PID 013-061-267) and water lot (Lot A DL 5469, PID 029-462-142) owned in fee simple by Haisla Enterprises, an affiliate of Haisla Nation. An agreement will be put in place with Haisla Enterprises for Cedar's use of this land. Cedar LNG requires a water lot tenure for the submerged Crown land to encompass the area required for the FLNG facility, mooring LNG carriers and to safely operate Cedar LNG. For the transmission

line right-of-way, tenure would be required for the provincial Crown land portion and Cedar would negotiate right-of-way agreements with landowners for the parts of the right-of-way that cross private property. The assessment of Land and Resource Use is provided in section 5.8, and Marine Use is provided in section 5.9 of this Report.

Cedar LNG's Marine Shipping Route overlaps with the following Indigenous nations: Haisla Nation (Haisla), Gitga'at Nation (Gitga'at), Gitxaała Nation (Gitxaała), Kitselas First Nation (Kitselas), Kitsumkalum First Nation (Kitsumkalum), Lax Kw'alaams Band (Lax Kw'alaams) and Metlakatla First Nation (Metlakatla). In granting the EAO's substitution request to have the EAO conduct the impact assessment under the Act (2002), the Agency required the EAO to consult with the Council of Haida Nations (Haida) and the Métis Nation British Columbia (MNBC) on behalf of the Government of Canada.

The Cedar LNG on-site Facility Area would be closest to Kitamaat Village, a community of the Haisla Nation which is located across the Kitimat Arm approximately 3 km east of the facility.

See Figure 1 for the Location of the Cedar LNG and the Marine Shipping Route.

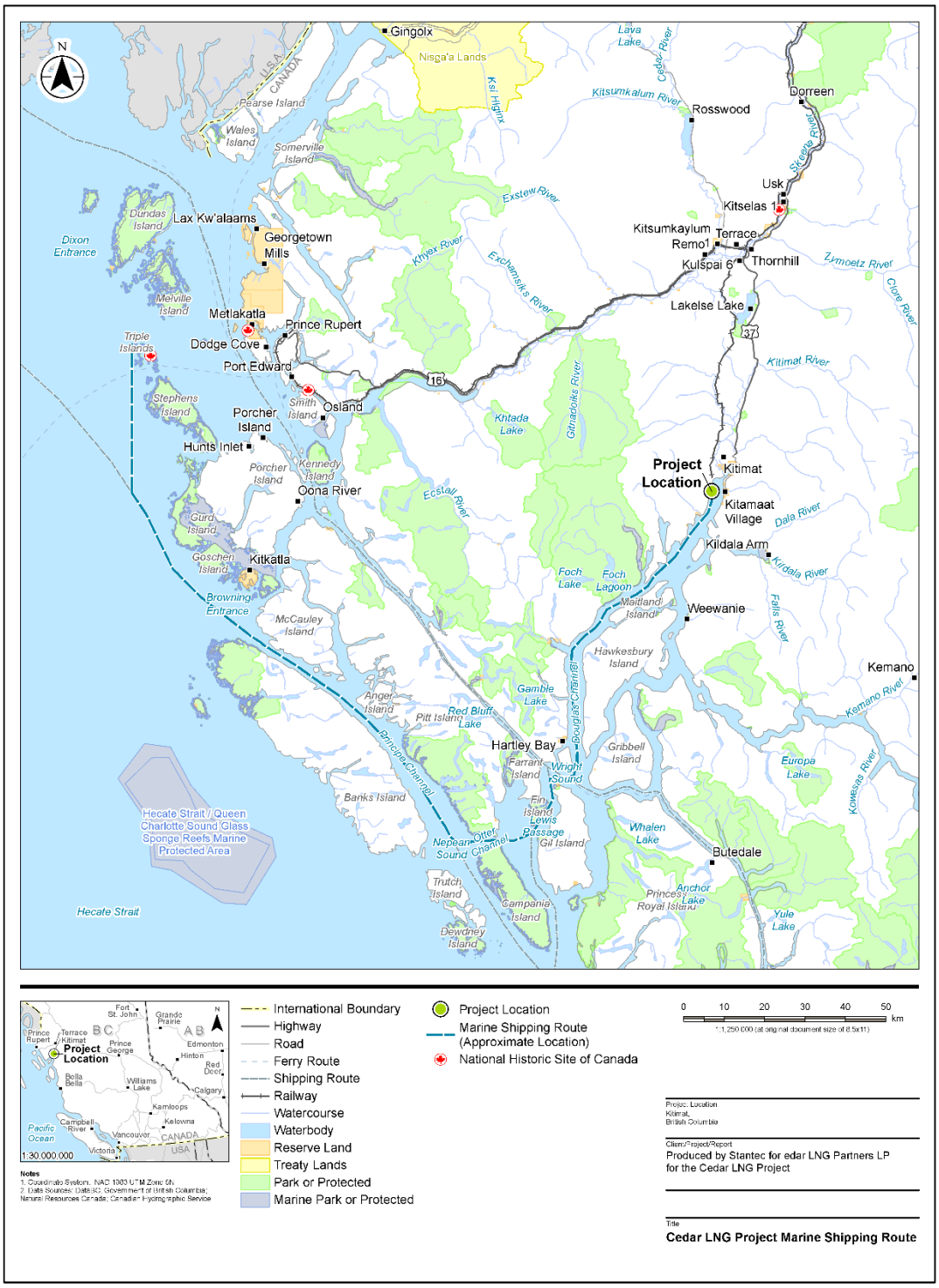


**Figure 1: Location of Cedar LNG and the Marine Shipping Route**

### 2.2.2 PROJECT COMPONENTS

Cedar LNG would involve the following on-site and off-site components: a FLNG facility that will be permanently moored to a marine terminal which will provide power and gas line connections to the FLNG as well as an optional small craft (tug) jetty, and a transmission line to provide power from the Minette Substation located in Kitimat (see Figure 2). Shipping of LNG between the marine terminal and the Triple Island Pilot Boarding Station, which is shown on Figure 1 above, is considered a project activity. See section 2.2.1 of this Report for details on the Marine Shipping Route.

Below is a summary description of the Facility Area and the Marine Shipping Route. The Application provides more details on these components as well as on the proposed supporting infrastructure including warehouse(s), substation, security building, parking, access road, the transmission line, systems for water treatment, firewater system, control room monitoring including an emergency shutdown system and emergency power. The component information is based on pre-FEED information and according to Cedar, this information will be refined as project design advances. Any changes to the detailed design of Cedar LNG will be contained in the relevant permit applications.

**Floating LNG Facility**

The FLNG facility would be a physical barge structure, constructed overseas in a shipyard in Asia and then transported by sea to the marine terminal where it will have the strut mooring system attached to it. The FLNG will have 4 to 5 membrane tanks for LNG storage contained in the barge's hull and modules will be installed above the main deck to treat and liquefy the natural gas as well as having supporting infrastructure and power infrastructure. The barge's dimensions are approximately 320 m long, 65 m wide and 32 m deep. The FLNG's main deck will be from 19 m to 24 m above the water level. The topside infrastructure will extend 45 m above the main deck. The flare stack will extend from the main deck to a height of approximately 115 m above the deck. The LNG carriers will berth directly alongside the FLNG facility for side-by-side loading. The LNG produced will be transferred to the LNG carriers through marine loading arms which will be designed to automatically disengage in the event of severe weather or emergency situation to allow the LNG carriers to quickly depart.

**Marine Terminal**

The marine terminal will be a physical structure that will permanently moor the FLNG facility through an articulated system that presently consists of four struts that will be directly connected to the shore. However, the number of struts in the system may change as design advances. This strut-mooring system will allow lateral and vertical movement of the FLNG facility. During FEED, it is anticipated that the use of additional catenary type spread mooring,

potentially consisting of four to eight anchors connected to the FLNG using heavy chains will be investigated. The additional moorings will serve as a fail-safe in the event of a tsunami.

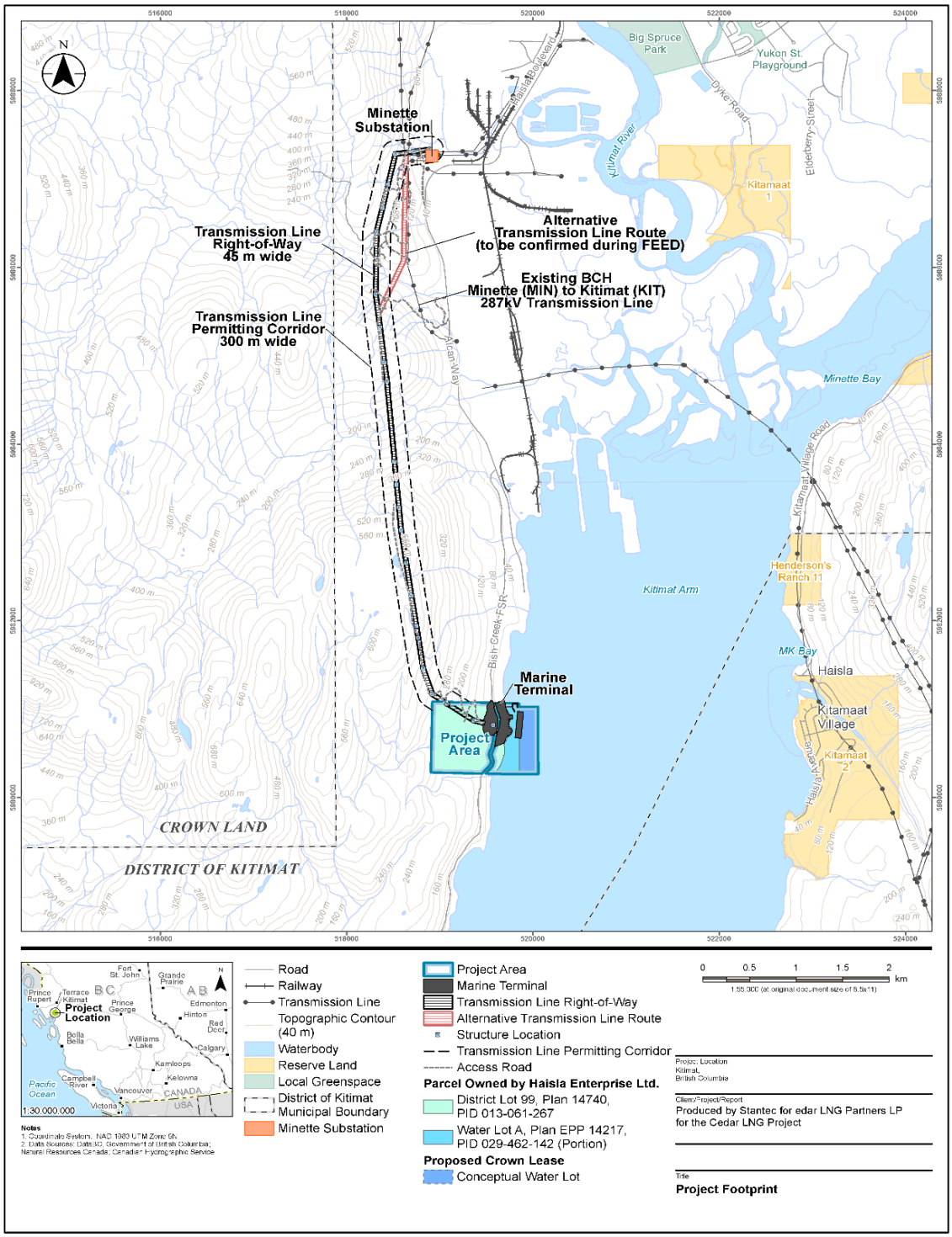


**Figure 2: Project Footprint of On-Site and Off-Site Components**

The struts will be anchored on pile-supported anchor blocks located in the nearshore and high intertidal area. The marine terminal infrastructure will also provide connections to land-based power and natural gas supplies (See Figure 3 for the conceptual marine terminal layout).

LNG carriers are anticipated to arrive at the terminal on average every 7 to 10 days or approximately 50 times a year, and tugs will be required to escort the LNG carriers from the BC Pilot Boarding Station at Triple Island to the terminal. Berthing and de-berthing of the LNG carriers is expected to need tug assistance. Cedar LNG would use contracting tug service from independent tug companies that may or may not have a dedicated tug terminal in Kitimat. Cedar LNG's terminal design has a small craft jetty option, in the event that the independent tug provided does not have its own terminal.

**Transmission Line**

The delivery of electricity for the FLNG facility requires a new 287 kV transmission line that will be built between BC Hydro's Minette Substation in Kitimat and a substation that will be constructed within the project Facility Area. The route of the transmission line will be approximately 8 km in length and has a 300 m proposed corridor, within which the approximately 45 m wide right-of-way for the transmission line will be situated. At the present time, two route options have been identified, one which follows the top of the mountain ridge, while the second option follows an existing powerline from Minette Substation to Rio Tinto's Aluminum Smelter before proceeding up the mountain slope and following the route along the top of the mountain ridge to the project site. The FEED process will determine the best route alignment. Once constructed Cedar may enter into discussion with BC Hydro to transfer the ownership of the line to them.

**Other Supporting Infrastructure**

Other physical works proposed for Cedar LNG include support buildings, parking areas, access areas off the Bish Creek Forest Service Road and water and wastewater facilities. Below is a summary description of the other supporting infrastructure.

The supporting works that are proposed for Cedar LNG includes warehouses, electrical substation, and a security building with a gate control access to the marine terminal area. One of the supporting works will be a flammable liquids storage shelter. It is anticipated that both the electrical substation and the flammable liquids storage shelter will be fenced off. The electrical substation will include a stepdown transformer to reduce voltages from 287 kV to 138 kV or 132 kV. Cedar has also put forward the option of locating the administrative building and warehouse(s) in existing buildings in the District of Kitimat town centre or light industrial areas. The required buildings would be leased or purchased. For the purpose of the EA, the on-site infrastructure is considered to be the base case since it would have the greatest potential effects.

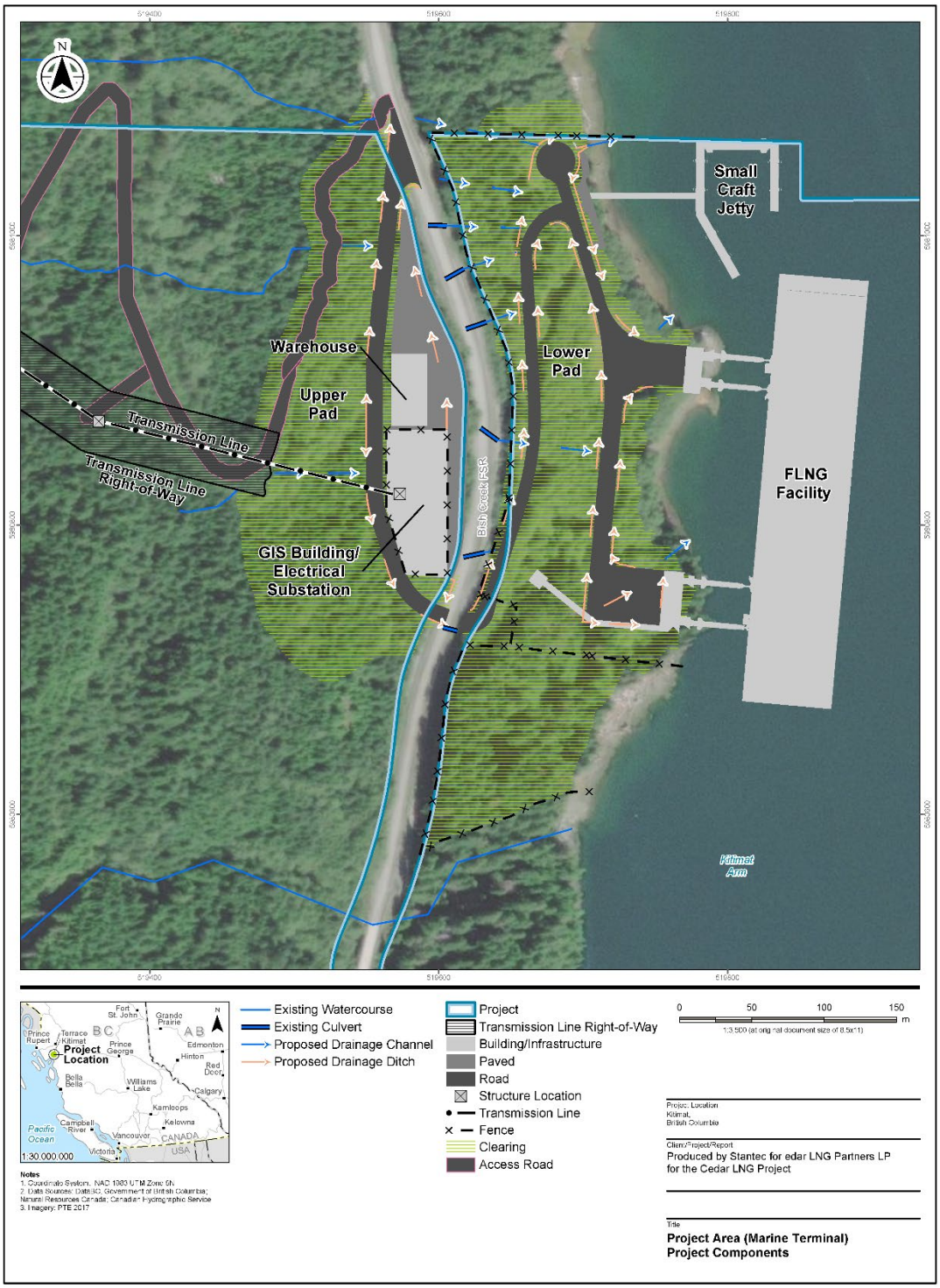


**Figure 3: Cedar LNG Facility Area (Marine Terminal) Project Components**

Access to the project site will be off the Bish Creek Forestry Road, which recently had an extensive upgrade. Further upgrades to the road are not anticipated. There will be an access road and parking area off the west side of the Forest Service Road to access the warehouses and a controlled access road off the east side of the Forest Service Road to the FLNG facility and the optional small craft jetty. According to the Application, if realignment of the Bish Creek Forestry Road is required, Cedar will work with the appropriate parties.

The main utilities for Cedar LNG are the power distribution lines between the substation and on-site buildings and the FLNG facility.

Water supply infrastructure required for fresh water and a system for treating sanitary wastewater is required. On the FLNG facility, Cedar's preferred option for fresh water is a seawater desalination system along with the system to treat and discharge sanitary wastewater. For on-site infrastructure, freshwater is expected to be trucked in and stored or Cedar may withdraw water from local non-fish-bearing streams under a water licence or use approval. Sanitary wastewater from the on-site infrastructure will be stored, pumped and removed from the Facility Area for disposal at a licenced facility.

### 2.2.3 PROJECT ACTIVITIES

The temporal boundary is defined as the life of Cedar LNG, which involves three phases: construction, operations, and decommissioning. For the effects assessment, the temporal boundaries are as follows:

- Construction: four years;
- Operations: a minimum of 25 years and up to 40 years; and
- Decommissioning: approximately 12 months.

#### *CONSTRUCTION*

If Cedar receives an EA certificate (EAC), federal IAA approval, and all applicable permits and approvals on the anticipated timeline, the proposed on-site and off-site construction clearing, Facility Area preparation and grading activities are anticipated to commence in Q3 2023 and the clearing and access for the transmission line are expected to begin in Q2 2024. On-site construction of the supporting infrastructure and marine terminal is expected to begin in Q3 and Q4 of 2024. The construction work for the transmission line would begin in Q1 2025 and be completed by Q2-Q3 of 2026. All construction activities are anticipated to be completed by Q2 2027. Construction of the FLNG facility has not been included in construction activities since it will be built overseas and transported to the Facility Area for installation and commissioning. Key activities during construction are summarized below.

**Site Preparation, Temporary Works and Construction**

Marine terminal and Supporting Infrastructure:

- Clearing of vegetation, grubbing, and stripping topsoil;
- Grading to meet design elevations including blasting where bedrock is present;
- Installation of water runoff structures include ditches, erosion prevention and sediment control measures;
- Withdrawal of water from local creeks during construction to support dust suppression and drilling for mooring system piles;
- Construction of access roads;
- Construction of the marine terminal and supporting infrastructure;
- Construction of the strut mooring system foundation blocks including installation of piles, access ramps and floating dock structures;
- Preparation of temporary workspaces;
- Reclamation of areas disturbed by construction and not required for the operation phase;
- Installation of perimeter security fencing and onshore access/security gates;
- Potential construction of the small craft jetty for tug moorage including installation of piles and pile caps; and
- Waste disposal and recycling.

Transmission Line:

- Construction of temporary access roads to the right-of-way off the Bish Creek Forest Service Road or off Alcan Way, by using existing resource roads or constructing new access (on both private property and Crown land);
- Clearing the right-of-way;
  - Due to the depth of the Moore Creek and Anderson Creek ravines, portions of the right-of-way at these spans will not need to be cleared;
- Grubbing and grading of transmission tower foundation areas;
- Installing the foundation and towers including piles, rock anchors and guy wires where appropriate;
  - Helicopters will be required for some of this work;
- Stringing the conductors using ground equipment and/or helicopters; and
- Completing connections to the Minette Substation and the Project's substation.

FLNG Facility

- Marine transportation of the FLNG facility from the shipyard in Asia to Kitimat;
- Potential temporary mooring of the FLNG facility;
- Permanent mooring of the FLNG facility to the marine terminal; and
- Connection of utilities (for example: electrical, controls, gas, water) to the FLNG facility.

***OPERATION***

The operations phase will include operation of project components described in subsection 2.2.2 to produce, store and ship LNG to international markets. Operation of Cedar LNG is anticipated to start in Q4 2027, with the first cargo leaving the FLNG facility before the end of 2027.

During the operations of Cedar LNG, activities would involve:

- Navigation of LNG carriers along the established shipping route from the BC Pilot Boarding Station at Triple Island, through Browning Entrance, south through Principe Channel, down to the Douglas Channel, and then to Cedar LNG at Kitimat;
- Berthing of LNG carriers and LNG bunker vessels at the FLNG;
- Transfer of LNG from the FLNG to LNG carriers using FLNG loading arm system; and
- Pilotage will guide the LNG carriers to and from the FLNG facility and the transits will have tug support.

Cedar LNG's shipping route for the LNG between the marine terminal and the BC Coast Pilot Boarding Station as well as information on the vessel type and size are outlined in subsection 2.2.1 of this Report.

### *DECOMMISSIONING*

Decommissioning would involve the removal of the FLNG facility, for either re-use elsewhere or scrapping or recycling at a dedicated facility. All onshore facilities and structures will be removed where they will not serve a future use and the Facility Area will be restored in accordance with the lease agreement between Cedar and Haisla Enterprises, Haisla's development plans and any applicable regulatory requirements.

### *PHYSICAL ACTIVITIES INCIDENTAL TO THE PROJECT*

The FEED process will identify and confirm where laydown areas and temporary workspace as well as borrow pits that may be required to provide fill for the on-site facility, will be located. Location of disposal areas for overburden and excess rock will also be identified during the development of FEED.

The feed gas supply will be provided by a pipeline from the Coastal GasLink pipeline interface near the LNG Canada Export Terminal in Kitimat to the project site. It is anticipated that this feed gas supply pipeline will be approximately 8.5 km long and have a minimum 20-inch diameter. This pipeline is not a component of Cedar LNG.

#### *Operation Waste Management*

The FLNG will generate liquid effluent, air emissions and solid waste. There are no effluents directly generated by the liquefaction of natural gas. All effluents are incidental to the production of LNG. The waste generation is summarized below.

***Liquid Effluents***

- Discharge from the reverse osmosis freshwater generators
  - The desalinization process will withdraw approximately 40.5 m3 of seawater to generate 12.5 $m^3$ of freshwater per hour.
  - The remaining intake seawater will be discharged at a flow rate of 28 m3/hour and will have total dissolved solids concentrations (marine minerals and salts) of less than 10 milligrams per litre (mg/L).
- Ballast
  - Ballast water will be pumped from the FLNG facility barge back into Douglas Channel at a rate of approximately 840 $m^3$/hour for 12 hours per day as LNG is produced and stored in the FLNG facility tanks.
  - The ballast water system will pump seawater into the hull at a rate of 5,000 $m^3$/hour for approximately 18 hours while the LNG carriers are loading (every 7 to 10 days).
  - This system will transfer approximately 3,650,000 $m^3$ of seawater into and out of the FLNG facility hull each year.
- Water Curtain
  - To be employed during the transfer of LNG from the FLNG facility to LNG carriers.
  - Is a safety feature in a case of an accident that protects workers on the FLNG facility as well as protecting the FLNG facility in case of cryogenic spills.
  - Seawater will be withdrawn from Douglas Channel at a flow rate of 150 $m^3$/hour for approximately 20 hours (during LNG carrier loading) and will discharge directly back to Douglas Channel at the rate of withdrawal.
  - The LNG carriers may have similar requirements to protect their hulls
- Firewater Pumps
  - Any seawater withdrawals by the firewater pumps for testing or emergency use will be discharged back to the Douglas Channel at the rate of withdrawal.
- Stormwater Collection and Discharge
  - Stormwater (rain and snowmelt) from the FLNG facility and marine terminal area will be discharged to the Douglas Channel.
  - Stormwater from the marine terminal area will be collected and collected and discharged to Douglas Channel through standard means of water conveyance (such as ditches).
  - Clean stormwater from the FLNG facility will be allowed to directly run-off the deck.
  - Stormwater on the FLNG facility that may have contacted hydrocarbons will be collected in an oily water collection tank.
    - If the collected stormwater meets water quality guidelines of containing concentrations of less than 15 mg/L, it will be discharged directly to Douglas Channel.
    - If it does not meet the guidelines, it will be treated in oily water separator package before discharge.

- Domestic Wastewater
  - May also be treated and discharge once it meets the applicable federal and provincial regulations (Wastewater Systems Effluent Regulations under the Fisheries Act and under provincial legislation requirements).
  - Treated septic wastewater is expected to be discharged at less than 0.4 $m^3$/hour and will have total dissolved solids concentrations of less than 35 mg/L, a pH of 6 to 8.5 and a biochemical oxygen demand of less than 25 mg/L.

***Air Emissions***

- Electricity will be used to power the liquefaction process and most ancillary power demand, so emissions from Cedar LNG are predicted to be low.
- Natural gas liquids separated from the inlet gas will be combusted to provide the process heat needed for the gas treatment process.
- Major emission sources are the glycol reboiler, thermal oxidizer, flare pilot and purge and non-routine flaring.
- Cedar must obtain a permit under the Environmental Management Act for air emissions produced during operation by the combustion of fuel and waste gases.

***Solid Waste***

- Both the FLNG facility and the LNG carriers will generate non-hazardous waste that could include paper, cardboard, wood, scrap metal and plastic wrapping which will be recycled or reused where possible.
- Domestic waste will be disposed of at a local landfill or other approved waste disposal facility in accordance with the applicable legal requirements.
- Hazardous solid waste will be properly handled, and the collected materials will be transported off-site to a licenced hazardous waste facility.

### 2.2.4 CUMULATIVE EFFECTS

In this Report where residual effects from the Project act cumulatively with adverse residual effects from other projects and physical activities, a cumulative effects assessment has been done. The Cedar LNG Project Cumulative Effects Inclusion Sites (see Figure 4 below) shows the location of past, present and reasonably foreseeable future projects and physical activities that may potentially interact cumulatively with Cedar LNG. The projects with the potential to interact with the effects of Cedar LNG include those listed below. For a description of each project see table 6.8.1 in the Application.

**Prince Rupert Area**

- Present or in progress projects:
  - Fairview Container Terminal (Prince Rupert Port Authority);
  - Northland Cruise Terminal (Prince Rupert Port Authority);

  - Prince Rupert Ferry Terminal (BC Ferries);
  - Prince Rupert Grain Terminal (Prince Rupert Grain Ltd.);
  - Prince Rupert LPG Export Terminal (Pembina Pipeline Corp.);
  - Prince Rupert Fuels Project (Wolverine Terminals ULC);
  - Ridley Terminals (Ridley Terminals Inc.);
  - Ridley Island Propane Export Terminal (Altagas and Royal Vopak); and
  - Westview Wood Pellet Terminal (Pinnacle Renewable Energy Inc.).
- Reasonably foreseeable projects:
  - Fairview Container Terminal Expansion – Phase 2 B (DP World/Prince Rupert Port Authority);
  - Ksi Lisims LNG Project (located at Wil Milit on the northern end of Pearse Island at the end of the Portland Inlet);
  - Port Edward Small Scale LNG (Port Edward LNG);
  - Ridley Island Export Logistics Platform Project (Prince Rupert Port Authority);
  - Ridley Terminals Berth Expansion Project (Ridley Terminals Inc.); and
  - Vopak Pacific Canada Storage and Export Facility (Vopak Development Canada Inc.).

**Terrace Area:**

- Skeena LNG

**Kitimat Area:**

- Past projects:
  - Former Eurocan Pulp and Paper Mill; and
  - Former Moon Bay Marina.
- Present or in progress projects:
  - LNG Canada Export Terminal (LNG Canada Development Inc.);
  - LNG Canada Load Interconnection Project (BC Hydro);
  - MK Bay Marina (Haisla);
  - Rio Tinto Aluminum Smelter (Rio Tinto Alcan);
  - Rio Tinto Terminal A Extension (Rio Tinto Alcan).
- Reasonably foreseeable projects:
  - Kitimat LNG Project[5] (Chevron Canada Limited/Woodside Energy Ltd.).

**North Coast:**

- Various fishing and aquaculture activities (applicable throughout the marine terminal and Marine Shipping Route).

[5] The Kitimat LNG Project was originally included in the assessment, but the certificate holder for this project has now indicated publicly that it will not be advancing the project. Therefore, the EAO has assumed that the Kitimat LNG Project would not contribute to cumulative effects and its effects are not incorporated into this Report. The shipping volumes reported in this section reflect those without the Kitimat LNG Project.

If all the projects listed above proceed to construction and operation, approximately 2,313 vessels could intersect the northern portion of the Marine Shipping Route annually, with 560 of those vessels (or 24.2 percent) visiting the port of Kitimat directly.

While non-marine activities may not directly affect the Marine Shipping Route, they have, and will continue to, contribute to non-marine cumulative effects (such as social effects) in the region:

- Rail activities;
- Traffic activities; and
- Various forestry activities.

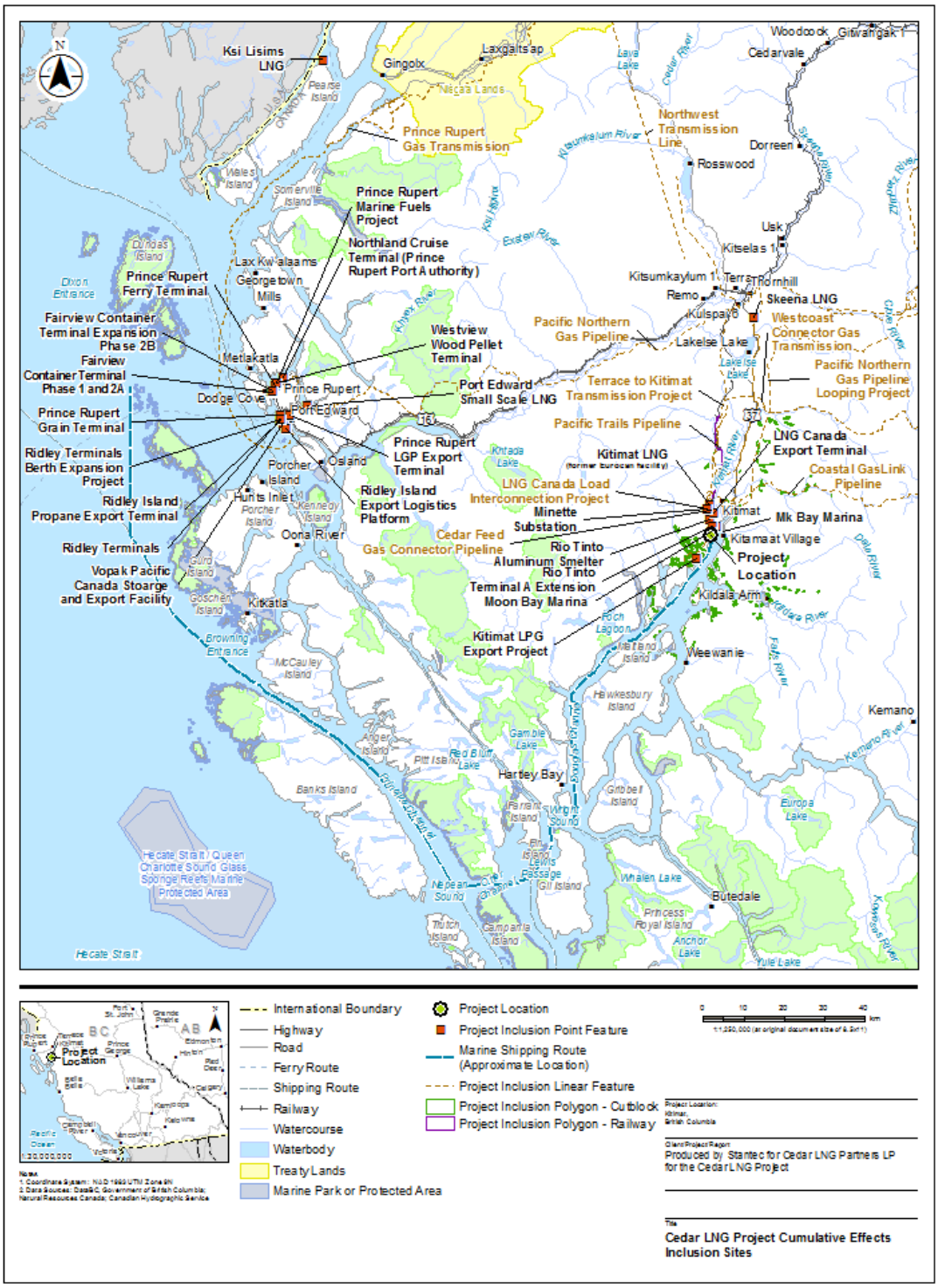


**Figure 4: Cedar LNG Project Cumulative Effects Inclusion List**

### 2.2.5 MATTERS BEYOND THE SCOPE OF THE PROJECT

As noted above, the Agency required the EAO to consult with Haida during this EA on behalf of the Government of Canada through the substitution provisions of the IAA. During the course of the EA, Haida raised concerns about the potential for effects of Cedar LNG marine shipping on air quality, acoustics, wildlife, marine resources, marine use, human health and malfunctions and accidents in Haida territorial waters, which are outside the spatial boundaries for the scope of shipping for this EA.

To support discussions with Haida regarding their concerns, Cedar provided a supplemental memo[6] on potential effects of marine shipping within Haida territorial waters. Discussion of Haida's key concerns regarding effects in Haida territorial waters, and information from Cedar regarding their supplemental memo are described in Part C (section 7.0) of this Report.

## 2.3 PROJECT ECONOMIC BENEFITS

#### *ECONOMIC BENEFITS OF CEDAR LNG*

This section summarizes the estimated economic costs and benefits of Cedar LNG during construction and operations, as reported in the Application. According to the Initial Project Description and recently updated by Cedar, the capital costs for Cedar LNG are estimated to be between $1.8 billion to approximately 3.0 billion (cost estimate in 2019 Canadian dollars). The major percentage of capital costs are associated with material cost for the FLNG facility which will be built overseas in Asia.

#### *ECONOMIC TAX BENEFITS FROM CEDAR LNG CONSTRUCTION AND OPERATION*

For construction the federal tax contributions are estimated at $4.6 million, the provincial tax contributions are estimated at $19.4 million and the municipal tax contributions are estimated to be $7.7 million over the four-year construction period. During operation, annual federal tax contributions are estimated at $2.4 million, the provincial taxes are estimated at $7.0 million, and the municipal taxes are estimated at $4.2 million. Tax contributions related to project spending on turnarounds and decommissioning were not estimated. Additional details on economic benefits are in section 5.7 (employment and economy) of this Report.

Table 1 summarizes the estimated economic benefits from Cedar LNG construction and operation, as reported in the Application.

[6] Consideration of Environmental Effects within Haida Traditional Waters, Cedar LNG Partners LP, April 19, 2022.

**Table 1: Estimated Government Tax Contributions ($Millions)**

| Level of Government | Category | British Columbia | | | Other Parts of Canada | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Direct And Indirect | Induced | Total | Direct And Indirect | Induced | Total | Direct And Indirect | Induced | Total |
| Construction | | | | | | | | | | |
| Federal | Taxes on products | 0.7 | 2.9 | 3.6 | 0.1 | 0.8 | 0.9 | 0.8 | 3/7 | 4.5 |
| | Taxes on production | 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.1 | 0.1 |
| | **Total** | **0.7** | **3.0** | **3.7** | **0.2** | **0.8** | **1** | **0.8** | **3.8** | **4.6** |
| Provincial | Taxes on products | 5.6 | 8.9 | 14.5 | 0.3 | 1.2 | 1.5 | 5.9 | 10.1 | 16 |
| | Taxes on production | 0.9 | 1.7 | 2.6 | 0.2 | 0.6 | 0.8 | 1.2 | 2.2 | 3.4 |
| | **Total** | **6.6** | **10.6** | **17.2** | **0.5** | **1.8** | **2.3** | **7.1** | **12.3** | **19.4** |
| Municipal | Taxes on products | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 |
| | Taxes on production | 2.0 | 3.6 | 5.6 | 0.5 | 1.3 | 1.8 | 2.6 | 4.9 | 7.5 |
| | **Total** | **2.1** | **3.7** | **5.8** | **0.6** | **1.3** | **1.9** | **2.6** | **5.1** | **7.7** |
| Operation (annually) | | | | | | | | | | |
| Federal | Taxes on products | 0.4 | 1.3 | 1.7 | 0.1 | 0.4 | 0.5 | 0.6 | 1.7 | 2.3 |
| | Taxes on production | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | **Total** | **0.5** | **1.4** | **1.9** | **0.1** | **0.4** | **0.5** | **0.6** | **1.8** | **2.4** |
| Provincial | Taxes on products | 1.5 | 2.9 | 4.4 | 0.2 | 0.6 | 0.8 | 1.7 | 3.5 | 5.2 |
| | Taxes on production | 0.4 | 0.7 | 1.1 | 0.2 | 0.4 | 0.8 | 0.7 | 1.1 | 1.8 |
| | **Total** | **2.0** | **3.6** | **5.6** | **0.4** | **1.0** | **1.4** | **2.4** | **4.6** | **7.0** |
| Municipal | Taxes on products | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Taxes on production | 1.0 | 1.6 | 2.6 | 0.6 | 0.9 | 1.5 | 1.5 | 2.5 | 4.0 |
| | **Total** | **1.0** | **1.6** | **2.6** | **0.6** | **0.9** | **1.5** | **1.6** | **2.6** | **4.2** |

### *ECONOMIC BENEFITS FROM CEDAR LNG CONSTRUCTION AND OPERATION*

According to the Application, project spending is estimated to result in $257 million in Gross Domestic Product (GDP) contributions over the four-year construction phase. When this GDP amount is broken down there will be $107 million in direct effects (100 percent occurring in B.C.) and $94 million in indirect effects (63.8 percent occurring in B.C.) and $56 million in induced effects (67.9 percent occurring in B.C.). During the 40-year operation life of Cedar LNG, the annual GDP contributions are estimated at $85 million, comprised of $24 million in direct effects (100 percent occurring in B.C.) and $22 million in induced effects (68.2 percent occurring in B.C.).

The Application reported that GDP contributions at the local assessment area (LAA) were not estimated. Based on increased economic activity in the region it was assumed this is inherently beneficial to the economy of the LAA. As such, a moderate magnitude positive effect on the GDP is estimated during construction, operation, and decommissioning phases of the Cedar LNG. Positive effects include increased business revenue, which can support capital investment and hiring, which could lead to increased capacity and capabilities among local businesses. Direct and indirect income spending in the area could result in positive effects on the local businesses.

Cedar LNG construction is expected to have a peak workforce of approximately 500 full-time equivalent workers (FTEs) starting in the second year of construction and will be sustained (annually) for roughly eight months. The operation phase of Cedar LNG will have a workforce comprised of 100 FTEs over the 40-year life of the facility. During operations there would need to be an additional turnaround workforce of approximately 100 FTEs, every three to five years to perform shutdown and maintenance work on the LNG facility. Based on decommissioning workforce requirements on other projects Cedar anticipates that the decommissioning workforce will peak at 100 to 150 workers.

With Haisla being the majority owner of Cedar LNG, Cedar would directly support Haisla through the generation of business profits, which would be invested back into the Haisla community. Cedar LNG will create jobs, contracting and other economic opportunities for Haisla, the local community, neighbouring Indigenous nations, and the Northwest Region of B.C. However, some of the construction and operation workforce will require specialized trades and other technical skills not available locally, including LNG experience and these FTEs will be sourced from elsewhere in B.C., Canada, or internationally. The Application reports on the workforce requirements based on the National Occupational Classification system and timelines for employment opportunities, as well as skills and education levels for key positions.

### *ECONOMIC CONTRIBUTIONS OF REGIONAL SPENDING AND BUSINESSES DEVELOPMENT*

Cedar LNG expenditures would contribute economic benefits to local and regional businesses as well as direct and indirect workers through supply and service contracts and goods and service provision.

Regional spending is estimated to result in 694 FTEs of indirect labour (65.3 percent occurring in B.C.) and 354 FTEs of induced labour (65.0 percent occurring in B.C.) over the four-year construction period. There will be a total of 270 FTEs (64.8 percent occurring in B.C.) of annual indirect labour and 144 FTEs (64.6 percent occurring in B.C.) of annual induced labour are estimated to occur over the 40-year operation phase.

## 2.3.1 PURPOSE AND NEED FOR THE DESIGNATED PROJECT

Cedar LNG is a partnership of Haisla and Pembina Pipeline Corporation and, if approved, it would be the first Indigenous majority owned LNG export facility in Canada. Haisla have identified this facility as a key element in its economic and social development strategy. As reported in the Application, for the first time, Haisla will have an opportunity to directly own and participate in a major industrial development in its territory.

The Application also reports that Haisla sees the advancement of the LNG facility in its territory as further advancing reconciliation, as well as, addressing Article 32 in the United Nations Declaration of Rights of Indigenous People, which states:

- Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources.
- States shall consult and cooperate in good faith with the Indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources.

Cedar indicates that the Project is strategically located to take advantage of a shorter shipping distance to Asia-Pacific markets compared with competitors on the American Gulf Coast. The global demand for LNG has steadily increased over the past decade driven by demand in Asia and Europe. A substantial part of this increased demand is the planned conversion of coal-fired power plants to natural gas (from the LNG) to meet various national net-zero GHG emissions and air pollution reduction targets. Cedar LNG is also in line with greatly reducing GHG emissions since it would be powered by electricity from BC Hydro, making this facility one of the lowest carbon intensity LNG facilities in the world, if the Project received the appropriate approvals and it is built and proceeds to operation.

According to Shell's LNG Outlook 2021[7], the global LNG consumption was 360 million tonnes in 2020 and it is expected to increase to 700 million tonnes by 2040. The Project will help meet this increasing global demand for LNG, connecting abundant natural gas resources in the Western Canadian Sedimentary Basin with overseas markets. According to the Application Cedar LNG would be able to provide LNG to address this increased consumption need.

Cedar LNG would create jobs, contracting and other opportunities for Haisla, the local community, neighboring Indigenous nations and the region.

### 2.3.2 ALTERNATIVES TO THE PROJECT

Section 22(1)(f) of the IAA requires that the assessment take into account any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project. Subsection 2.3.1 above discusses the purpose and need for Cedar LNG which is to 1) develop the infrastructure needed to export natural gas from western Canada to international markets, and 2) advance Haisla's authority over economic development on Haisla-owned lands, while promoting economic development that respects community values and creates employment and skills development opportunities for members.

According to the Application, another technically and economically feasible option has not been identified to achieve the equity ownership and community benefits that would be provided by Cedar LNG. LNG export facilities have been considered on the Douglas Channel since the late 1990's. Haisla has been advancing the planning of an LNG facility at the present location of Cedar LNG for approximately a decade.

One of the primary economic alternatives would be for Haisla to take an equity position in another of the LNG export facility such as LNG Canada Export Terminal. While Haisla has considered this option, it does not support the goals of the Haisla Comprehensive Community Plan. Cedar LNG, being a Haisla-led development, directly incorporated community values into the site selection, engineering design, and hiring policies which are reflected in the Application.

Cedar's alternatives analysis took into consideration the manner in which gas can be transported from its source to the receiving location. According to the Application, the only two technically and economically feasible options for exporting/transporting natural gas is by pipeline or by an LNG export facility for shipping overseas or around the world. The pipeline option was ruled out since the main market would be the United States and between 2010 and 2020, Canadian natural gas exports to the United States have dropped by 22 percent which makes it not economically viable. Additionally, Haisla's traditional territory is located far away from the Western Canadian Sedimentary Basin which is the source of the natural gas. The

[7] https://www.shell.com/energy-and-innovation/natural-gas/liquefied-natural-gas-lng/lng-outlook-2021.html#iframe=L3dlYmFwcHMvTE5HX091dGxvb2svMjAyMS8

Application identified that there are no alternatives to an LNG facility that would allow for the production of LNG for export to international markets outside of North America.

# 3.0 REGULATORY BACKGROUND AND AUTHORIZATIONS

In addition to needing an EA certificate and a Federal Public Interest Decision, Cedar LNG would need various authorizations from federal, provincial, and local governments. Cedar LNG did not apply for concurrent permitting under the Act for any of the provincial authorization. The list of required federal and provincial permits and authorizations is contained in the Agency and EAO's Joint Permitting/Regulatory Coordination Plan which is posted to the Cedar webpage on EPIC. Local Government Authorization and Technical Safety BC Approvals are listed below.

## *LOCAL GOVERNMENT AUTHORIZATION*

For the Cedar LNG Project the following local government authorization listed in Table 2 is required.

**Table 2: Required Local Government Authorization**

| Act and Regulatory Instrument | Responsible Agency | Overview |
|---|---|---|
| *Kitimat Municipal Code*<br>Building Permit | District of Kitimat | Required for construction of buildings within District of Kitimat land |

## *TECHNICAL SAFETY BC APPROVALS*

Technical Safety BC is an independent, self-funded organization created under the *Safety Authority Act* by the Province of B.C. in 2004. Technical Safety BC oversees the safe installation and operation of technical systems and equipment across B.C. For Cedar LNG the following approvals listed in Table 3 are required.

**Table 3: Required Technical Safety BC Approvals**

| Act and Regulatory Instrument | Responsible Agency | Overview |
|---|---|---|
| *Safety Standards Act*<br>Alternative Safety Approach Plan | Technical Safety BC<br>(Technical Safety BC is an independent, self-funded organization created | Required for projects that deviate from CSA code |
| *Safety Standards Act*<br>Design Registration | | Required for specific pressure equipment |

| Act and Regulatory Instrument | Responsible Agency | Overview |
|---|---|---|
| *Safety Standards Act* Operating Permit | under the Safety Authority Act by the Province of British Columbia in 2004) | Required when operating or maintaining equipment identified under the Safety Standards General Regulations (i.e., typically includes industrial plants) |
| *Safety Standards Act* Installation Permit | | Required for all LNG facilities moving forward to ensure safe operation and design of facilities |
| *Safety Standards Act* Class 8 Special Type Operating Permit | | Required for all LNG facilities moving forward to ensure safe operation and design of facilities |

## 3.1 MARINE REGULATORY FRAMEWORK

This subsection describes the regulatory framework that governs safety, security and environmentally responsible marine transportation system in relation to marine shipping, which would cover vessels associated with Cedar LNG. Marine shipping associated with Cedar LNG would be required to meet the international standards and Canadian regulations set out by Canada's compliance-based marine safety and security systems, which is designed to protect life, property, and the marine environment. Compliance with those standards and regulations would be monitored and enforced through existing compliance and enforcement programs.

Non-regulatory initiatives are currently underway, aimed at collecting habitat and monitoring data/information, conducting assessments, implementing management measures to address cumulative effects, supporting capacity building by Indigenous nations to undertake studies and stewardship activities in the northwest and developing planning and management tools (listed below). Although these initiatives are not Cedar LNG-specific, these initiatives may be applicable in the future to the marine vessels used to transport LNG. Some of the federal legislation, authorizations and approvals listed above are repeated here to show how these fit into the marine regulatory process.

### 3.1.1 INTERNATIONAL

Regulations and standards that govern shipping operations are implemented through international agreements. Countries negotiate their governments' approved positions on international standards for the safety, security, and environmental performance of international shipping, and, once agreement has been reached, member countries, like Canada, must create regulatory frameworks for the shipping industry that reflect the agreement.

There are over 50 International Maritime Organization (IMO) conventions covering a range of topics. Canada is a member state and signatory to most conventions. The conventions are

reflected in Canada's marine safety and security system, including the *Canada Shipping Act*, 2001. Canadian maritime laws apply to all vessels operating in Canadian waters, and to Canadian vessels worldwide.

In addition to the IMO conventions, Canada and B.C. have other cooperative agreements and working relationships in place with the United States regarding spill prevention and response.

Some of the major conventions and agreements are provide in Table 4.

**Table 4: International conventions and agreements governing marine shipping.**

| International Convention/Agreement | Overview |
|---|---|
| International Convention on Load Lines | • Sets limits on the draught to which a ship may be loaded, given in the form of freeboards, taking into account different global zones and seasons |
| International Convention for the Safety of Life At Sea (SOLAS) | • How a vessel is constructed, its required safety equipment and establishes security requirements |
| International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW) | • Competencies of a vessel's crew |
| International Convention for the Prevention of Pollution from Ships (MARPOL) | • Limits on a vessel's operational discharges and sets detailed technical standards for:<br>○ Carrying and handling oil;<br>○ Carrying and handling noxious liquid substances in bulk;<br>○ Carrying packaged dangerous goods; and<br>○ Managing vessel sewage discharges, garbage and air emissions.<br><br>[Transport Canada Note: Canada has its own Ballast Water Regulations that supersede the international convention for vessels coming to Canada] |
| International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC Convention) | • Canada is signatory to the OPRC Convention, which provides a framework for dealing with pollution incidents, including oil pollution, either nationally or in co-operation with other countries.<br>• Canada is working on the development of a HNS Regime, similar to the Canadian oil regime, in order to ratify the OPRC-HNS Protocol (Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substance, 2000) which is an extension of the OPRC Convention. |
| Hazardous and Noxious Substances (HNS) Convention (not yet entered into force) | • The HNS Convention aims to ensure adequate, prompt and effective compensation for damage to persons and property, costs of clean up and reinstatement measures, and economic losses resulting from the maritime transport of hazardous and noxious substances, including LNG.<br>• The HNS Convention has not yet entered into force. For information on |

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| | its status, visit: https://www.hnsconvention.org/status/<br>• Canada has ratified the HNS Convention, which positions Canada as a leader in the move towards creating a liability and compensation structure for HNS. |
| Maritime Labour Convention, 2006 | • Standards for protecting the rights of seafarers |
| United Nations Convention on the Law of the Sea (UNCLOS) | • Sovereign rights that a coastal state can exercise in these areas of the sea<br>• Rights that other countries can exercise when they wish to undertake activities in these areas of the sea |
| International Gas Carrier Code (IGC Code) | • The IGC Code provides an international level for the safe carriage by sea in bulk of liquefied gases, by advising the design & construction standards of ships involved in such transportation & the equipment they should carry so as to minimize the risk to the ship, to its crew & to the environment, having considered the nature of the products involved |
| International Safety Management Code (ISM Code) | • The ISM Code provides an international standard for the safe management and operation of ships and for pollution prevention, by way of appropriate organization of management. |
| International Maritime Organization's 2011 Guidelines for the Control and Management of Ship's Biofouling | • Voluntary guidelines that encourage the ship-owners to adopt practices to control and manage biofouling |
| International Convention on the Control of Harmful Anti-fouling Systems | • Prohibits, and/or restricts the use of harmful anti-fouling systems |
| Pacific States/British Columbia Oil Spill Task Force | • Emphasizes working together to reduce the likelihood of a transboundary spill occurring and to improve spill response |

### 3.1.2 FEDERAL

Kitimat is a private port with no established federal port authority; however, Transport Canada and other federal agencies regulate navigation and other areas of federal responsibility in Kitimat Arm and the waters along the shipping route.

Marine shipping is governed by Canada's compliance-based marine safety and security system, which is designed to protect life, property and the marine environment. Transport Canada is the federal lead regulator of marine shipping, with the *Canada Shipping Act, 2001* (CSA 2001) being the principal statute that governs safety in marine transportation and protects the marine environment.

Transport Canada has the authority to regulate pleasure craft and Canadian and foreign vessels operating in Canadian waters extending 12 nautical miles offshore. Therefore, all vessel activity

within the territorial sea is subject to Canadian regulations regardless of the geographic extent of the projects. Under the CSA 2001, the Collision Regulations establish rules about how to safely operate one's vessel in the vicinity of other vessels. These rules apply to every type of vessel, from small self-propelled boats to large international vessels, and would be applicable to marine shipping associated with Cedar LNG. An overview of the CSA 2001 and other pertinent legislation is provided below.

**Table 5. Federal legislation governing marine shipping in Canada.**

| Responsible Authority | Statute / Authorization / Initiative | Overview |
|---|---|---|
| Transport Canada<br>Canadian Coast Guard | *Canada Shipping Act*, 2001 (CSA, 2001) | • The CSA, 2001 is the principal statute governing marine transportation in Canada.<br>• International conventions are adopted into Canadian law through the CSA, 2001 and its regulations.<br>• Nearly 50 regulations exist under the CSA, 2001.<br>• Transport Canada is responsible for administering the CSA 2001 and its regulations, as well as certification, inspection, compliance, and enforcement.<br>• Under CSA 2001, the Canadian Coast Guard (CCG) is the lead agency responsible for taking measures to repair, remedy, minimize or prevent marine pollution damage from a vessel, an oil handling facility, and where the source of the spill is unknown, in waters under Canadian jurisdiction. The CSA 2001 also provides powers, responsibilities and obligations to CCG related to aids to navigation, search and rescue, and vessel traffic services. |
| Transport Canada | Navigation Safety Regulations (2020) | • Covers navigation safety and radiocommunications |
| Transport Canada | Ballast Water Regulations | • Restricts the number and type of viable organisms per cubic metre of ballast water discharged to prevent the introduction of invasive species and protect global biodiversity.<br>• The new regulations mark a transition from the traditional method of ballast water management (the exchange of ballast water in mid-ocean) to the use of modern ballast water management systems (which clean ballast water of organisms before release).<br>• Canadian ships travelling abroad and those coming into Canada from abroad are now required to meet standards by 2024. |
| Transport Canada | Collision Regulations | • Establishes rules about how to safely operate one's vessel in the vicinity of other vessels<br>• These rules apply to every type of vessel, from small self-propelled boats to large international vessels, and would |

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| | | be applicable to marine shipping associated with Cedar LNG |
| Transport Canada | *Marine Transportation Security Act* | • Provides a framework to detect security threats and take measures to prevent security incidents that could affect marine vessels and their facilities |
| Transport Canada | *Marine Liability Act* | • The Marine Liability Act establishes rules that ensure that if a marine incident happens in Canadian waters, people affected can be compensated for eligible losses. Depending on the incident, vessel owners can be held liable (responsible) for damage to property, the environment, and injuries to people. |
| Fisheries and Oceans Canada (DFO) | *Fisheries Act* | • Provides the regulatory framework for the management and control of marine and inland fisheries and the protection of fish and fish habitat, including by preventing pollution. |
| Canadian Coast Guard (CCG) | *Oceans Act* | • Gives the Minister of Fisheries, Oceans and the Canadian Coast Guard responsibility for providing services such as aids to navigation systems and services, marine communications and traffic management services, ice breaking and ice management services, the marine component of the federal search and rescue program, and marine pollution response within Canadian navigable waters and the Exclusive Economic Zone. |
| Transport Canada | *Canadian Navigable Waters Act* | • Protects the public's right to travel on navigable waters and regulates the construction and operation of works that may infringe upon this right.<br>• The Act applies to all waters that the public may use for travel or transport, whether the water is on the list of 'scheduled' waters of the Canadian Navigable Waters Act or not.<br>• Projects that affect navigation require an application for an approval to Transport Canada's Navigation Protection Program. |
| Transport Canada/Pilotage Authorities | *Pilotage Act* | • Sets out a framework for the provision of pilotage services; every ship of more than 350 gross tonnage that is not a pleasure craft are subject to compulsory pilotage (requirement that the ship be under the conduct of a licenced pilot or a pilotage certificate holder). |

The EAO notes that the federal government is also exploring potential amendments to the CSA 2001 to better support the proactive management of marine emergencies, including marine pollution preparedness, response and recovery and examining changes to the *Marine Liability Act* to clarify the liability and compensation regime for ship source incidents. Further details on

these potential changes are available here: https://tc.canada.ca/en/campaigns/protecting-our-coasts-oceans-protection-plan/stronger-incident-prevention-response.

### 3.1.3 PROVINCIAL

**Table 6. Provincial legislation relating to marine shipping in B.C.**

| Responsible Authority | Statute / Authorization | Overview |
|---|---|---|
| Government of BC | *Environmental Management Act* | • Managing discharge of pollutants<br>• Environmental Emergency management<br>• Cost recovery from a spill (polluter pays) |
| Government of BC | *Wildlife Act* | • Protection of wildlife |

### 3.1.4 REGIONAL

**Table 7. Regional authorities for marine shipping relevant to Cedar LNG**

| Responsible Authority | Statute / Authorization / Initiative | Overview |
|---|---|---|
| Western Canada Marine Response Corporation (WCMRC) | *Canada Shipping Act*, 2001 | • WCMRC is the Transport Canada-certified marine spill response organization for Canada's West Coast. Their mandate is to be prepared to respond to ship-source oil spills on the polluter's behalf, along all 27,000 km of BC's coastline.<br>• WCMRC maintains strategically located response equipment, trained responders, and response plans, and conducts exercises on a regular basis. |
| Pacific Pilotage Authority (PPA) and<br>BC Coast Pilots | *Pilotage Act*<br>Pacific Pilotage Regulations | • The PPA is a federal Crown corporation whose mandate is to provide a safe, reliable, and efficient marine pilotage service on the west coast of Canada<br>• BC Coast Pilots is a private company that contracts their services to the PPA under a service agreement for the BC Coast (excluding the Fraser River area, which is covered by the Fraser River Pilots)<br>• Pilots are a resource to the master and bridge team providing them with expert local knowledge, and are responsible to the master for the safe navigation of the vessel while it is in British Columbia pilotage waters<br>• Provides added level of safety to the vessel by placing a pilot on the vessel meaning at least one member of the bridge team has in-depth |

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| | | knowledge of local dangers, is not fatigued, and is a knowledgeable resource.<br>• Would determine pilotage requirements and tug escorts for Cedar LNG vessels |

### 3.1.5 NON-REGULATORY INITIATIVES

**Table 8. Regional initiatives relating to marine shipping relevant to Cedar LNG**

| Responsible Authority and Participants | Initiative | Overview |
|---|---|---|
| Environment and Climate Change Canada (ECCC) | National Environmental Emergencies Centre (NEEC) | • Provides ECCC's technical and scientific environmental advice and assistance to the Lead Agency in the event of an environmental emergency<br>• Uses a mapping application and data viewing portal, enabling quick identification of the location of an incident, its geographical context, and environmental concerns and protection priorities<br>• Consolidates geospatial data for the purpose of delivering expert advice in a variety of formats – maps, reports and other associated documentation are delivered to the lead agency and others that assist on environmental emergencies.<br>• NEEC conducts post-emergency assessment, provides specialized advice on shoreline cleanup assessment technique, and provides advice on ecosystem recovery objectives. |
| Transport Canada<br>Canadian Coast Guard | Oceans Protection Plan (OPP) | • Includes initiatives aimed at protecting Canada's coasts, including a state-of-the art marine safety system, preservation, and restoration of marine ecosystems, building Indigenous partnerships, creating a stronger evidence base and increasing community participation and public awareness.<br>• The first phase of the OPP was announced in 2016 and in July 2022 the next phase of the OPP was announced. |
| Transport Canada in partnership with Pacific North Coast Nations (PNC) First Nations (under the Oceans Protection Plan) | Cumulative Effects of Marine Shipping (CEMS) Northern Shelf Bioregion pilot area | • Work is collaboratively done with TC and PNC First Nations through an established Technical Working Group.<br>• Assessments are being completed to examine the effects of marine shipping activities on valued components prioritized by the Technical Working Group. |

| | | |
|---|---|---|
| | | • Assessment findings will inform the identification of management actions and strategies to mitigate cumulative effects. |
| Government of Canada / 15 Pacific North Coast First Nations including but not limited to:<br>• Council of Haida Nation<br>• Lax Kw'alaams Band<br>• Gitxaała Nation<br>• Metlakatla First Nation<br>• Gitga'at First Nation | The Government of Canada and PNC First Nations signed the Reconciliation Framework Agreement for Bioregional Oceans Management and Protection (the "RFA"). | • The RFA serves as an important commitment to regional partnership in the task of ocean management and an opportunity to develop a Nation-to-Nation approach to oceans protection between Canada and PNC First Nations.<br>• The RFA commits the Parties to advance Collaborative Governance and Management on matters related to Marine Planning and Oceans Management and Shipping, Marine Safety, and Ocean Protection.<br>• Schedule B of the RFA specifies the commitment of all Parties to work on cumulative effects initiatives in the NSB. |
| Government of Canada / Indigenous nations including:<br>• Kitselas<br>• Kitsumkalum | Separate Reconciliation Framework Agreement (RFA) with these Nations for Bioregional Oceans Management and Protection | • While separate, this agreement sets the framework for the collaborative planning and implementation of marine planning initiatives/activities in a way that preserves the health and resilience of the oceans, including initiatives that address cumulative effects in the Northern Shelf Bioregion |
| Fisheries and Oceans Canada (DFO), federal, provincial, and Indigenous nations governments, with contributions from a diverse group of organizations and stakeholders | Pacific North Coast Integrated Management Area (PNCIMA) Plan | • Provides a joint federal-provincial-First Nation planning framework for conservation and management of human activities on the Pacific North Coast. |
| Developed through a collaborative planning process led by 16 members of Indigenous nations, including the Gitga'at First Nation, Gitxaała Nation, Haisla Nation, Kitselas First Nation, Kitsumkalum First Nation, and Metlakatla First Nation, supported by the North Coast-Skeena First Nations Stewardship Society, and the Province of British Columbia | Marine Plan Partnership for the North Pacific Coast | • Provides a framework for ecosystem-based management for the North Pacific Coast and includes recommendations for achieving ecosystem health, social and cultural well-being, and economic development |

| | | |
|---|---|---|
| TC and Indigenous and Coastal Communities | Enhanced Maritime Situational Awareness (EMSA) Initiative | • Initiative is a web-based geographic information system (GIS) which was launched in 2017 as a pilot project under the OPP (see below for details on the Initiative) |

Further details on some of these initiatives are provided below.

### *OCEANS PROTECTION PLAN (OPP)*

The first phase of the OPP (2016-2021) was a five-year plan with a $1.5 billion dollar investment, led by multiple federal departments, that focused on marine safety, environmental protection and working in partnership with Indigenous Peoples across Canada including the Pacific North Coast (PNC) First Nations. PNC First Nations who are being consulted on Cedar are: Gitga'at, Gitxaała, Lax Kw'alaams, Metlakatla, and Council of Haida Nation.

The next phase of the OPP, announced July 2022, received an investment of $2 billion over nine years, and is designed based on the lessons learned and engagement with Indigenous communities and organizations, as well as marine stakeholders, involved in or impacted by the OPP. In this next phase of the OPP, Canada will establish 15 new measures to expand ocean protection initiatives to more regions and better proactively combat emerging threats to marine safety, while continuing or expanding 39 existing initiatives. The renewed and expanded plan will help make further progress to enhance the protection and restoration of vulnerable marine ecosystems and wildlife; improve the efficiency, safety, and sustainability of Canada's marine supply chains and mitigate their impacts on the environment, including by advancing research on marine pollution, ecosystems, and wildlife; better manage marine traffic navigation off our coasts and marine incidents of all types; and advance partnerships and training opportunities for Indigenous and coastal communities to incorporate their expertise and experiences in various aspects of marine safety and ecosystem protection. Further information is available through the OPP website: https://tc.canada.ca/en/campaigns/oceans-protection-plan.

Below are descriptions of specific OPP-related initiatives that were part of the OPP and continued/renewed/ expanded during the next phase of the OPP that overlap with the Cedar LNG project area and are relevant to issues raised during the EA.

### *RECONCILIATION FRAMEWORK AGREEMENTS*

In June 2018, the Government of Canada entered into a Reconciliation Framework Agreement (RFA) with the PNC First Nations for Bioregional Oceans Management and Protection. This agreement sets the framework for the collaborative planning and implementation of marine planning initiatives/activities in a way that preserves the health and resilience of the oceans, including initiatives that address cumulative effects and improves marine safety and environmental protection in the Northern Shelf Bioregion.

Notably, under the OPP, Transport Canada is partnered with PNC First Nations under the RFA to pilot a regional cumulative effects assessment in the Northern Shelf Bioregion focused on the impacts of marine shipping activities. Transport Canada and the PNC First Nations have established a Technical Working Group to work collaboratively on assessing the impacts of marine shipping activities on certain valued components that were jointly prioritized with the First Nations, which includes the impacts of marine shipping on cetaceans as well as on Indigenous marine uses.

The Canadian Coast Guard (CCG), along with other federal partners and the province of B.C., are working collaboratively with PNC First Nations on a regional framework for integrated response planning (the Marine Incident Preparedness, Response and Recovery Framework for the Northern Shelf Bioregion (NSB Framework)). The NSB Framework seeks to establish a common understanding of how governments come together to plan for, respond to, and recover from marine incidents in the NSB. This includes establishing the principles, guidance and processes for the collaborative development of sub-regional marine incident response plans to guide operational, integrated and cooperative marine responses in PNC First Nations territories.

As part of marine incident response planning and preparedness, Nations have led the development of Geographic Response Strategies, which describe geographic-specific response tactics to protect important cultural and ecological features that are particularly vulnerable to oil spills, or Areas of Concern. As part of the NSB Framework, CCG is also working with PNC First Nations to develop a long-term national approach for marine emergency towing, known as the National Strategy on Emergency Towing. A Regional Technical Team consisting of Transport Canada, CCG, and PNC Nations, including the CHN, is working to finalize the methodology for a marine navigational risk assessment, in which the outcomes will help to inform the strategy.

### *ENHANCED MARITIME SITUATIONAL AWARENESS INITIATIVE*

The Transport Canada-led Enhanced Maritime Situational Awareness (EMSA) Initiative is a web-based geographic information system (GIS) which was launched in 2017 as a pilot project under the OPP (OPP 1.0) and is being developed in partnership with Indigenous and coastal communities. This partnership includes all aspects of project governance, scope, and system development. In addition to 10 original pilot hosts under OPP 1.0, EMSA was extended as an accommodation measure for the Trans-Mountain Expansion Project (TMX) adding three more pilot hosts (total 13) and offering immediate access to EMSA, plus technical support and training for all impacted Indigenous communities along the TMX marine transit route. Highly successful as a pilot project, EMSA was renewed in the spring of 2022 under OPP 2.0, and is now a steady state system.

There are presently over 700 users of the EMSA system, approximately half of whom represent Indigenous communities, while other users include federal and provincial/territorial government staffs, BC Coast Pilots, port authorities, marine science organizations and the

marine industry. This expanded base of perspectives greatly increases opportunities for collaboration in a wide range of marine safety and environmental monitoring and protection initiatives, including those under the OPP.

EMSA provides access to over 1300 layers of maritime information and data such as near real-time vessel traffic, weather, sensitive habitats, hydrography, and local information. By creating a common operating picture for Indigenous partners, coastal communities and stakeholders, the EMSA system supports collaboration in local and regional initiatives. This includes maritime situational awareness for vessel monitoring and safety; planning vessel routes; identifying sensitive areas; protecting the environment; and managing response to changes in vessel traffic volumes. Indigenous data governance and sovereignty, which includes Ownership, Control, Access and Possession (OCAP) principles, are foundational to the development of EMSA.

13 Indigenous communities continue to work in partnership with Transport Canada to develop the system in close collaboration with the CCG. Pilot project host communities in the North coast include both Gitga'at and Haida.

### *PROACTIVE VESSEL MANAGEMENT INITIATIVE*

Under the OPP and RFA, Transport Canada has also been working in partnership with Indigenous nations including Haida on the Proactive Vessel Management (PVM) Initiative. PVM fosters collaboration between Indigenous groups and the commercial shipping industry and other stakeholders to develop voluntary measures that enhance marine safety and environmental protection. In 2018, TC and Haida launched a PVM pilot project to look at "safe" transit distances from shore to increase the likelihood that a disabled vessel could self-repair or be rescued by an emergency tug, thereby preventing it from drifting ashore and grounding. Cedar has communicated with Transport Canada about becoming a member on this committee. Transport Canada is following up with the other co-chairs to check on the next steps and if Cedar may be able to become a member.

### *PLACES OF REFUGE*

A situation in which a ship requests a place of refuge falls under Transport Canada's jurisdiction. Transport Canada is currently working with pilots and Indigenous communities up and down the coast to identify potential Places of Refuge, which are safe places where ships that need help can stabilize their conditions. Identifying these places ultimately reduces hazards to navigation, human life and environment.

### *COASTAL ENVIRONMENTAL BASELINE PROGRAM*

DFO is undertaking a pilot project in the Prince Rupert Area under the Coastal Environmental Baseline Program (CEBP). CEBP is collecting comprehensive data on the current state of the marine ecosystem at six pilot sites across Canada with high or increasing vessel traffic. The CEBP project in the Prince Rupert area is being implemented collaboratively with Indigenous

nations, including three Indigenous nations that are part of the RFA in the North Coast sub-region. Gathering comprehensive baseline data allows for the better detection of changes in the environment over time.

### *PACIFIC NORTH COAST INTEGRATED MANAGEMENT AREA PLAN*

As well, DFO leads the implementation of the Pacific North Coast Integrated Management Area (PNCIMA) Plan, which provides a joint federal-provincial-First Nation planning framework for conservation and management of human activities on the Pacific North Coast.

# 4.0 ASSESSMENT PROCESS OVERVIEW

## 4.1 OVERVIEW AND SCOPE OF THE ENVIRONMENTAL ASSESSMENT

Cedar LNG would be a new energy storage facility and subject to review pursuant to Part 4 (Table 8) of the Reviewable Projects Regulation because construction of Cedar LNG would result in a new energy storage facility with the capability to store an energy resource in a quantity that can yield by combustion ≥3 petajoule (PJ) of Energy. Cedar LNG is also subject to a federal impact assessment as it meets section 37(d) and 52 of the Physical Activities Regulations (SOR/2019-285) under the *Impact Assessment Act*, as follows:

- **37(d)** The construction, operation, decommissioning, and abandonment of a new facility for the liquefaction, storage or regasification of liquefied natural gas, with a liquefied natural gas processing capacity of 3,000 tonnes/day or more or a liquefied natural gas storage capacity of 136,000 $m^3$ or more; and
- **52** The construction, operation, decommissioning, and abandonment of a new marine terminal designed to handle ships larger than 25,000 DWT.

Table 9 summarizes major milestones reached during the EA of Cedar LNG including EAO's, the Agency's and Cedar's Consultation Activities.

**Table 9: Major Milestones of the EA**

| Dates | Milestones |
|---|---|
| | ***Pre-Application*** |
| August 22, 2019 | Proponent submits Project Description to EAO. |
| August 30, 2019 | Proponent submits Initial Project Description to Agency. |
| August 30, 2019 | The EAO issues a Section 10(1)(c) Order designating Cedar LNG as a reviewable project requiring an EA. |

| Dates | Milestones |
|---|---|
| September 17, 2019 | The EAO wrote a letter to the Agency requesting for substitution for the EA of Cedar LNG under IAA. |
| September 19 – October 20, 2019 | Agency provides notice to the public on commencing the Public Comment Period on the Initial Project Description and request for substitution. |
| October 30, 2019 | Agency prepares Summary of Issues (SOI) and shares with Proponent. |
| December 6, 2019 | Agency posts the Proponent's Detailed Project Description and responses to SOI |
| December 13, 2019 | EAO issues the Section 11 Order to specify the scope of the roles and responsibilities of Cedar and the EAO including requirements for public consultation and Indigenous consultation and federal IAA requirements if substitution is granted |
| December 19, 2019 | The Agency posted the Notice of Impact Assessment Decision with Reasons for Cedar LNG on the federal Canadian Impact Assessment Registry at: https://iaac-aeic.gc.ca/050/evaluations/document/133318 |
| January 24, 2020 | Federal Ministerial substitution decision, granting the request for substitution for the EA of Cedar LNG |
| June 3 - July 19, 2021 | The EAO held a 45-day public comment period on the draft Application Information Requirements (dAIR) which included the Valued Components Selection document. The Public Comment Period included two Virtual Open Houses on June 8th and June 10th that Cedar participated in. Approximately 10 members of the public participated. A total of 22 comments were received during the public comment period |
| November 15, 2020 | The EAO issued the approved Application Information Requirements (AIR) to Cedar. The AIR establishes information that must be collected, analyzed and included as part of Cedar's Application for an EAC. |
| December 15, 2020 | The EAO received Cedar's Application for an EAC for Cedar LNG. The EAO began the 30-day Application screening process |
| January 14, 2022 | The EAO sent a letter to Cedar advising the EAO has approved the Application for a detailed EA review. The EAO also identified additional information that Cedar is to provide before submitting the updated Application for formal review |
| February 4, 2022 | The EAO received the Application and posted it to EPIC |
| February 4, 2022 | The EAO initiated the 180-day assessment of the Application under Section 16(1) of the Act. |
| February 28 - April 14, 2022 | The EAO held a 45-day public comment period on the Application. The Public Comment Period included a Virtual Open Houses on March 16th that Cedar participated in. Approximately 20 members of the public participated. A total of 16 comments were received during the public comment period |
| March 31 - July 14, 2022 | The EAO received 26 Technical Memos from Cedar that responded to issues raised by the Working Group and the EAO posted these documents to EPIC |
| Placeholder | The EAO held a public comment period on a draft of its decision materials, prior to referral to Ministers. |
| Placeholder | The EAO referred Cedar LNG to provincial Ministers for a decision on whether to issue an EAC under Section 17 of the Act |
| Placeholder | The EAO referred Cedar LNG to the Agency for a federal decision under the IAA |

## 4.2 ROLE OF THE ADVISORY WORKING GROUP

The EAO established a Working Group made up of federal, provincial, local government staff or representatives and Indigenous nation representatives (listed in Schedules B and C of the Section 11 Order) with the mandates and expertise relevant to the review of Cedar LNG. Refer to the list of Working Group members in Appendix 3: List of Working Group Members.

The EAO sought and considered advice from the Working Group to understand and assess the potential adverse effects associated with Cedar LNG. Working Group members were responsible for providing advice to the EAO on:

- Key EA documents including, but not limited to, the selection of VCs, AIR, Application, Supplementary Technical Memos, the EAO's Report and proposed EAC conditions and recommended Mitigation Measures under the IAA;
- 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 that were raised by the public during the public consultation process.

The following local governments were members of the Working Group:

- District of Kitimat;
- City of Terrace; and
- Regional District of Kitimat Stikine.

In granting substitution of the EA, the federal Minister was satisfied the EAO would involve the Federal Authorities in the EA. The following federal departments participated in the review of Cedar's documents including the draft VCs, dAIR Application and EAO's draft report and proposed conditions:

- CCG provided comments and information related to its regulatory and statutory responsibilities within the themes of marine shipping, accidents and malfunctions, cumulative effects, and follow-up programs;
- Environment and Climate Change Canada provided comments and information related to its regulatory and statutory responsibilities within the themes of vegetation, wildlife, marine mammals, water quality, cumulative effects, air quality, GHG, accidents and malfunctions and strategic assessment of climate change;
- Employment and Social Development Canada provided comments and information related to its regulatory and statutory responsibilities with the themes of community profiles on socioeconomics of the workforce for the project, jobs created,

employment barriers to participation for local under-represented groups and Indigenous nations labour force including GBA Plus8;

- DFO provided comments and information related to its regulatory and statutory responsibilities within the themes of fish and fish habitat and marine mammals;
- Health Canada provided advice and information related to its statutory responsibilities to support the assessment of impacts on human health;
- Indigenous Services Canada provided advice and information related to Indigenous nations employment, workforce requirements and employment opportunities;
- Innovation, Science and Economic Development provided comments on contracting requirements, auditing, need for an enforcement program and needing measures in place to address effects that are beyond Cedar's control;
- Natural Resources Canada provided comment on seismicity, terrain hazards, marine environment and marine geohazards including tsunamis;
- Public Safety Canada participated but did not raise any issues or concerns related to its mandate;
- Transport Canada provided comments and information related to its regulatory and statutory responsibilities within the themes of marine navigation, accidents and malfunctions, cumulative effects, identification of mitigation measures and follow-up program; and
- Women and Gender Equality Canada provided comments and information related to expertise in the application of GBA Plus and gender equality as well as information related to gender-based violence.

The EAO reviewed the adequacy of Cedar's responses to all comments received from Working Group members during the review of the dAIR and the Application and held various meetings with Working Group members to discuss outstanding issues and concerns. In the development of this Report, proposed provincial conditions and recommended federal Mitigation Measures under the IAA, the EAO considered all comments and issues raised during the EA. The EAO and the Agency also developed the Joint Permitting / Regulatory Coordination Plan that outlines the key federal and provincial regulatory instruments, including permits, licences and authorizations, that may be required for Cedar LNG. The EAO also developed the Regulatory Issues Tracking Table that describes the key topics and issues that were raised during the assessment and how these were addressed in the assessment, or would be addressed by a subsequent permitting process, other regulatory process, or government initiative. The

[8] GBA Plus is an analytical process that provides a rigorous method for the assessment of systemic inequalities, as well as a means to assess how diverse groups of women, men, and gender diverse people may experience policies, programs and initiatives. The "plus" in GBA Plus acknowledges that GBA Plus is not just about differences between biological (sexes) and socio-cultural (genders). GBA Plus considers many other identity factors such as race, ethnicity, religion, age, and mental or physical disability, and how the interaction between these factors influences the way we might experience government policies and initiatives. See here for further details: https://women-gender-equality.canada.ca/en/gender-based-analysis-plus.html

document will be provided to the statutory decision makers to show how issues have been addressed and where they are being carried forward to another regulatory process.

## 4.3 INDIGENOUS ENGAGEMENT

On December 13, 2019, the EAO issued an Order establishing the scope and procedures of the EA (Section 11 Order), which specified the consultation activities that both the EAO and Cedar would undertake with all Indigenous nations potentially affected by Cedar LNG. Indigenous nations listed in Schedule B of the Section 11 Order include (alphabetically):

- Gitga'at First Nation;
- Gitxaała Nation;
- Haisla Nation;
- Kitselas First Nation;
- Kitsumkalum First Nation;
- Lax Kw'alaams Band; and
- Metlakatla First Nation.

Indigenous nations in Schedule B of the Section 11 Order were consulted at the deeper end of the consultation spectrum. Haida Nation was listed in Schedule C of the Section 11 Order and engaged on aspects of the Project related to marine shipping.

Métis Nation British Columbia was listed in the Section 11 Order and engaged at the lower end of the consultation spectrum. Further detail regarding engagement with Indigenous nations in provided in Part C of this Report.

### 4.3.1 MEETING THE CROWN'S DUTY TO CONSULT AND ACCOMMODATE INDIGENOUS NATIONS

The Government of B.C. has a constitutional duty to consult and, if appropriate, accommodate Indigenous nations where they have asserted or established Aboriginal rights and title, as recognized and affirmed by Section 35 of the Constitution Act, 1982 ("Section 35 Rights"), that may be adversely impacted by provincial decisions. In the past, the provincial EA process focused primarily on impacts to Section 35 Rights that the courts and/or treaties have generally addressed to date: typically hunting, fishing, trapping, and gathering rights, and title. For Cedar LNG, the EA considered an assessment of effects to Indigenous interests in the broader sense, which includes any interests related to an Indigenous nation as well as their Section 35 Rights (collectively, "Indigenous Interests").

There is often considerable overlap between the interests of Indigenous nations and the assessment of environmental, economic, social, heritage and health effects. Indigenous nations' comments and interests that directly relate to the assessments of VCs are discussed in Part B of this Report. The Requirements of the Impact Assessment Act, section 6.9, also addresses effects on Indigenous nations from impacts on the environment and to the health, social or economic conditions of the Indigenous nations of Canada.

Indigenous nations' comments and interests in terms of consultation and specific consideration of the Crown's duty to consult and accommodate Indigenous Interests are factored into the analysis in Part C of this Report. The EAO engaged collaboratively and sought consensus with Indigenous nations on the assessment of project effects to Indigenous Interests and proposed provincial conditions and proposed federal Mitigation Measures under the IAA. The EAO worked with those Indigenous nations, who were interested in doing their own assessment, to provide their own section of this Report. These nation-led assessments were based on their nation-specific Indigenous Interests using the information provided by Cedar in its Application and each Indigenous nation's own Indigenous knowledge. The sections that the EAO drafted for Indigenous nations were shared with those Indigenous nations to work together on a final version for this Report.

### 4.3.2 INDIGENOUS KNOWLEDGE

The Act (2018) establishes that one of the purposes of the EAO is to use the best available science, Indigenous Knowledge[9] and local knowledge in decision-making under the Act. The IAA also requires the consideration of Indigenous Knowledge provided with respect to the designated project. As part of the EAO's incorporation of aspects of the Act (2018) into the assessment as described above in section 1.0 and to meet the requirements of the IAA, the EAO required that the best available science, Indigenous Knowledge and local knowledge be considered and integrated throughout the assessment process. The Application described how scientific, Indigenous, and local knowledge was used in the assessment. Each VC contains a summary section of the Indigenous Knowledge provided that informed the assessment. This section includes the information provided in the Application as well as the information provided by Indigenous nations throughout the EA in submissions and during meetings.

[9] Within the context of EAs, Indigenous Knowledge is a unique way of knowing that is held by Indigenous Knowledge holders that pertains to the area within which a project may occur, including how that project may interact with the environment and people in the region. Indigenous Knowledge not only informs how projects should be delivered and their relationship to the land, but also informs Indigenous decision-making. The EAO's Guide to Indigenous Knowledge in Environmental Assessments provides further detail on the EAO's approach to the consideration of Indigenous Knowledge.

The EAO also drew on its experience working with the Haisla Nation and Tsimshian nations on past EAs, in addition to the consultation process with nations and the nations' participation in the EA. While the EAO has described Indigenous Knowledge in this Report, as available, the EAO recognizes that knowledge-holders are the only people who can truly define Indigenous Knowledge for their communities.

## 4.4 PUBLIC CONSULTATION

Public consultation is an important aspect of the EA process. Both the EAO and Cedar have responsibilities around involving the public in the EA. The key roles and responsibilities for public consultation are outlined in the Section 11 Order issued by the EAO. The EAO's public consultation responsibilities are also outlined in the Public Consultation Policy Regulation.

The EAO required Cedar to prepare a Public Consultation Plan. The plan describes Cedar's consultation objectives and activities. On March 27, 2020, Cedar submitted the Public Consultation Plan to the EAO. Cedar designed the Public Consultation Plan to meet the public consultation requirements under the Section 11 Order for both the PreApplication and Application review phases of the EA for Cedar LNG and in accordance with the Public Consultation Policy Regulation.

### 4.4.1 SUMMARY OF CONSULTATION ACTIVITIES LED BY CEDAR AND THE EAO

#### *PRE-APPLICATION STAGE*

Cedar consulted with key stakeholders via a Cedar LNG website, via email, meetings and other forms of communication. Additional information on Cedar and Cedar LNG was available on the Cedar LNG website. Due to the COVID-19 pandemic, online or phone-based consultation opportunities were often used as alternatives to in-person meetings, in accordance with any current public health recommendations and restrictions, increasing the level of participation in Cedar LNG engagement overall due to increased accessibility for interested parties or persons.

The purpose of Pre-Application consultation was to inform the stakeholders on the development of the AIR and candidate VCs, Cedar LNG and the scope of the information that needed to be included in an Application. Cedar focused their public consultation activities on District of Kitimat and City of Terrace communities. Cedar identified potentially affected stakeholders on the basis of proximity to these communities, potential interest in Cedar LNG and its effects, and review of consultation activities undertaken by other proponents in the District of Kitimat community.

Cedar established 11 categories of key stakeholders:

- Potential Industrial Partners
- Community Organizations

- Economic Development Organizations
- Educational Stakeholders
- Environmental Stakeholders
- Health and First Responders
- Heritage and Cultural Stakeholders
- Marine Users and Associated Stakeholders
- Fishing and Charter Operations
- Eco Tour Operators
- Recreational Groups

Cedar's Public Consultation Plan describes key activities for the consultation during the Pre-Application and Application Review Stages and post EA engagement.

Details on Cedar's public engagement and responses to public comments raised during EAO's public comment period and Virtual Open Houses (see Table 4: Major Milestones of the EA above) are in Cedar's Public Consultation Report #1, Public Consultation Report #2, Public Consultation Report #3 and described below.

The EAO received major submissions from the Kitimat Terrace Clean Air Coalition, Council of Canadians Terrace Chapter, Douglas Channel Watch which had received Agency public participation funding. Cedar responded to public comments submitted during Pre-Application in a tracking table contained in Cedar's Public Consultation Report #1.

The following are some of the themes summarized in Cedar's Table 3.3.1 in the Application that are specific to Cedar LNG:

- Air emissions and air quality;
- Climate change;
- Cumulative effects;
- Greenhouse gas (GHG) emissions;
- Human health;
- Marine resources;
- Project rationale;
- Sustainability; and
- Wildlife.

During the public consultation on the draft AIR, Cedar also held three virtual small-group meetings on June 16, 2021, June 17, 2021, and June 22, 2021. General topics discussed during these meetings include:

- Contracting and business opportunities;
- Geohazards including landslides and tsunamis;
- Extreme weather conditions;
- FLNG facility design including storage of LNG and natural gas liquids;

- Marine shipping; and
- GHG emissions including upstream emissions.

### *APPLICATION REVIEW STAGE*

Cedar continued to consult with key stakeholders via a Cedar LNG website, via mail, meetings and other forms of communication. This stage of the public consultation was conducted during the Application Review stage. The focus of this stage was to continue to provide information to stakeholders and the public as well as to provide opportunities for these groups to offer feedback on Cedar LNG. Efforts to engage diverse subgroups of the public, including Indigenous peoples, included holding open house and information sessions virtually and in the evenings, and making paper copies of its Application available, to provide greater accessibility for those limited in mobility, with time, financial or other familial constraints. Cedar also continued discussions with landowners, tenure holders and tenants to establish and maintain access agreements.

EAO's public consultation activities during Application Review are contained in Table 4: Major Milestones of the EA above. Cedar considered public comments received during the EAO's Public Comment Period and responded to those comments in a Tracking Table contained in Cedar's Public Consultation Report #3. Again, major submissions were received from the Kitimat Terrace Clean Air Coalition, Council of Canadians Terrace Chapter, Douglas Channel Watch which had received Agency public participation funding for the Application Review Stage of the EA.

Below is a summary of the key issues or themes raised by the public during the Application Review Stage:

- **Need for LNG Projects and the Net-Zero Plan** - Concerns with allowing LNG projects to go ahead if B.C. and Canada are serious about meeting their net-zero GHG commitments by 2050. The perception that LNG projects present an insurmountable emissions problem even if every other sector of B.C.'s economy could be reduced to net-zero by 2050, which in itself would be an extremely difficult challenge.
- **Use of Fossil fuels and Climate Change** - Concerns over government's support for gas and prolonged fuel production which contributes to climate change and need for a complete Strategic Assessment of Climate Change.
- **GHG Emissions** – Concerns that upstream methane emissions are not properly estimated and the amount of GHGs that will be emitted by Cedar LNG as well as concern with the adequacy of the cumulative GHG analysis.
- **Air Emissions** – Concern that the air dispersion modelling is inadequate, the need to use a smaller grid size in the modelling, the need to validate atmospheric stability in the modelling/pollutant concentration to properly reflect actual concentrations. Expressed the view of the need to review and incorporate information from other sources and studies.

- **Health** – Concerns with air emissions effecting human health and impacts of spills and leaks on the local community and Indigenous nations.
- **Industrializing of Kitimat** – Concerns that all the industrial development is depleting public access to Douglas Channel and enjoyment of activities such as whale watching.

The EAO has considered the issues raised by the public throughout the EA and in its effect assessments presented in this Report. The EAO will be considering public comments on this Report, the proposed provincial conditions and project description before finalizing and referring materials to provincial Ministers.

#### *POST-ENVIRONMENTAL ASSESSMENT CERTIFICATE ENGAGEMENT*

Cedar has committed in its Public Consultation Report #3 to providing updates and undertake information sharing activities to inform key stakeholders and the public on issues and concerns regarding construction, operations and decommissioning. Cedar will host community meetings with interested parties to discuss updated information on its website and contracting training and employment opportunities.

#### *THE EAO'S CONCLUSION ON THE ADEQUACY OF PUBLIC CONSULTATION*

Based on consideration of Cedar's Public Consultation Plan and Reports, the EAO is satisfied with Cedar's understanding and responsiveness to public interests. Public comments from the Public Comment Periods and Cedar's responses are posted on EPIC for the Pre-Application and Application Review stages.

### 4.4.2 SUMMARY OF CONSULTATION ACTIVITIES LED BY THE AGENCY

The public were consulted by the Agency on the Initial Project Description and the EAO's substitution request which were posted on the Agency's Canadian Impact Assessment Registry. The Public Comment Period on the Initial Project Description was from September 19, 2019 to October 20, 2019. Based on feedback received from Indigenous nations, federal authorities and the public during the public comment period, the Agency prepared a Summary of Issues relevant to Cedar LNG that are in Appendix D of the Detailed Project Description, along with Cedar's responses to the identified issues.

As noted in 4.4.1 above the Agency provided public participation funds during Pre-Application and Application Review to the Kitimat Terrace Clean Air Coalition, Council of Canadians Terrace Chapter, and Douglas Channel Watch to participate in the Cedar LNG assessment.

The Agency will be considering the public comments on the draft potential federal conditions with Description of Designated Project and the draft Executive Summary, submitted during EAO's public comment period on the draft referral materials for provincial and federal decision-makers for the Cedar LNG Project.

# PART B – ASSESSMENT OF POTENTIAL ADVERSE EFFECTS

# 5.0 ASSESSMENT OF VCS

## 5.1 AIR QUALITY

### 5.1.1 BACKGROUND

This chapter assesses the potential effects Cedar LNG would have on the air quality VC. Cedar LNG could adversely affect air quality though the emission of criteria air contaminants (CACs). CAC emissions would occur during each phase of Cedar LNG from various marine and land-based activities, including construction of infrastructure, traffic, liquefaction of natural gas, transportation, and LNG loading. The Application evaluated the following CACs predicted to be emitted as a result of Cedar LNG:

- Nitrogen dioxide ($NO_2$);
- Sulphur dioxide ($SO_2$);
- Carbon monoxide (CO); and
- Fine particulate matter (PM) with a diameter of less than 2.5 microns ($PM_{2.5}$).

Air quality effects within federal jurisdiction including federal lands, effects to the health, social or economic conditions of the Indigenous peoples of Canada, the current use of lands and resources for traditional purposes and cultural heritage are discussed in section 6.9 of this Report.

#### *5.1.1.1 Regulatory Context*

The air quality VC was assessed through comparison of predicted or measured concentrations of CACs to provincial and federal thresholds, including:

- B.C. Ambient Air Quality Objectives (AQO);
  - Provincial Framework for Developing Air Quality Objectives (2020);
  - Guidance on Application of Provincial Air Quality Objectives for $SO_2$ (2017);
- Current Canadian Ambient Air Quality Standards (CAAQS; 2020);
  - Canadian Council of the Ministers of the Environment Air Zone Management Framework; and
- Updated CAAQS which will come into effect in 2025.

The AQO are used to consider current and historic air quality to guide environmental impact assessments and are used to characterize air quality and potential air quality impacts beyond the industrial fence line, in areas where people live, or other sensitive receptors are located. As there are multiple CACs (including $PM_{2.5}$ and $NO_2$) without clear thresholds below which health

effects to do not occur AQO should not be interpreted as maximum acceptable levels; they are benchmarks which are used to assess air quality in B.C. with the goal to improve air quality over time. Any exceedances should be considered in the context of their magnitude, frequency, timing and proximity to the sensitive receptors (such as schools, hospitals, Indigenous communities). As of 2020, the provincial AQO for $SO_2$ became equivalent to the 2020 CAAQS for $SO_2$ (i.e., superseded by the CAAQS levels and metrics).

The CAAQS are used to manage air quality to maintain clean air. They are an appropriate comparison for modelled or otherwise estimated ambient air concentrations, and provide useful information on the project's potential impact on ambient air quality. CAAQS are most effectively used as a tool for improving air quality, not as a benchmark for assessing the acceptability of risk to human health. They are used by provinces and territories to guide overarching air zone management actions to reduce ambient concentrations below the CAAQS and prevent CAAQS exceedances.

If Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits, including a waste discharge permit for air emissions under the Environmental Management Act. This permitting process would be administered by the Oil and Gas Commission (OGC).

#### *5.1.1.2 Boundaries*

The regional assessment area (RAA) and local assessment area (LAA) for the air quality VC were the same. They consisted of a 40 km by 40 km area centered on the Cedar LNG Facility Area and a 3 km wide[10] and approximately 265 km long polygon along the LNG shipping route. Figure 5 and Figure 6, below, depict the extent of the RAA and LAA.

Cedar considered effects to air quality during construction, operations, and decommissioning; however, a quantitative assessment of effects on air quality was only conducted for the 40 years of operations as this is the phase when air emissions would be the greatest and the emissions from construction and decommissioning would be intermittent and short-term.

[10] 1.5 km on either side of the LNG shipping route.

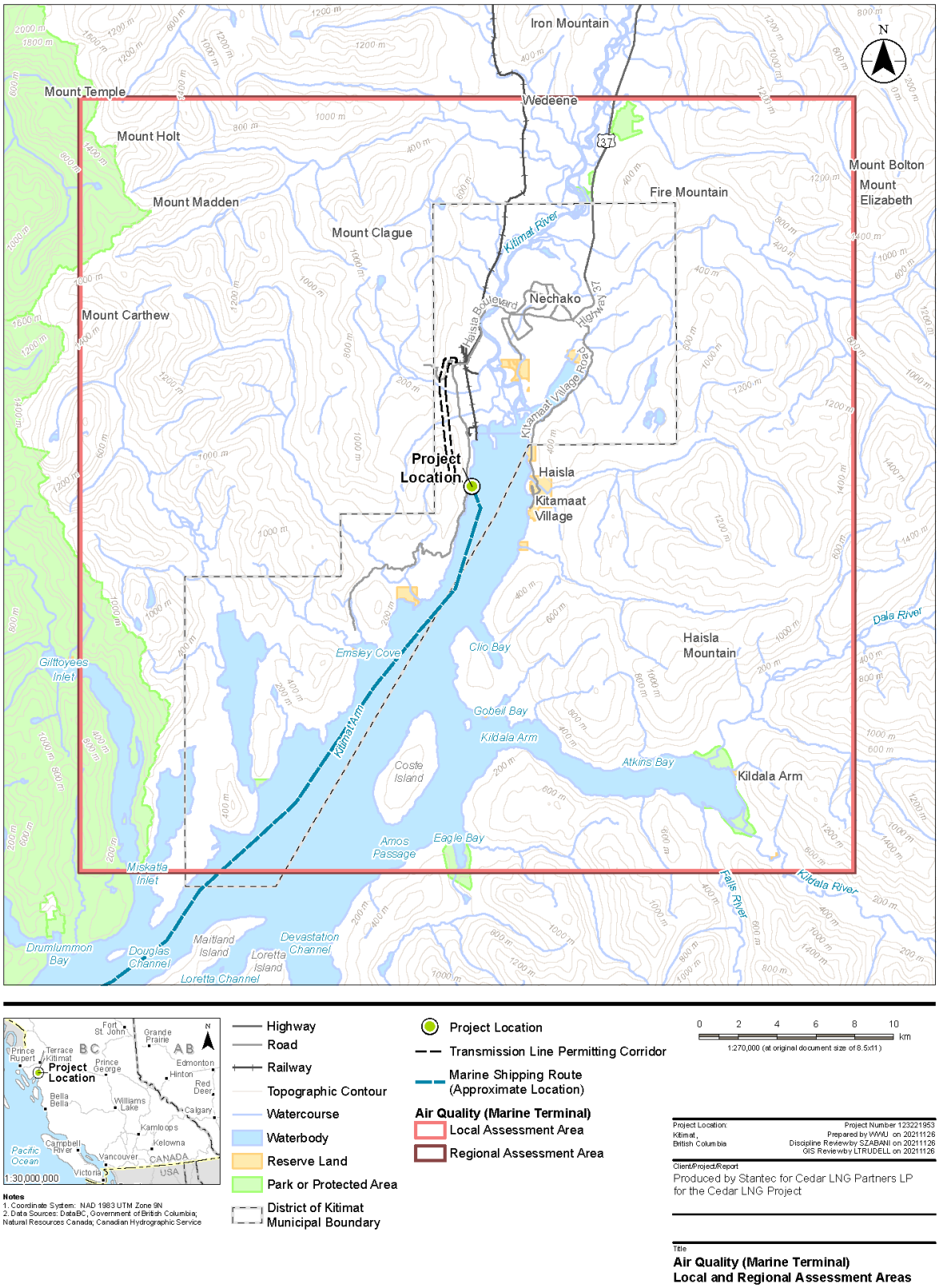


**Figure 5. Marine Terminal LAA and RAA for the air quality VC.**

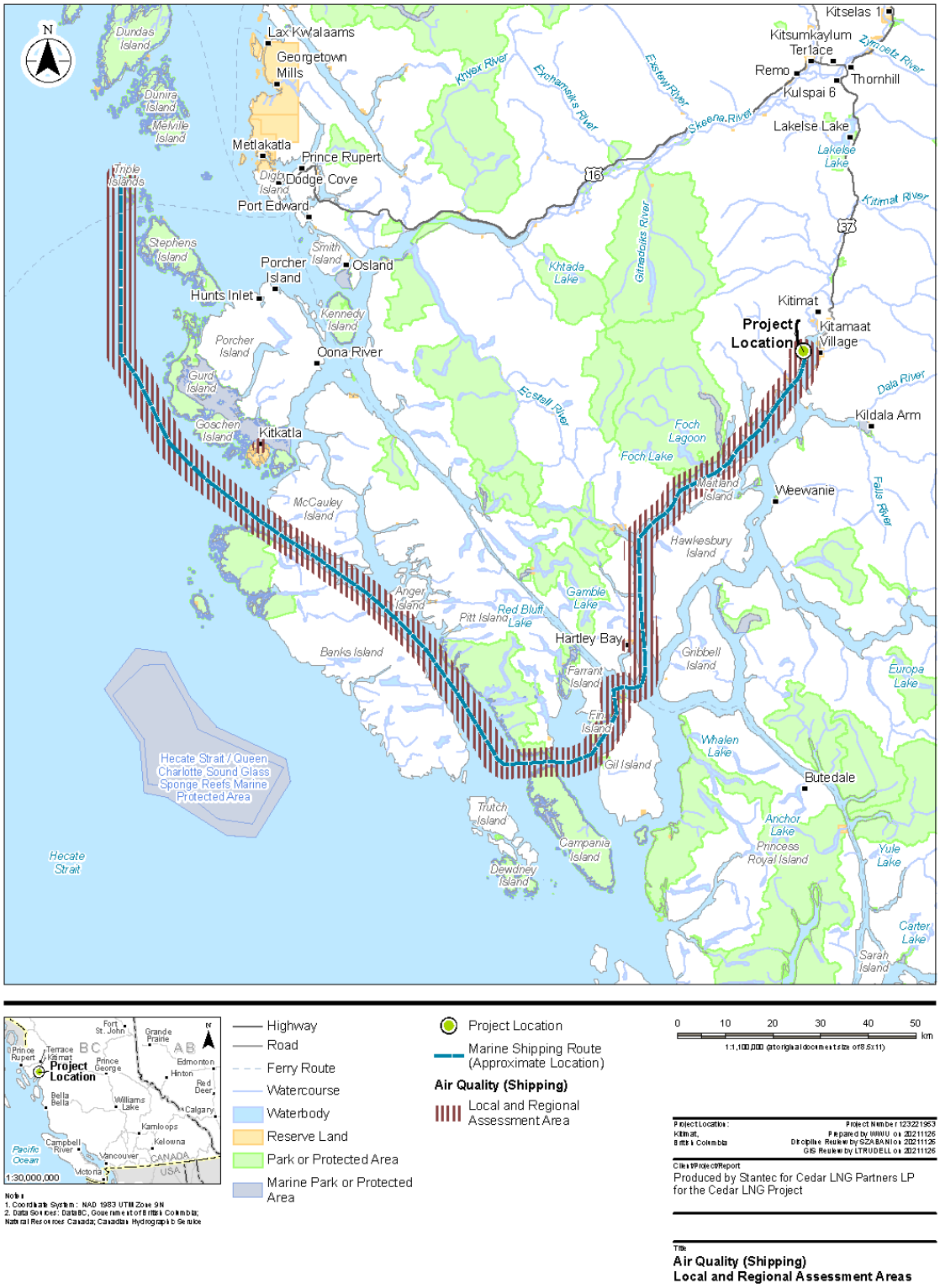


**Figure 6. Marine Shipping Route Cedar LNG LAA and RAA for the air quality VC.**

### 5.1.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.1.3.

#### *5.1.2.1 Existing Conditions*

Cedar established existing conditions from real time ambient measurements from five monitoring stations that provide the current concentrations of CACs in the LAA/RAA. Four monitoring stations (Kitamaat Village, Kitimat Haul Road, Kitimat Riverlodge and Kitimat Whitesail) are located in close proximity to Cedar LNG. The fifth location, Smither St Joseph's is approximately 130 km northeast of Cedar LNG but was included as it is the closest monitoring station with valid CO data. CAC concentrations at all five monitoring stations were below the relevant AQO and the prevailing winds confine the influence of industrial emission sources to the west side of the Kitimat Valley, away from urban populations.

Air quality in Kitimat is influenced by emissions from industrial facilities within the community as well as, among other things, emissions from transportation, residential home heating, open burning of forestry waste, food preparation and road dust. The largest existing industrial sources relate to the Rio Tinto aluminum smelter (Rio Tinto) and associated marine traffic. Emissions from the LNG Canada Export Terminal (LNG Canada) and associated marine traffic will occur when the facility commences operation and therefore were included in the assessment.

The Kitimat LNG Project was originally included in the assessment, but the certificate holder for this project has now indicated publicly that it will not be advancing the project. Therefore, Cedar updated its modelling to remove emissions from the Kitimat LNG Project in its estimates, at the EAO's request. The estimates in this Report reflect those without the Kitimat LNG Project.

#### *5.1.2.2 Potential Project Effects*

The Application noted that the majority of CAC emissions from Cedar LNG during construction would result from site preparation and clearing, marine-based and land-based infrastructure construction, marine transport of construction materials and vehicle traffic. During the operations phase, emissions would be created through treatment and liquefaction of natural gas, storage and offloading of LNG at the floating LNG facility, LNG carrier loading, marine shipping/transportation, facility/infrastructure maintenance and vehicle traffic. During decommissioning, CAC emissions may result from vehicle traffic, decommissioning of marine-based and land-based infrastructure and marine transport of decommissioned infrastructure.

The potential effects of Cedar LNG on air quality were assessed in the Application through dispersion modelling of emissions associated with operations, as the Application stated that emissions during this phase of Cedar LNG would be the most substantial. Three modelling scenarios (refer to , below) were identified in the Application to represent operations.

The base case dispersion model considered emissions from existing (Rio Tinto) and approved (LNG Canada) sources in the LAA/RAA. Cedar proposed that this approach was sufficiently conservative to characterize cumulative air quality; therefore, the inclusion of additional baseline values based on nearby long-term monitoring stations was considered to be unnecessary. The base case identified exceedances of the AQO or CAAQS for concentrations of $SO_2$ and $PM_{2.5}$. Rio Tinto was determined to be the source of $SO_2$ concentrations greater than the AQO and CAAQS, with these exceedances extending approximately 15 km south and more than 20 km north of the smelter.

The project-alone case considers only Cedar LNG emissions. To be conservative the modelling assumed all of Cedar LNG's equipment operated at full capacity 100 percent of the time rather than at average operating capacity (i.e., less than 100 percent). This includes boiler use, flare stack, thermal oxidizer, tugboats (marine diesel powered) used for berthing and LNG carriers (marine diesel powered) at berth while loading. No exceedances to the AQO or CAAQS were identified from the project-alone case.

The Application case considers the combination of Cedar LNG emissions (project-alone case) and existing/approved emission projects in the LAA/RAA (base case). This model also assumes Cedar LNG's equipment is operated at full capacity 100 percent of the time. Cedar determined that the CAC concentrations in the Application case were very similar to the base case and that Cedar LNG would have negligible effects on predicted maximum concentrations.

Cedar stated that the emissions associated with the operation of Cedar LNG are predicted to result in a small, localized effect on air quality. With the largest effect within 100 m to 1 km of the FLNG Facility, on remote, unoccupied lands. This effect diminishes substantially with increasing distance from the Cedar LNG emission sources. This predicted deterioration is attributable to the combustion sources onsite (regen gas heater, thermal oxidizer, boiler, flare stack, and docked marine vessels).

**Table 10: Summary of the maximum predicted CAC concentrations**

| Air Quality Parameter | Averaging Period | Ambient Air Quality Objective (µg/m³) | Base Case (µg/m³) | Project-Alone Case (µg/m³) | Application Case (µg/m³) |
|---|---|---|---|---|---|
| $NO_2$ | One-hour | 113<br>*79* | 102.6* | 73.5 | 103.0* |
| | Annual | 32<br>*23* | 11.2 | 4.2 | 12.1 |

| Air Quality Parameter | Averaging Period | Ambient Air Quality Objective (µg/m³) | Base Case (µg/m³) | Project-Alone Case (µg/m³) | Application Case (µg/m³) |
|---|---|---|---|---|---|
| $SO_2$ | One-hour | 183[1]<br>*170* | **1,176*** | 55.6 | **1,176*** |
| | Annual | 13<br>*11* | **43.6*** | 1.3 | **43.9*** |
| $PM_{2.5}$ | 24-hour | 25<br>*27* | **29.4*** | 4.2 | **29.6*** |
| | Annual | 8<br>*8.8* | 7.2 | 0.8 | 7.5 |
| CO | One-hour | 14,300 | 1,813 | 631 | 1,818 |
| | 8-hour | 5,500 | 319 | 244 | 319 |

Italics indicates the applicable CAAQS (2020 for $PM_{2.5}$, and 2025 for $NO_2$ and $SO_2$)
Bold text indicates AQO exceedances
*Indicates exceedance of the applicable 2020 or 2025 CAAQS
1 indicates the AQO as of 2019 and is equivalent to the 2020 CAAQS

### *MARINE SHIPPING SUMMARY OF CAC EMISSIONS AND DISPERSION MODELLING RESULTS*

Throughout operations, it is estimated that one LNG carrier will travel along the shipping route every seven to 10 days (including both in and out of Kitimat Arm). Two tugboats will escort this carrier along the shipping route from the Triple Island Pilot Boarding Station. Cedar conducted dispersion modelling of exhaust emissions. The modelling assessed the effects to two nearby communities, Hecate Strait near the Triple Island Pilot Boarding Station and in the Douglas Channel near Hartley Bay. The modelling predicted marine vessel traffic could result in a maximum hourly average $NO_2$ concentrations of 17.0 µg/m³ in Hecate Strait with SO2 concentrations significantly below the AQO and CAAQS. In the Douglas Channel, Cedar predicted the maximum hourly average $NO_2$ concentrations from marine vessels would be 31.0 µg/m³ also with $SO_2$ concentrations significantly less than the AQO and CAAQS.

### *POSITIVE EFFECTS*

Cedar did not identify any positive effects of Cedar LNG on the air quality VC.

#### *5.1.2.3 Mitigation Measures Proposed in the Application*

The Application proposed the following mitigation measures to avoid or minimize the potential adverse effects of Cedar LNG on air quality:

- Implement a construction environmental management plan (CEMP) to manage potential effects on air quality;
- Manage vehicle and equipment emissions by conducting regular maintenance during all project phases;
- Control fugitive dust emissions from the movement of construction equipment during construction and decommissioning; and

- Ensure diesel-fired equipment that will be used during construction (vehicles and equipment) and operations (emergency power generators) are powered by low sulphur fuel.

In addition to the identified mitigation measures listed, Cedar has integrated certain design decisions into the Project to help reduce the effects of Cedar LNG. The key design decision relevant to the air quality VC is the use of BC Hydro electricity as the power source during operations rather than the alternative option of a natural gas generator system. Usage of BC Hydro electricity will result in approximately 96 percent less emissions (for example, $SO_2$, $NO_2$).

During Application Review, Cedar also proposed a Follow-up Program for air quality, and a community feedback process which are described further below.

### 5.1.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group and public, the following key issues related to the assessment of air quality for Cedar LNG were identified:

- Kitimat airshed and dispersion modelling;
- Emissions from vessels along shipping route; and
- Indigenous Knowledge and engagement.

#### *5.1.3.1 Kitimat Airshed and Dispersion Modelling*

The Ministry of Environment and Climate Change Strategy (ENV) was of the view that the cumulative effects assessment did not adequately account for the contribution of unmodelled sources because baseline concentrations were not applied to model results. Specifically, a global background concentration for $SO_2$ was not included and local baseline concentrations for $NO_2$ and $PM_{2.5}$ were not added to model results to account for the contribution of unmodelled sources such as domestic emissions, open burning etc. ENV recommended that further consideration was required, including addition of baseline concentrations from monitoring data. In addition, a comment was submitted by Kitimat Terrace Clean Air Coalition (KTCAC) (via the public comment period on the Application) regarding Cedar LNG's dispersion modelling. KTCAC expressed concerns regarding lack of adequate model evaluation, inappropriate claims regarding model conservatism and a weakness in the model scope (that is, exclusion of ozone). Finally, ECCC and Northern Health recommended that Cedar participate in airshed-wide management strategies (such as Kitimat Airshed Group) to identify opportunities for emission reductions.

To address ENV's concern, Cedar provided predicted concentrations, with removal of Kitimat LNG, with the inclusion of local baseline (consistent with the BC Air Quality Dispersion Modelling Guideline) for $PM_{2.5}$ and $NO_2$, and with inclusion of global/regional background for $SO_2$.

As was shown in the original modelling, the base case concentrations of 1-hour and annual $SO_2$ and 24-hour $PM_{2.5}$ concentrations exceeded the AQO in various locations past the industrial fence line. With the addition of local baseline concentrations for $PM_{2.5}$ and $NO_2$ the increase in maximum predicted concentrations resulted in fence line exceedances for both 1-hour $NO_2$ and annual $PM_{2.5}$. There were no exceedances of the AQO for CO or annual $NO_2$.

The fence line exceedances were largely attributed to the base case as opposed to the project-alone case. To appropriately assess the application case, which combines the base case and the project alone case, specific scenarios were applied to each CAC (consistent with the BC dispersion modelling guideline). For $SO_2$ the change from a base case including global background concentrations to the application case showed an increase of 0.08 percent and 0.69 percent for the 1-hour and annual averaging periods, respectively. For $NO_2$, the change from a base case including local baseline concentrations to the application case showed an increase of 0.31 percent for the 1-hour averaging period. For $PM_{2.5}$ the change from a base case including local baseline concentrations to the application case showed an increase of 0.49 percent and 2.59 percent over the 24-hour and annual averaging periods, respectively.

ENV agreed with the proponent's conclusion that the project itself will result in very minor changes to local air quality. ENV's primary focus was that the proponent needed to reasonably characterize air quality in the assessment area.

Regarding KTCAC's concerns, Cedar explained that the modelling methods that were selected were chosen to account for a range of potential factors, including methods following the BC Air Quality Dispersion Modelling Guidelines, methods specifically designed/modelled to replicate the potential conditions (such as atmospheric or terrain) that would be encountered, and the utilization of current information (for example, Rio Tinto) for the base case estimation. As previously noted, to ensure a conservative assessment both the original application case, as well as two additional models (inclusion of baseline and global/regional), were evaluated. Ozone was not assessed as it is not directly emitted by Cedar LNG and little evidence has been shown regarding increased ozone production or that ozone is an issue in Kitimat, as demonstrated in an air quality technical data report released in 2014 regarding LNG Canada. Cedar also committed to developing a community feedback process that aims to provide open and transparent means for the community to seek information and raise concerns as well as have inquiries addressed in a timely manner during construction and operation.

Regarding the request from ECCC and Northern Health to participate in airshed-wide management strategies, Cedar committed to joining the Kitimat Airshed Group and has begun the process to become a member.

Following review, ENV stated a lack of confidence in the approach that Cedar had taken for assessing the model results in their model evaluation. ENV noted that Cedar had scaled ambient concentration of $SO_2$ by 68 percent to account for reduced emission from the Rio Tinto as opposed to scaling the emission sources themselves, which would be necessary as the facility is large and has many different sources, each with unique discharge characteristics. With

respect to $PM_{2.5}$ and $NO_2$, ENV stated that model evaluation conducted by Cedar demonstrated how the model was not conservative and that the addition of a regional baseline concentrations was important.

The EAO notes that as part of the permitting process for Cedar LNG, the OGC would require detailed project design with updated emissions modelling, justification of the equipment and consideration of ENV's best achievable technology (BAT) policy. An air quality management plan and monitoring program would be expected to be conditions of a permit. Considering the concerns raised during the EA, the EAO also recommends a condition (9) requiring Cedar to develop a CEMP, including air quality management measures and a condition (11) requiring Cedar to develop a community feedback process. The EAO also recommends this same community feedback process as a federal Mitigation Measures, and additionally recommends a Follow-up Program for air quality under the IAA, as described in section 5.1.4.1 below. In consideration of the comments received during the EA and in acknowledgement of the importance of considering the wider regional context and cumulative effects of air quality, the EAO recommends a provincial condition (16) requiring Cedar to participate in regional cumulative effects initiatives, specifically, the Kitimat Airshed Group, or successor airshed monitoring programs established by the Province (which include participation from industry). The EAO is of the view that these conditions, the Follow-up Program, and the additional information that will be provided in permitting would provide adequate means to verify the predictions on air quality during the EA and would require Cedar to implement additional mitigation, if thresholds are exceeded. The community feedback process would also provide a venue for the community to raise concerns directly to Cedar, including through additional mitigation measures or monitoring, as required.

#### *5.1.3.2 Emissions from Vessels along Shipping Route*

Lax Kw'alaams, Kitselas, Gitga'at, Gitxaała, and Haida raised concerns around the effects of marine shipping emissions and requested mitigation measures for air emissions from shipping.

Lax Kw'alaams, Kitselas, Gitga'at, Gitxaała questioned whether the two locations modelled for effects to air quality from shipping (the Triple Island Pilot Boarding Station and Douglas Channel nearly Hartley Bay) were sufficient and representative of marine users and sensitive areas throughout the entire shipping route.

Cedar noted that the locations used to assess potential air quality and noise effects were selected for two reasons. First, these locations are representative of the entire shipping route based on the meteorological conditions and terrain characteristics. The location near the Triple Island Pilot Boarding Station is representative of the open water portion of the shipping route. The location near Hartley Bay is representative of the Principe Channel and Douglas Channel portion of the shipping route. Results of air dispersion modelling at these locations can be defensibly extrapolated to the entire shipping route due to the similar meteorological conditions and terrain characteristics of the other areas along the shipping route. As a result, modelling is expected to provide similar predicted concentrations of CACs along the entire

shipping route. Second, modelling results for the section of the shipping route passing Hartley Bay provides an understanding of the greatest potential exposure of people to shipping emissions. While traditional harvesting activities and other marine users occur along the entire length of the shipping route, these activities are short-term and intermittent. Therefore, marine users would have very limited exposure to air emissions from the LNG carriers and tugboats. In contrast, residents of Hartley Bay are present continuously and therefore would have the highest potential exposure to air emissions. This allows for assessment to consider the greatest potential interaction between people and shipping-related air emissions.

Indigenous nations did not provide further comments on this issue. The EAO is satisfied with Cedar's response and concludes that the assessment of air quality along the shipping route was adequate for the purposes of the EA.

Kitselas, Metlakatla and Gitxaała noted that the proponent indicated that the base case modelling scenario included marine traffic along the marine shipping route associated with LNG Canada and Rio Tinto. However, it was unclear if emissions from carriers and tugboats associated with LNG Canada and Rio Tinto along the proposed shipping route were included. Lax Kw'alaams requested clarification as to why CAC concentrations associated with LNG carrier traffic along the shipping route were modeled only in the project-alone case, rather than considered in the base case and application case. Lax Kw'alaams also requested Cedar provide further rationale for Cedar's statement that the cumulative effects of shipping would be negligible or very small. Gitxaała noted the uncertainty in modeling shipping emissions and commented that estimates of effects would benefit from real-world data to verify assumptions. Gitxaała requested Cedar commit to participating in any new regional initiatives that could oversee and manage the effects on air quality from project-related shipping activities.

Cedar stated that for the shipping assessment for Cedar LNG, existing and future shipping activities were considered by adding a conservative baseline concentration to predicted concentrations from LNG carrier and tugboats associated with Cedar LNG. This baseline concentration was established using ambient monitoring data from Kitimat. This value is considered conservative because existing and future marine vessels are transient in nature and as the shipping assessment shows marine vessel emissions are not expected to persist in one location for a long duration (< 1 hour).

Cedar explained that the Cedar LNG-related shipping activities (i.e., one LNG carrier and two tugboats) at Hartley Bay under conditions that are conducive to poor dispersion (low wind speeds, temperature inversion) are predicted to result in a maximum 1-hour predicted $NO_2$ concentration of 31 µg/m$^3$. Near the Triple Island Pilot Boarding Station under conditions that move vessel plume towards land (moderate wind speeds from the west direction) the maximum 1-hour predicted $NO_2$ concentrations is 17 µg/m$^3$. To estimate the cumulative effects, Cedar developed a conservative baseline concentration using ambient monitoring data from Kitimat Whitesail monitoring station (4.5 µg/m$^3$). Cedar was of the view that this baseline reflects the current and expected future ambient air conditions from shipping along the

shipping route. By adding the baseline concentration with the maximum predicted $NO_2$, the cumulative concentration predicted at Hartley Bay is 35.5 µg/m$^3$ and at the Triple Island Pilot Boarding Station is 21.5 µg/m$^3$. In all cases these predicted levels are less than the AQO (113 µg/m$^3$) and CAAQS (79 µg/m$^3$) for $NO_2$. Considering the transient nature of these vessels and the frequency of adverse meteorological conditions affecting Hartley Bay and the Triple Island Pilot Boarding Station (these weather conditions were predicted to occur for only 34 hours over a three-year period at Hartley Bay [0.13 percent of the time] and only 263 hours over a three-year period at the Triple Island Pilot Boarding Station [1 percent of the time]). Cedar noted that this is a conservative estimate of cumulative effects to air quality from shipping.

In its Application, Cedar proposed the development of a marine transportation management plan that describes the mitigation measures that will protect marine users and maintain navigational safety during all phases of the Project (see Section 5.9: Marine Use for further details). As part of this plan, Cedar proposed to include reporting mechanisms for Indigenous nations and marine users to provide feedback related to LNG carrier interference with marine use, which could include concerns related to air quality. Members of the public or Indigenous users could also submit concerns regarding air quality through the community feedback process, described above.

Kitselas and Metlakatla did not provide further comments on this issue. In consideration of concerns raised by Indigenous nations, the EAO proposes a provincial condition requiring Cedar to develop a marine transportation communication report (Condition 12) and recommends Mitigation Measures under the IAA for air quality, including a marine transportation plan, as described below in section 5.1.4.1. Both of these provincial and federal recommendations would include reporting mechanisms for Indigenous nations and marine users to report on any concerns related to LNG carrier interference with marine use, including from air quality effects. The EAO also notes that the provincial condition recommended above on regional cumulative effects initiatives (16) also requires Cedar to participate in relevant federal initiatives (in which industry is invited to participate) related to effects of marine shipping in the region. The EAO notes that air quality effects of the Project on Indigenous experience and use is discussed Part C of this Report. The EAO has also considered comments from Metlakatla, Kitselas, and Gitxaała in the rating of residual effects below. With the proposed mitigation measures, the EAO is satisfied this issue has been adequately addressed for the purpose of EA.

#### *5.1.3.3 Indigenous Knowledge and Engagement*

Kitselas, Haida and Gitxaała were of the view that the assessment of the air quality VC did not effectively or clearly integrate Indigenous and community knowledge. Nations noted that they needed this information to understand potential interactions and effects, determine their significance and characterize impacts to Indigenous interests.

Cedar stated that their engagement with Indigenous nations began between late 2019 and early 2020 with the primary purpose of understanding potential Cedar LNG-related effects to Indigenous interests, as well as identifying measures to avoid or mitigate those effects. Specific

observations and trends over time related to air quality were not provided. Cedar's approach to engagement with Indigenous nations included providing drafts of environmental assessment documents and technical data reports (such as air quality assessment of emissions resulting from an LNG carrier and two tugboats travelling along shipping route) prior to submission to the EAO and continuing to meet with Indigenous nations representatives regularly to provide Cedar LNG updates.

Through these engagement activities with Indigenous nations, concerns regarding air quality were shared with Cedar. In consideration of these concerns, Cedar assessed effects from marine shipping, which included emissions from one LNG carrier and two tugboats that will travel along the shipping route. However, specific observations and trends over time regarding air quality were not provided to Cedar by Indigenous nations through the previously referenced engagement. Had these observations been shared, Cedar noted that it would have incorporated them into the air quality assessment. In the absence of Indigenous and/or community knowledge-defined indicators related to air quality, regulatory indicators in the form of air quality objectives were used in the assessment of air quality.

Kitselas did not provide any further comments on this issue. The EAO notes that it has considered the information provided from Indigenous nations on the importance of the area to Indigenous use in the rating of context below.

### 5.1.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated the potential effects to air quality by considering construction, operations and decommissioning activities that could affect air quality and may result in residual adverse effects from increased one-hour and annual $SO_2$, one-hour and annual $NO_2$, one-hour and 8-hour CO emissions, and 24-hour and annual $PM_{2.5}$.

#### *5.1.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[11] , the EAO proposes the following provincial conditions:

- CEMP, including air quality management (Condition 9);
- Community feedback process (Condition 11) to receive, address, and report on community concerns from the Project, including related to air quality, which would include the requirements to:

[11] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

    - Establish and maintain communication methods for providing the public with information and enabling the public to submit comments or concerns regarding Cedar LNG; and
    - Report out comments received and Cedar's response to issues raised, including follow-up actions, mitigations or resolutions applied; and
- Marine transportation communication report (Condition 12), including establishment of a shipping schedule notification process for Indigenous nations; and
- Regional cumulative effects initiatives (Condition 16), which requires Cedar to participate in the Kitimat Airshed Group and relevant federal initiatives related to effects of marine shipping in the region.

The EAO notes that if Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits, including a waste discharge permit under the *Environmental Management Act*. This permitting process would be administered by the OGC. As part of this process, the OGC would require detailed project design with updated emissions modelling, justification of the equipment and consideration of ENV's BAT policy. An air quality management plan and monitoring program would be expected to be conditions of a permit. The EAO considers that, in combination with the proposed conditions, this detailed permitting process and expected permitting conditions will address the effects to air quality identified during the EA.

The EAO recommends the following Mitigation Measures under the IAA:

- Manage vehicle and equipment emissions by conducting regular maintenance during all Project phases;
- Control fugitive dust emissions (such as dust suppression by water and vehicle speed limits) from the movement of construction equipment during construction and decommissioning;
- Marine transportation plan, as described in the mitigation measures for marine use (section 5.9); and
- Community feedback process, which will require Cedar to:
    - Develop the process with the Indigenous nations and relevant authorities;
    - Implement modified or additional mitigation measure(s) and/or follow-up requirement(s) in response to the feedback received;
    - Prepare and submit to Indigenous nations, at a frequency to be determined during the development of the feedback process, summary report(s) of the feedback received during the reporting period;
    - Offer to meet with the Indigenous nations to discuss the summary report(s); and
    - Submit any updates to the community feedback process to the Indigenous nations and the Agency.

In addition, the EAO also proposes a Follow-up Program for air quality under the IAA, which would include:

- In the first three years of operation Cedar will provide an annual summary report with a comparison of pre-operation and post-operation air quality for that year. At the end of the three-year period following commencement of operation, the air quality data from the Kitimat monitoring stations will be consolidated and the results compared to:
  - Air quality modelling results;
  - Federal and provincial air quality objectives; and
  - Residual effects characterization criteria applied in the Application.
- Results of this review should include consideration of health effects, along with identifying any implementable corrective actions should monitoring show the characterization of effects exceeds what is provided in the Application, will be provided to the Agency, Health Canada, Northern Health, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla.

#### *5.1.4.2 Residual Effects*

After considering the mitigation measures, the EAO concludes that increases in CACs from Cedar LNG would be a residual adverse effect to the air quality VC for both the FLNG facility and vessels (LNG carriers and tugboats) travelling along the shipping route. Residual air quality effects to specific federal topics (for example, federal lands and effects to the health, social or economic conditions of the Indigenous peoples of Canada) are discussed in section 6.9 of this Report.

**Table 11: Characterization of residual effects for the air quality VC in the Facility Area**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low | The base case scenario showed potential concentrations of 1-hour $SO_2$, and $PM_{2.5}$ and annual $SO_2$ were all predicted to exceed the AQO and/or CAAQS, primarily as a result of Rio Tinto; therefore, the EAO considers air quality in the Kitimat area to have low resiliency or ability to accommodate additional increases in CACs. |
| Direction and Magnitude | Adverse and Low | Exceedances of the AQO and/or CAAQS occur in the base case scenario for 1-hour $SO_2$, and 24-hour $PM_{2.5}$ and annual $SO_2$. The application case is expected to result in only small increases for these CACs (with the exceedances ranging from <1 percent to 2.6 percent) and not result in any additional exceedances (of $NO_2$ or CO). |
| Extent | Local | Predicted effects to air quality from each of the CACs may occur throughout the LAA. The exceedances of the AQO and CAAQS from the application case are from one-hour and annual $SO_2$ and 24-hour $PM_{2.5}$. However, the concentrations of these CACs that are associated with the project-alone case are only present within a radius of approximately 100 m to 1 km of the FLNG facility. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Duration | Long-term | The increased concentrations of CACs from Cedar LNG facility emissions would last throughout construction and operations of the FLNG facility. Effects from decommissioning would be expected to be less but effects to air quality are still expected over the lifetime of the Project. |
| Reversibility | Reversible | The residual effects on air quality from the FLNG facility would cease following decommissioning of Cedar LNG. |
| Frequency | Frequent/Regular | Emissions of CACs from the FLNG facility would occur frequently, at regularly intervals throughout operation. |
| Affected Populations | Disproportionate | The air quality effects of the facility area would be more acutely experienced by local residents and Indigenous nation members who are located in closer proximity to emissions (such as because of employment or residence location), and have higher frequency (for example, permanency of residence or length of employment/shifts) of exposure, as well as sensitive populations including individuals that are more susceptible to COPC exposure due to physiology (such as newborns, children, pregnant or breastfeeding women and elderly people), health status (such as immune-compromised persons, persons suffering from heart disease, respiratory conditions or allergies), behaviour (such as amount of time spent outdoors), and lifestyle (for example: smoking, Body Mass Index ([BMI)] and exercise status). |
| Risk (likelihood and consequences) | Likelihood: high likelihood of effects to air quality during construction and operations (medium likelihood during decommissioning).<br>Consequence: minor consequence based on the low magnitude extending throughout the LAA.<br>Risk: based on the high likelihood (construction and operations) and minor consequence of residual effects to air quality the EAO determined that there would be a moderate level of risk during construction and operations and low during decommissioning. | |
| Uncertainty | Uncertainty in effects to the air quality VC is considered to be moderate. The EAO has a moderate level of confidence in the characterization of the residual effects presented here based on the air quality modelling completed, the approach used to establish baseline conditions, and the feedback from the Working Group during the assessment. | |
| Significance | In consideration of the above analysis, low magnitude of the predicted effects, and the conditions identified in the TOC (CEMP), proposed federal Mitigation Measures and required permitting process, the EAO concludes that the FLNG facility would not have significant adverse residual effects on the air quality VC. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

**Table 12: Characterization of residual effects for the air quality VC in the Marine Shipping Route.**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low to High | The Marine Shipping Route is not currently exposed to high levels of CACs for extended periods of time and the presence of wind increases the rate of dispersion; therefore, the resilience of air quality in the Marine Shipping Route is considered to be high. However, Indigenous users along the Marine Shipping Route are also considered highly sensitive to any change in air quality due to the potential for decreases in air quality to lead to a deterioration in experience of cultural, harvesting, and other traditional practices. |
| Direction and Magnitude | Adverse and Low | The air quality modelling predicted exhaust emissions from marine vessels would result in CAC concentrations less than the AQO and CAAQS with the baseline concentration of $NO_2$ at both Hartley Bay and the Triple Island Pilot Boarding Station (4.5 µg/m$^3$) estimated to increase by only 31 µg/m$^3$ and 17 µg/m$^3$, respectively. These cumulative totals are both less than the AQO (113 µg/m$^3$) and the 2025 CAAQS (79 µg/m$^3$). |
| Extent | Regional | Predicted effects to air quality from each of the CACs are applicable throughout the marine LAA/RAA. The emissions occurring in the marine LAA/RAA result from shipping and disperse quickly due to prevailing winds and transient nature of the vessels. |
| Duration | Long-term | The residual effects on air quality from marine shipping would occur during operations. |
| Reversibility | Reversible | The residual effects on air quality from marine shipping would cease following the end of operations of Cedar LNG. |
| Frequency | Frequent/Regular | Emissions of CACs from the marine vessels would occur frequently, approximately twice every 7-10 days as a ship transits each way along the shipping route, throughout operations. |
| Affected Populations | Disproportionate | The effects along the Marine Shipping Route would be more acutely experienced by local residents along the shipping route and Indigenous nation members who are present within the local extent (such as recreational boating or marine harvesting). |
| Risk (likelihood and consequences) | Likelihood: high likelihood of effects to air quality during operations.<br>Consequence: minor consequence based on the low magnitude extending throughout the marine LAA.<br>Risk: based on the high likelihood and minor consequence of residual effects to air quality the EAO determined that there would be a low level of risk. | |
| Uncertainty | Uncertainty is high, based on the approach to establishing baseline conditions, the modelling techniques, and the feedback from the Working group. However, the proposed provincial condition, the federal Mitigation Measures, and the required permitting process assist to reduce the risk associated with this level of uncertainty. | |
| Significance | In consideration of the above analysis, low magnitude of predicted effects, and the proposed federal Mitigation Measures, the EAO concludes that marine shipping would not have significant adverse residual effects on the air quality VC. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.1.4.3 Cumulative Effects Assessment*

**Facility Area**

Two past, present and reasonably foreseeable future projects and activities that were considered in the cumulative effects assessment for the air quality VC in the Facility Area, these being:

- Rio Tinto; and
- LNG Canada.

The two projects listed above produce similar types of CACs to Cedar LNG; however, Rio Tinto and LNG Canada produce greater quantities of CAC (with the exception of CO production by Rio Tinto). Rio Tinto produces approximately 320, 15,290, 509 and 1.7 tonnes per year of $NO_2$, $SO_2$, $PM_{2.5}$ and CO, respectively. LNG Canada will produce approximately 2,794, 716, 206 and 2,917 tonnes per year of $NO_2$, $SO_2$, $PM_{2.5}$ and CO, respectively. In comparison, Cedar LNG will produce approximately 108, 79, 23 and 54 tonnes per year of $NO_2$, $SO_2$, $PM_{2.5}$ and CO, respectively. Rio Tinto is currently in operation and LNG Canada is under construction but expected to enter operation prior to the start of Cedar LNG. Therefore, interactions during operations were the focus of the cumulative effects assessment.

**Marine Shipping Route**

Cedar assessed the cumulative emissions for shipping using dispersion modelling to come up with a baseline concentration that was added to the project shipping predicted $NO_2$ and $SO_2$ concentrations assuming a total of 12.9 vessels per day passing the Triple Island Pilot Boarding Station while coming and going from port, 4.3 vessels per day transiting the Browning Entrance and Principe Channel portion of the shipping route and 3.3 vessels per day transiting the Douglas Channel coming and going from Kitimat. The effects of marine shipping, as described in Sections 5.1.2.2 and 5.1.3, above, would not result in exceedances to the AQO or CAAQS, instead only short-term increases in CACs are predicted. These would be limited to the vicinity of the shipping route and be predicted to be substantial (but still below AQO or CAAQS) only under unfavourable and infrequent weather conditions. No additional mitigation measures for marine vessels have been proposed.

No additional mitigation measures for cumulative effects have been proposed beyond the proposed CEMP and Mitigations Measures described above. The EAO concludes that Cedar LNG would not have significant adverse residual cumulative effects on the air quality VC from either the FLNG facility or marine shipping. For the Facility Area, this conclusion was based on the small incremental effect of Cedar LNG to increases in CAC in the Facility Area; however, it is acknowledged that Project-related emissions would represent a cumulative effect in areas where $SO_2$ and $NO_2$ (1-hour) concentrations are predicted to equal or exceed guidelines in the base case. For the Marine Shipping Route, this was based on the fact that exceedances of the

AQO or CAAQS are not predicted and the duration and frequency of effects from shipping would be short-term and under infrequent weather conditions.

#### *5.1.4.4 Interactions between Effects*

Under section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the Act (2018)[12] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the air quality effects are described above in section 5.1.4.2.

The air quality VC assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Air quality modelling informed the predicted air concentrations, which were considered as part of the human health risk assessment. Inhalation of air contaminants is a pathway of potential effects that is considered in the human health risk assessment within the human health VC (section 5.12);
- The effect of the deposition of sulphur and nitrogen compounds in freshwater lakes and streams from air emissions (potentially leading to acidification and eutrophication) is considered within the freshwater fish VC (section 5.5);
- The effects of increased SO2 and NO2 concentrations on vegetation, nitrogen deposition and soil acidification are considered in the assessment of the change in native vegetation within the vegetation VC (section 5.3);
- The impact of air emissions on federal lands is discussed in section 6.9.2 of this Report; and
- The impact of air emissions on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and section 6.9 of this Report, respectively.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

[12] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

In addition, the effects of all biophysical VCs including air quality, vegetation and freshwater fish, are considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6) and the effects of all human VCs, including human health, are considered in the assessment of human and community well-being (section 6.8). These assessments consider linkages within each of the biophysical and human realms and consider effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function and a moderate magnitude effect, with effects both positive and negative, on human and community well-being.

#### *5.1.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of air quality effects.

In the Application, Cedar stated that it did not receive traditional knowledge or traditional use information related to air quality during its consultation and information sharing activities. Therefore, Cedar only used publicly available ambient monitoring data to describe the existing conditions of air quality and predicted air quality using modelling using standard scientific practices.

During the EA, Gitga'at, Gitxaała, Haida, Kitselas, Kitsumkalum, Lax Kw'alaams and Metlakatla provided comments on the assessment of air quality effects, including related to proposed mitigation measures and characterization of residual and cumulative effects. The information provided is summarized above in section 5.2.3, as well as being discussed in the nation-specific sections in Part C of this Report. Key ways in which the EAO took these comments into account in the acoustics assessment included:

- In the residual effects characterizations:
  - Identifying that that the air quality environment of the Marine Shipping Route as sensitive, based on the potential for decreases in air quality to result in a deterioration of experience of cultural, harvesting, and other traditional practices of Indigenous nations;
  - Identifying the potential for disproportionate effects to Indigenous nations along the Marine Shipping Route; and
  - Rating the uncertainty of the air quality residual effects assessment for the Marine Shipping Route as high;
- Recommending a Follow-Up Program for air quality under the IAA;
- Recommending marine transportation communication procedures and a community feedback process, which would provide a mechanism for Indigenous nations to raise concerns regarding air quality, as federal Mitigation Measures and provincial conditions;
- For the community feedback process: requiring the report to be developed in consultation with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams

and Metlakatla, including newspaper notices as a method of communication, and including a requirement on reporting location information; and
- Including a proposed condition requiring Cedar to participate on regional cumulative effects initiatives.

#### *5.1.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or significant cumulative effects on the air quality VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 9: Construction Environmental Management Plan, Condition 11: community feedback process, Condition 12: marine transportation communication report, and Condition 16: Regional Cumulative Effects Initiatives; and recommended Mitigation Measures and Follow-up Program under the IAA for air quality (Appendix 1).

# 5.2 ACOUSTICS

## 5.2.1 BACKGROUND

This section assesses the potential effects on acoustics from Cedar LNG during all Project phases. Construction, operations, and decommissioning of the Project all have the potential to increase noise and nuisance to the Project assessment area and noise sensitive receptors.

Acoustic effects to federal lands and effects to the current use of lands and resources for traditional purposes, cultural heritage, and the health, social or economic conditions of the Indigenous peoples of Canada are discussed in section 6.9 of this Report, Requirements of the *Impact Assessment Act*.

### *5.2.1.1 Regulatory Context*

The Health Canada Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada Noise Guidance), is the primary source of federal noise guidance. It provides generic guidance on predicting health risks resulting from noise emissions common to major infrastructure projects. This noise guidance addresses noise effects as they relate to high annoyance as well as sleep disturbance when assessed at noise sensitive receptors. It uses daytime or nighttime equivalent sound levels ($L_d$ and $L_n$, respectively), adjusted day-night average sound levels ($L_{dn}$), and percent highly annoyed ( %HA) and other metrics to quantify noise effects for project construction, operation and decommissioning activities. Health Canada does not have a noise regulation and does not mandate specific noise limits, instead its approach to noise assessment health-based evaluation tools and guidelines developed in partnership with organizations such as the World Health Organization (WHO), the International Organization for Standardization and the American National Standards Institute.

If Cedar received an EAC and federal IAA approval, it would require a Facility Permit under the *Oil and Gas Activities Act*. Permit requirements would be established based on the British Columbia Noise Control Best Practice Guideline (OGC Noise Guideline), the Liquified Gas Facility Regulation, and the OGC LNG Facility Permit Application and Operation Manual, which are the primary Provincial regulations providing noise guidance. The OGC Noise Guideline specifies the best practices for noise control for LNG facilities in BC. The OGC Noise Guideline indicates that all new OGC-regulated facilities when in operation must meet a daytime (0700 hr to 2200 hr) and nighttime (2200 hr to 0700 hr) permissible sound level (PSL)[13] at nearest residential dwellings or 1.5 km from facility boundary, whichever is closer. The OGC Noise guideline does not define a sound level limit for construction and decommissioning activities of energy facilities in BC.

[13] The PSL is derived from a base value which includes a 5 dBA allowance for industrial activity to the assumed ambient sound level, plus adjustments intended to reflect site specific aspects of the facility, and the environment. The nighttime permissible sound level cannot exceed 65 dBA after adjustments.

The LNG Facility Permit Application and Operation Manual (OGC 2022 V1.7) is a guidance document supporting the provincial permitting process for LNG facility construction and operation. Under Section 4.2.3 of this manual, permit holders should ensure that mitigations measures are built into the design and operating procedures using the OGC Noise Guideline. The manual further states that, in some cases a noise management plan may be used. Cedar, if issued both an EA approval and permit, would also be required to adhere to any conditions of the provincial or federal environmental assessment approval and the LNG facility permit. Permit holders will also need to consider the effect of noise from the LNG Facility throughout the engineering design.

The OGC Noise Guideline also addresses low frequency noise concerns.

The Health Canada Noise Guidance has a broader definition of noise sensitive receptors than the OGC Noise Guideline, and as such the following are considered as noise sensitive receptors in this assessment:

- Residential dwellings;
- Traditional land use area;
- Commercial and industrial premises;
- Daycare centres and schools;
- Entertainment establishments;
- Hospitals;
- Places of worship and cemeteries;
- Active and passive recreation areas;
- Permanent and seasonal residences;
- Seniors' residences; and
- Worker's living quarters (while off-duty).

Based on the Health Canada Noise Guidance, the change in percent highly annoyed (%HA) should not increase by more than 6.5 percent at a receptor for project activities with a duration of more than one year. Therefore, for this assessment, this threshold is applicable to all project phases. Health Canada suggests that mitigation be implemented when noise levels during long-term construction result in a greater than 6.5 percent increase in %HA. Health Canada also recommends mitigation of project noise if the $L_{dn}$ exceeds 75 dBA at the noise sensitive receptor, even if the change in %HA does not exceed 6.5 percent.

For sleep disturbance, the Health Canada Noise Guidance recommends that maximum indoor sound levels ($L_{max}$) should not exceed 45 dBA $L_{max}$ more than 10 to 15 times during the nighttime period (Health Canada 2017). Health Canada also recommends a sleep disturbance threshold of no more than 30 dBA energy equivalent sound level ($L_{eq}$) for indoor continuous noise during the sleep period. With an estimated 15 dBA outdoor-to-indoor sound transmission loss, Health Canada recommends that the equivalent outdoor sound levels should not exceed 60 dBA $LA_{max}$ (maximum) and 45 dBA (continuous), respectively.

There are no applicable federal or provincial regulations related to noise from marine transportation and shipping.

#### *5.2.1.2 Boundaries*

The local assessment area (LAA) is a 3 km area in all directions from the Facility Area, transmission line corridor, and shipping route. The regional assessment area (RAA) is the same as the LAA (Figure 7). The OGC Noise Guideline requires that environmental noise impacts be assessed at a distance of 1.5 km from the facility or at nearest residential dwelling whichever is closer. Since there are no residential noise sensitive receptors within 1.5 km from the Project, the nearest residential noise sensitive receptor in Kitamaat Village, approximately 2.6 km from the Project Area, was assessed. Noise decreases with distance from the noise source. Cedar assumed that noise at a distance greater than 3 km from the LNG facility, transmission line, and shipping route would attenuate to a level that is below the ambient sound level. Therefore, assessments outside the 3 km LAA/RAA were not completed.

Cedar considered effects to acoustics during construction, operation, and decommissioning.

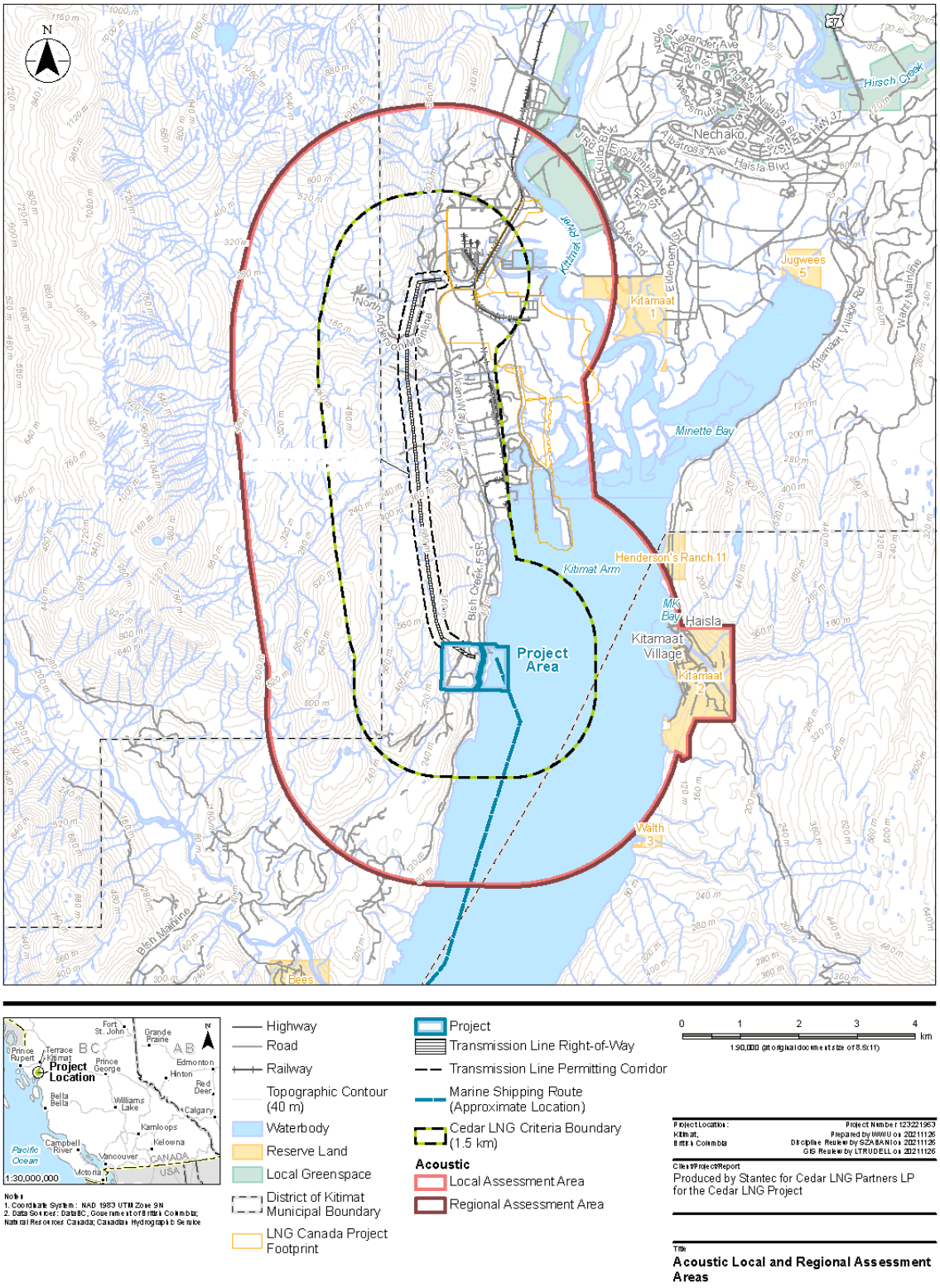


**Figure 7. Marine Terminal LAA and RAA for the acoustics VC.**

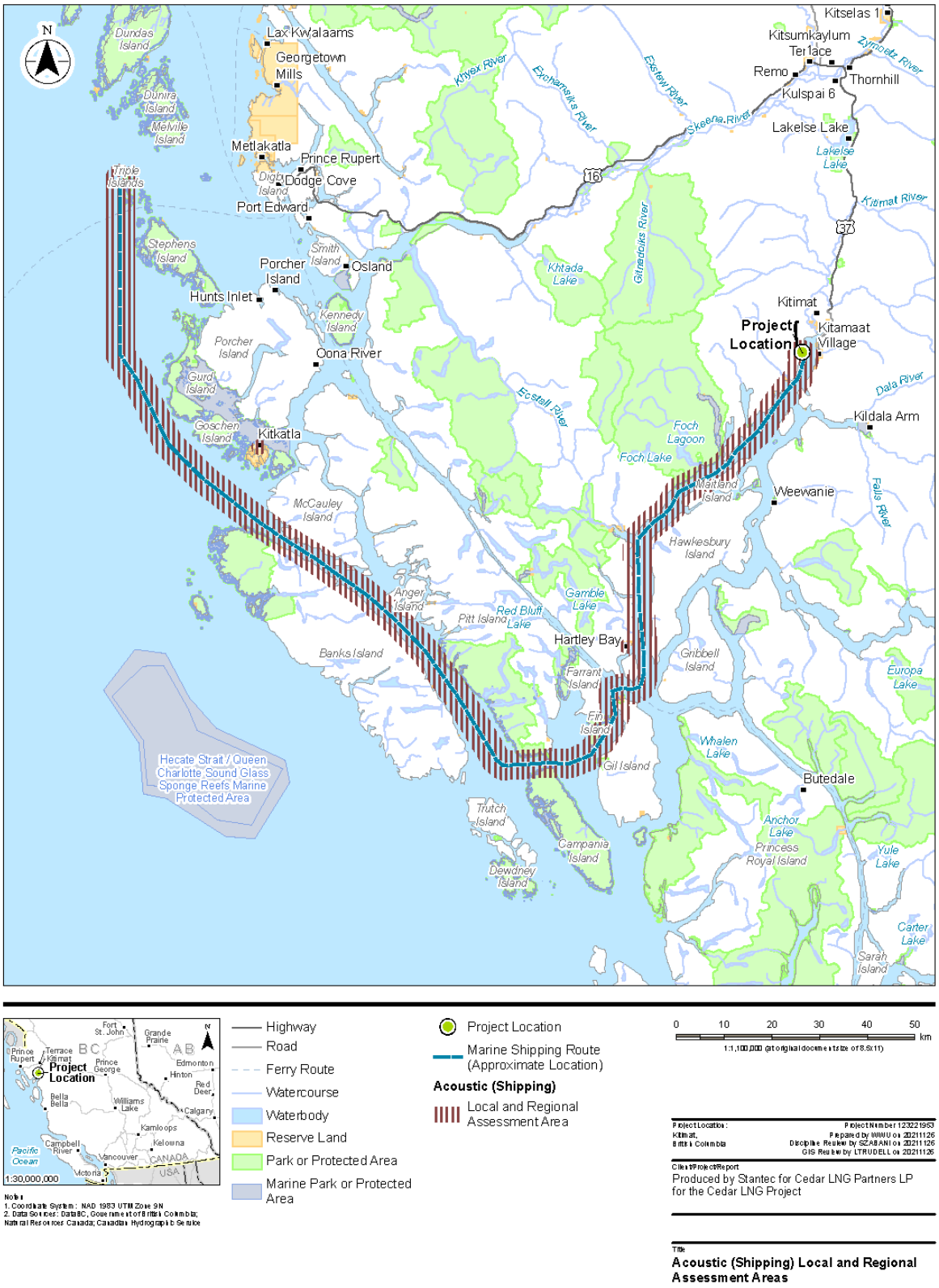


**Figure 8. Marine Shipping Route Cedar LNG LAA and RAA for the acoustics VC.**

### 5.2.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.2.3.

#### *5.2.2.1 Existing Conditions*

The existing conditions were described using measures $L_d$ (existing baseline day), $L_n$ (existing baseline night) and $L_{dn}$ (existing baseline day-night). The baseline sound levels were assessed for the closest noise sensitive residential receptors within 3 km from the LNG facility, transmission line, and shipping routes. The locations along the combined Project and LNG Canada 1.5 km criteria boundary were also assessed as per the OGC Noise Guideline. The noise sensitive receptors within the LAA/RAA are presented in Table 7.3.4 and Figure 7.3.3 of the Application and were identified in accordance with regulatory requirements and input from Indigenous nations. Only the most affected noise sensitive receptors were assessed in the Application because residences further away are expected to experience similar or lower noise levels than those experienced at the identified receptors. The existing acoustic environment in the LAA/RAA is dominated primarily by nature sounds such as those from birds, wind-generated noise from vegetation, rain, waves, and sometimes the sounds of marine vessel traffic. In Kitamaat Village, Metlakatla Village, and Kitimat, the existing acoustic environment also includes anthropogenic sounds such as rail, marine, air, and vehicular traffic, as well as industrial activities. For Lach Klan (Kitkatla), anthropogenic noises are limited and infrequent.

Baseline sound levels for residential noise sensitive sound receptors are based on default ambient sound levels from the OGC Noise Guideline combined with predicted operation noise from the LNG Canada Export Terminal (LNG Canada 2014). Daytime sound ranged between 45.0 dBA and 48.1 dBA, nighttime sound ranged from 35.5 dBA to 38.9 dBA, and day-night sound ranged between 45.2 dBA and 48.4 dBA. Both the Daytime baseline sound levels and the Nighttime baseline sound levels do not exceed the calculated OGC PSL at any of the receptor IDs (See Appendix 7-3A Acoustic Technical Data Report, Table 2).

There have been recent noise monitoring programs conducted in the Kitimat area as part of the environmental assessment process for LNG Canada. Data from this monitoring were used to establish the ambient sound levels for representative noise sensitive receptors at Kitamaat Village. The baseline sound levels for identified receptors in the LAA/RAA beyond residential noise sensitive receptors ranged from 43.3 dBA to 48.0 dBA (Daytime sound), 35.0 dBA to 43.9 dBA dBA (Nighttime sound), 46.9 dBA to 55.3 dBA (Day-Night sound). These baseline sound levels used in the compliance assessment against the %HA threshold from the Health Canada guidance. As per Health Canada noise guidance, receptors that are in rural areas that are considered to have a greater expectation of “peace and quiet” (i.e., $L_{dn}$ of less than 45 dB) have their $L_{dn}$ adjusted by +10 dBA.

#### *5.2.2.2 Potential Project Effects*

Project activities including site preparing and clearing, construction of infrastructure, traffic, FLNG facility operation and maintenance, LNG carrier loading, marine shipping and transportation, and decommissioning would all create noise.

Cedar's noise modelling predicted there would be no change from existing sound levels with the addition of the Project at many of the 28 noise receptors during construction and operations. For receptors with a change, the increase in noise level was less than 2 dBA (Day-Night sound) and the increase in %HA was less than 2.0 for all receptors, with the exception of Half Moon Bay during construction and operations (where %HA increased 5.8 and 2.9, respectively) (see the Cedar HC-019 Response Technical Memo, Tables 15 and 16 for further details).

Construction, operation, and decommissioning phase activities would cause an increase in noise levels within the LAA/RAA. However, the modelled construction noise does not exceed the 6.5 percent highly annoyed threshold (%HA) of the Health Canada Noise Guidance for suggested mitigation at any of the identified noise sensitive receptors (See Table 7.3.13 in the Application). Construction noise modelling is considered a conservative estimate of decommissioning phase noise; thus, the magnitude of decommissioning noise is also predicted to be low. Modelled operation noise does not exceed the %HA, $L_d$, $L_n$ or $L_{max}$ nighttime threshold of the Health Canada Noise Guidance at any of the identified noise sensitive receptors. Noise effects are also predicted to comply with provincial guidelines.

Marine shipping is conservatively estimated to occur twice a week during peak construction times. Since the noise effect associated with construction-related marine shipping is expected to be similar or less that the noise effect during operation, the information on marine traffic during operation can be used to conservatively understand the effects of the marine transportation activities during construction and decommissioning. Therefore, effects for marine shipping were only considered during operations. In operations, noise will be emitted from shipping activities and the marine terminal. The shipping activity noise effects include the LNG carriers, warning airhorn, and accompanying tugboats. It is expected that one LNG carrier every 7 to 10 days will travel along the shipping route from the Triple Island Pilot Boarding Station to the Project's marine terminal. Shipping activities were modelled on a worst-case 24-hour basis which included one LNG carrier travelling along the channel (carrier speeds of approximately 8 knots [14.8 km/hour]), accompanied by two escort tugboats for approximately 19 hours of which 10 hours and 9 hours are during the daytime and nighttime periods, respectively. The LNG carrier will berth at the terminal for loading of LNG for approximately 5 hours. Therefore, a total of 24 hours of shipping time is estimated for the worst-case basis. Of the receptors that will receive marine horn sleep disturbance, none of them exceed a 60 dBA $L_{max}$ (See table 7.3.14 in Application). Noise effects from project operation which includes shipping activities will comply with federal and provincial noise guidance. Predicted effects for

the decommissioning phase are assumed to be the same or lower than the noise levels predicted for the construction phase.

***POSITIVE EFFECTS***

Cedar did not identify any positive effects of the Project on the acoustics VC.

#### *5.2.2.3 Mitigation Measures Proposed in the Application*

Cedar identified the following mitigation measures would apply to noise effects of Cedar LNG:

- Advanced notification to residences (within 3 km of activities) of planned high-disturbance noise-causing activities at the Facility Area;
- Fitting gas or diesel engine exhausts with noise mufflers and turn off equipment when not in use to minimize idling;
- Quieter equipment will be selected over louder equipment when possible (such as, vibratory or drill pilling over impact pilling);
- Regular maintenance of machinery and equipment to ensure noise emissions are within range set by manufacturer;
- Carry out noisy fabrication work at another site and then transport to project site; and
- In the procurement process, all noise ratings of construction and operation equipment would be considered.

On top of the identified mitigation measures listed, Cedar has integrated certain key design decisions into the Project to help reduce the effects on acoustics, such as:

- Noise emissions onsite are reduced during the construction phase as the FLNG facility is being constructed overseas and towed to site, instead of constructed onsite; and
- Electrification of Cedar LNG from the BC Hydro grid during operation reduces noise effects as electric equipment is generally quieter.

Cedar noted that construction activities are planned for the hours of 0700 to 2200 and would not be undertaken during nighttime hours. However, in the case that construction is required during nighttime hours (2200 h to 0700 h), Cedar would be required to work with the OGC and District of Kitimat to seek the necessary permits and approvals. This work would also be short-term. If blasting is required, blasting would occur during the daytime period only and the blast design will result in air overpressure and vibration levels meeting the thresholds at the closest receptor.

During Application Review, Cedar also proposed a Follow-up Program for noise, which is described further below, and a Community Feedback Process, which is described in Section 5.1: Air Quality.

### 5.2.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of acoustic for Cedar LNG were identified:

- Follow-up noise monitoring; and
- Effect of shipping noise on Indigenous land use patterns.

#### *5.2.3.1 Follow Up Noise Monitoring*

Concerns were raised by Gitxaała and Health Canada about acoustic effects from the facility and the need for follow-up monitoring. While Cedar identified that OGC would require noise monitoring and reporting as part of the permitting process, Health Canada and Gitxaała also recommended that, Cedar sho33333uld commit to preparing and implementing a comprehensive noise-specific Follow-up Program during the construction and operation phases of the Project to validate predictions and quantify noise related changes in the Project area.

Based on the concerns raised during Application Review, Cedar proposed a Follow-up Program for noise monitoring, which would determine if actual effects align with the characterization of potential effects assessed in the Application. Results of this review would be provided to the Agency, Health Canada, Northern Health, and Haisla Nation, and along with identifying any implementable corrective actions should monitoring show the characterization of effects exceeds that presented in the Application. Cedar also committed to providing Northern Health with a study plan in advance of undertaking the operational noise monitoring required by the LNG Facility Permit. Further, Cedar proposed a Community Feedback Process, as described in Section 5.1: Air Quality, that aims to provide open and transparent means for the community to seek information and raise concerns as well as have inquiries addressed in a timely manner during construction and operation.

The EAO notes that, during the OGC permitting process, OGC would establish several points of compliance (where noise monitoring would occur) for operation noise emissions for the facility through a condition of approval in the Facility Permit. These would be established based on the requirements in the OGC Noise Guideline, which prescribes the PSL for residential dwellings adjacent to the project boundary. The site-specific PSL for each compliance location is expected to be based on the results of a noise impact assessment prepared to support the Facility Permit application. This will include modelling of the FLNG noise emissions based on detailed engineering design information.

In consideration of the concerns raised, the EAO also recommends the Follow-up Program for noise proposed by Cedar as a Mitigation Measure under the IAA, in addition to the other noise mitigation measures described below in section 5.2.4.1. The EAO also notes that the proposed provincial condition for a Construction Environmental Management Plan (Condition 9) would include noise management measures and the community feedback process (Condition 11) ,

which was proposed both as a provincial condition (Condition 11) and federal Mitigation Measure in Section 5.1: Air Quality, would also provide a venue for community members to raise concerns on noise to Cedar and be responded to.

In reviewing the proposed conditions, Gitxaała requested the inclusion of specific provisions for reporting sensory disturbances, including acoustic disturbances, in the community feedback process. Gitxaała also expressed concerns that this approach returns the onus to affected users to report on impacts. Gitxaała expressed concerns that there is no trigger for collaborative adaptive management in the community feedback process condition. Finally, The EAO notes that the community feedback process is general and does not set out what types of comments may be submitted but is of the view that comments regarding sensory and acoustic disturbances would be reasonable and appropriate. The EAO notes that while the community feedback process is driven by comments submitted, the recommended noise Follow-up Program is not, and the two mitigations, together, provide the means for both monitoring and community engagement. Finally, in consideration of the feedback from Gitxaała, the EAO has applied its adaptive management requirements to the community feedback process.

The EAO is of the view that the provincial permitting, regulatory requirements, and proposed federal Mitigation Measures would be adequate to address the concerns raised regarding this issue.

#### *5.2.3.2 Effect of Shipping Noise on Indigenous Land Use*

Metlakatla, Lax Kw'alaams, Kitselas, Gitxaała and Haida raised concerns regarding the impact of shipping noise (including cumulative effects of shipping noise) on Indigenous land use. Indigenous nations noted that Health Canada guidance for maximum appropriate noise levels to limit sleep disturbance are 45 dBA $LA_{max}$ indoors[14] and that this definition does not fully recognize Indigenous land use patterns. During seasonal rounds / traditional activities sleeping may not occur indoors and therefore the application of a "noise transmission loss" discount is inappropriate. Noise exceedances associated with an outdoor maximum of 45 dBA $L_{max}$ should be used in order for Indigenous nations and regulators to be able to properly understand and evaluate impacts to Indigenous use. Indigenous nations requested that nighttime data exceedances without the indoor attenuation calculation be provided. Metlakatla also requested that Cedar consider a complaint reporting and recording process. Kitselas noted concern that any contribution of Cedar LNG to cumulative noise levels was a concern.

[14] Health Canada recommends the World Health Organization's (1999) Guidelines for noise during the sleep period. These guidelines state that consideration should be given to potential impacts on sleep, where adverse impacts are reported to begin when sound levels inside dwellings exceed 30 dBA for continuous noise sources and 45 dBA $LA_{max}$ for discrete noise events (maximum of 15 times per night). With an estimated 15 dBA outdoor-to-indoor sound loss, the equivalent sound levels outdoors should not exceed 45 dBA and 60 dBA $LA_{max}$, respectively.

Gitxaała also raised concerns about the %HA is not suitable for locations with short-term or infrequent occupancies and that Gitxaała harvesters were characterized as short-term and infrequent occupants. They agreed with Cedar that the OGC noise guidelines cannot be applied in the context of assessing how changes to the soundscape from Project related shipping will impact Gitxaała harvesters. Gitxaała requested feedback from Health Canada regarding Cedar's comments. Health Canada confirmed that the change in %HA is not intended to assess the immediate response towards a project's initial change in noise levels, but to noise levels that are predicted to occur long term, at which time any initial reaction to a change in noise levels may be expected to reach a steady state. Health Canada also noted that if the Gitxaała Nation had provided information to validate their longer-term presence in the vicinity of project related activities, the use of %HA is a valid measure to evaluate long term annoyance.

Cedar responded that the $L_{max}$ results represent the maximum outdoor noise level due to the pass by event of the LNG carrier and the associated tugboats. All results are below the Health Canada indoor maximum noise threshold of $L_{max}$ 45dBA. It was also noted that when sleeping outdoors, higher ambient noise level associated due to wind, insects, animals, tidal waves, and aircraft flyover is expected. The measured baseline nighttime sound level ($L_n$) at McCauley Island is 43.9 dBA (Acoustic TDR Section 6, Table 5). However, the $L_n$ value represents the average level over multiple nights of measurement. It is possible that the maximum nighttime sound level at any moment could exceed 45 dBA $L_{max}$. The maximum level will be transient for a short period of time and that may occur during the nighttime period. However, since project traffic will only result in 100 vessels transits per year, the pass-by event of a project LNG carrier will could occur once every 3 days (about 100 vessels per year). The modelling for the shipping route predicts the sound levels to be 50 dBA at a distance of 350 m from the LNG carrier and between 31.2 dBA and 36.6 at the shoreline within the Principe Channel portion of the shipping route. While there will be some minor additive sound effects when two LNG carriers pass each other, this will only occur approximately twice a day under the future cumulative case scenario if all projects in Kitimat proceed. These cumulative interactions would persist for less than 5 minutes based on a 10-knot vessel speed.

Cedar also proposed two mechanisms that would be provide an avenue for Indigenous nations and others to raised concerns regarding noise: a Marine Transportation Management Plan and community feedback process. The Marine Transportation Management Plan would include reporting mechanisms for Indigenous nations and marine users to report on and concerns related to LNG carrier interference with marine use (including from noise). The community feedback process would provide a mechanism for members of the public or individual Indigenous nation members to raise concerns about the Project.

In consideration of the concerns raised, the EAO proposes a provincial condition requiring Cedar to develop a marine transportation communication report (Condition 12) and recommends Mitigation Measures under the IAA for acoustics, as described below in section 5.2.4.1, including a marine transportation plan, with a recommendation that Cedar work with

the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for LNG carriers visiting Cedar LNG facilities. Both of these provincial and federal recommendations would include reporting mechanisms for Indigenous nations and marine users to report on any concerns related to LNG carrier interference with marine use, including from marine shipping noise. In addition, the community feedback process, recommended as both a provincial condition (Condition 11) and federal Mitigation Measure, mentioned above would also provide a means for Cedar to receive, address, and report on community concerns about shipping noise from the Project.

Gitxaala was of the view that the project effects on the soundscape in its marine territory may be understated, which is reflective of the fact that methodologies are still developing to adequately understand and assess impacts of qualitative, rather than quantitative, changes in sound levels. In addition, Gitxaała noted that Cedar's assessment was based on predicted operation noise from LNG Canada that has not yet been verified since construction of the Project is incomplete. Following the review of proposed mitigation measures, Gitxaała remained concerned that was no mitigation or noise monitoring proposed for the Marine Shipping Route; therefore, Gitxaała had moderate to low confidence in EAO's assessment that direct and cumulative adverse effects to the soundscape in the Marine Shipping Route were not significant.

The EAO notes that acoustic effects of the Project on Indigenous experience and use is discussed Part C of this Report. The EAO has also considered comments from Metlakatla, Kitselas, and Gitxaała in the rating of residual effects below. The EAO noted that, while not specifically requiring noise monitoring, the recommended combination of mitigation measures provides venues for Indigenous engagement related to marine shipping effects. In addition, the EAO also notes there are variety of non-regulatory initiatives targeting marine shipping effects (as described in section 3.1.5) that target marine shipping effects. In consideration of concerns raised regarding the proposed mitigation measures, the EAO proposed a condition (16) requiring Cedar to participate in relevant federal initiatives related to effects of marine shipping in the region, in which industry is invited to participate. With the proposed mitigation measures and conditions, the EAO considers this issue to be adequately addressed for the purpose of the EA.

### 5.2.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated the potential effects to the acoustics VC by considering construction, operation, and decommissioning activities that could elevate noise levels in the LAA and RAA, and potentially result in residual adverse effects from increased noise levels.

#### *5.2.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application and issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting /

Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[15], the EAO proposes the following provincial conditions:

- CEMP, including noise management measures (Condition 9);
- Community feedback process to receive, address, and report on community concerns from the Project, including related to noise (Condition 11); and
- Marine transportation communication report, which would include reporting mechanisms for Indigenous nations and marine users to report on any concerns related to LNG carrier interference with marine use (Condition 12).

The EAO notes that if Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits, including an LNG Facility Permit under the *Oil and Gas Activities Act*. Monitoring of noise at nearby receptor locations would be expected as a condition of the permit. The EAO considers that, in combination with the proposed community feedback process and marine transportation communication report, this detailed permitting process, and the expected permitting conditions would address the effects to the acoustics VC from the facility and marine shipping identified during the EA.

The EAO recommends the following Mitigation Measures under IAA for acoustics:

- Provide advance notification to residences (within 3 km of activities extending to Kitamaat Village) of planned high-disturbance noise-causing activities (i.e., blasting, helicopter work, and pile driving) at the Facility Area and along the transmission line (construction)
- Fit gas or diesel engine exhausts with noise mufflers and turn off equipment when not in use to minimize idling;
- Conduct regular maintenance of machinery and equipment to ensure noise emissions are within range set by manufacturer;
- Consider all noise ratings of construction and operation equipment in the procurement process;
- Community feedback process, as described in the proposed federal Mitigation Measures for air quality (section 5.1); and
- Marine communication procedures, as described in the proposed federal mitigation measures for marine use (section 5.9).

In addition, the EAO also proposes a Follow-up Program for noise under the IAA, which would include:

- During the year before operation and for the first three years of operation of the FLNG facility, Cedar will undertake noise monitoring at four receptor locations. The results of the monitoring will be compared to:
  - Noise modelling results in the Application;

[15] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

  - Permissible sound levels established by the British Columbia Noise Control Best Practices Guideline Version 2.2 published by the OGC in 2021; and
  - Thresholds recommended in the Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise published by Health Canada in 2017;
- The follow-up program will determine if the characterization of actual effects aligns with the characterization of potential effects assessed in the Application; and
- Results of this review, along with identifying any implementable corrective actions should monitoring show the characterization of effects exceeds that presented in the Application will be provided to the Agency, Health Canada, Northern Health, and Haisla.

#### *5.2.4.2 Residual Effects*

After considering the mitigation measures, the EAO predicts that noise effects from all phases of the Project would be a residual effect of Cedar LNG. The EAO's characterization of the expected residual effects of Cedar LNG on the acoustics VC are summarized below. Acoustic effects to specific federal topics, including federal lands, current use of lands and resources for traditional purposes, cultural heritage, and the effects to the health, social or economic conditions of the Indigenous peoples of Canada are discussed in section 6.9 of this Report.

**Table 13: Characterization of residual effects for the acoustic VC in the Facility Area**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Moderate | Existing noise levels are not above OGC and Health Canada Guidelines. However, ambient sound levels in the Indigenous residential areas, combined with present projects, make this area sensitive to noise additions. |
| Direction and Magnitude | Adverse and Low | Noise will be elevated within the LAA and RAA, with noise effects being greater closer to the Project than those from far away. For instance, Kitamaat Village 1 and 2 have the closest approximate distance to the Project. However, the change in %HA between total project sound and baseline is <6.5% at all Receptor IDs and application noise levels are all less than the PSLs under the OGC guidelines. During construction the projected daytime sound for the Kitamaat Village Residences are between 45-50 dB, while during operations, the Projected daytime sound for these residences will decrease to about 30-35 dB. |
| Extent | Local/Regional (LAA and RAA are the same area) | Residual effects to acoustic environment will not extend beyond the RAA. Noise decreases with distance from the noise source. Noise at a distance greater than 3 km from the FLNG facility and transmission would attenuate to a level that is below the ambient sound level. |
| Duration | Long-term | The residual effects will last for the duration of the Project and in all project phases: Construction, operation, and decommissioning. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Frequency | Continuous | While construction noises are planned to only take place during the day (0700 to 2200 h), during the operation phase, project noise will occur 24 hrs a day. |
| Reversibility | Reversible | Effects will cease upon completion of all project phases. |
| Affected Population | Disproportionate | While noise levels will increase the closer to the Project, residential populations are no closer than 2.7 km from the facility boundary. However, the potential effect would disproportionately be experienced by Haisla Nation Communities due to proximity to the Project. |
| Risk (likelihood and consequences) | Likelihood: high likelihood of acoustic effects during construction and operations.<br>Consequence: moderate consequence based on the low magnitude extending throughout the RAA.<br>Risk: based on the high likelihood and moderate consequence of residual effects to the acoustic environment, it was determined that there would be a moderate level of risk. | |
| Uncertainty | Uncertainty in acoustic effects at the facility is considered to be moderate. The EAO has a moderate level of confidence in the residual effects characterizations presented here, based on the acoustic modelling completed, the approach to establishing baseline conditions, the feedback received from the Working Group during the EA, and the proposed federal Mitigation Measures and provincial conditions (including a Follow-up Program for noise. | |
| Significance | In consideration of the above analysis and proposed conditions and federal Mitigation Measures, the EAO concludes that the Project would not have significant adverse residual effects on the acoustics VC in the Facility Area. Acoustic effects would not exceed Health Canada guidelines and effects would be fully reversible follow decommissioning of the Project | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

**Table 14: Characterization of residual effects for the acoustics VC in the Marine Shipping Route.**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low | While the existing sound levels on the Marine Shipping Route are all within PSL; Indigenous users along the Marine Shipping Route are considered highly sensitive to increases in noise due to the potential for increases in noise to result in a deterioration of experience of cultural, harvesting, and other traditional practices. |
| Direction and Magnitude | Adverse and Low | Noise will be elevated due to increases in marine shipment traffic and air horns. However, the change in %HA between total Project sound and baseline is <6.5% sleep disturbance criteria at all Receptor IDs were not exceeded, at all Receptor IDs and application noise levels are all less than PSL. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Extent | Local/Regional | Residual effects to acoustic environment due to marine shipping will not extend beyond the RAA (3 km on either side of the Marine Shipping Route). |
| Duration | Long-term | The residual effects of marine shipping would last throughout construction and operations, with the potential for some marine shipping (and acoustic effects) in decommissioning as well. The duration of the acoustic effects on a single person along the Marine Shipping Route would be several minutes long, once approximately every 3 days. The duration of acoustic effects from LNG carrier loading at the FLNG Facility would be 5 hours. |
| Reversibility | Reversible | Effects will cease upon completion of the Project. |
| Frequency | Regular | The pass by event of a LNG carrier will occur approximately once every 3 days. This disturbance could be a potential contributor of noise experienced by a person at a single location for several minutes. |
| Affected Population | Disproportionate | While noise levels will increase closer to the Project, residential populations are no closer than 2.7 km from the facility boundary. However, the potential effect will disproportionately be experienced by Indigenous nations along the Marine Shipping Route due to proximity to the Project. |
| Risk (likelihood and consequences) | Likelihood: high likelihood of acoustic effects during construction and operations.<br>Consequence: moderate consequence based on the low magnitude extending throughout the RAA.<br>Risk: based on the high likelihood and moderate consequence of residual effects to acoustic it was determined that there would be a moderate level of risk. | |
| Uncertainty | Uncertainty in acoustic effects in the Marine Shipping Route is considered to be moderate. The EAO has a moderate level of confidence in the residual effects characterizations presented here, based on the acoustic modelling completed, the approach to establishing baseline conditions, the feedback received from the Working Group during the EA, and the proposed federal Mitigation Measures and provincial conditions. | |
| Significance | In consideration of the above analysis and proposed conditions and federal Mitigation Measures, the EAO concludes that the Project would not have significant adverse residual effects on the acoustics VC in the Marine Shipping Route. Acoustic effects would not exceed Health Canada guidelines and effects would be fully reversible following the completion of the operation phase. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.2.4.3 Cumulative Effects Assessment*

**Facility Area**

Two major present, and reasonably foreseeable future projects and activities that were considered in the cumulative effects assessment for the Acoustic VC in the Facility Area are:

- Rio Tinto; and
- LNG Canada Export Terminal

The other projects and physical works that could have potential cumulative effects on acoustic are listed below:

- MK Bay Marina
- Rail activities
- Various forestry activities
- Various fishing and aquaculture activities

The physical activities present in the LAA/RAA that are likely to interact with the acoustic effects of the Project are a combination of residential, industrial, and commercial activities as well as the natural environment (for example, MK Bay Marina, Rio Tinto Aluminum Smelter). However, the existing baseline sound levels already include and account for existing noise emission activities in the LAA/RAA. Project residual effects results considered in the assessment already includes cumulative effects, since the OGC noise guideline requires that noise levels from any planned OGC-regulated facilities within the LAA/RAA be included as they could interact with the Project noise levels. Predicted noise levels from the other projects and activities have therefore been added to the baseline noise levels of all the noise sensitive receptors. The summary of residual effects listed in the above section are hence applicable to both Project and cumulative effects. Given the assessment results presented in the residual effects section, cumulative effects from the existing baseline sound levels and the one planned OGC-regulated project (that is, LNG Canada Export Terminal) within the RAA will not overlap with the predicted Project noise in such way as to exceed the OGC's PSL.

**Marine Shipping Noise**

Cedar assessed the cumulative effects on acoustics resulting from Cedar LNG using an estimate of vessels movements in the area. Up to approximately 50 LNG carriers per year (resulting in 100 transits) are expected to visit the Project. Project-related marine traffic is approximately 8 percent of the future non-project-related marine activities along the Douglas Channel portion of the Project shipping route. This percentage is less along the other portions of the shipping route (estimated 6 percent for Principe Channel and 2 percent for the Triple Island Pilot Boarding Station). In the Douglas Channel, the total transits will increase from 3.04 transits per day to 3.32 transits per day due to the Project. In Principe Channel, the total transits will increase from 4.07 transits per day to 4.3 transits per day. At the Triple Island Pilot Boarding Station, the total transits will increase from 12.65 transits per day to 12.92 transits per day (this includes traffic to/from the Port of Prince Rupert). The total transits include both the inbound and outbound movements for each vessel (i.e., one vessel visiting a port of call results in two

transits, one inbound and one outbound). Project-related marine traffic residual effect is based on a "worst-case" 24-hour scenario, conservatively assuming that LNG carriers and assistance/harbor tugboats activities will occur on a daily basis. The contribution of Cedar LNG to total vessel traffic is expected to be small and residual acoustic effects of marine shipping were considered to be low magnitude; therefore, the EAO considers that cumulative effects of Cedar LNG marine shipping on the acoustic environment would be low magnitude, regional, long-term and not significant.

#### *5.2.4.4 Interactions between Effects*

Under section 22(1) of IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25(2) of the Act 2018[16] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the acoustic effects are described above in section 5.2.4.2.

The acoustic VC assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Wildlife – Project-related noise may result in change in habitat suitability and wildlife (including bird) movement.
- Marine resources – this assessment considers underwater noise effects.
- Land and Resource Use – the assessment of potential effects on tenured and non-tenured land use includes consideration of Project-related noise.
- Marine use – Project-related shipping noise is considered a potential effect on marine use.
- Human health – the assessment of human health effects due to Project-related noise has been considered in the assessment.
- The impact of noise on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and section 6.9 of this Report, respectively.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

[16] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

In addition, the EAO notes that the effects of all biophysical VCs including acoustics, wildlife, and marine resources are considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6), and the effects of all human VCs, including human health are considered in the assessment of human and community well-being (section 6.8). These assessments consider linkages within each of the biophysical and human realms and consider effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function and a moderate magnitude effect on human and community well-being.

#### *5.2.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of acoustics effects.

In the Application, Cedar reported that direct traditional knowledge or traditional use information related to acoustic conditions was not shared with Cedar by any of the Indigenous nations identified in the Section 11 Order. However, Gitxaala has indicated that preferred noise conditions are necessary for sacred places to be considered "maintained and accessible" to maintain cultural identity through connection to sacred places, harvesting areas, and Clan/House territories. If preferred conditions are not met, community members may experience a disconnection from the sacred place, with implications for their cultural practices, identity, harvesting practices, governance structures, and other potential impacts to Gitxaała rights.

During the EA, Metlakatla, Lax Kw'alaams, Kitselas, Gitxaała, Kitsumkalum, and Haida provided comments on the assessment of acoustic effects, including related to proposed mitigation measures and characterization of residual and cumulative effects. Regarding existing conditions, Gitxaala noted that there are no rail or industrial activity noises in Lach Klan (Kitkatla) and noise from air and vehicular traffic is extremely limited and infrequent. The information provided by Indigenous nations is summarized above in section 5.2.3, as well as being discussed in the nation-specific sections in Part C of this Report.

Key ways in which the EAO took these comments into account in the acoustics assessment included:

- In the residual effects characterizations:
  - Identifying that that the acoustic environment of the Marine Shipping Route as sensitive, based on the potential for increases in noise to result in a deterioration of experience of cultural, harvesting, and other traditional practices of Indigenous nations;
  - Identifying the potential for disproportionate effects to Indigenous nations along the Marine Shipping Route;
  - Rating the uncertainty of the residual effects assessment as moderate (instead of low); and

- Applying the EAO's standard requirements for adaptive management (condition 3) to the community feedback process;

- Recommending a Follow-Up Program for noise under the IAA; and
- Recommending marine transportation plan (rather than marine transportation communication report) and a community feedback process, which would provide a mechanism for Indigenous nations to raise concerns regarding noise, as federal Mitigation Measures and provincial conditions.

#### *5.2.4.6 Conclusions*

The EAO is satisfied that Cedar LNG will not have significant adverse residual or significant cumulative effects on the acoustics VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 9: CEMP, Condition 11: community feedback process, and Condition 12: marine transportation communication report; and recommended Mitigation Measures and Follow-up Program under the IAA for acoustics (Appendix 1).

# 5.3 VEGETATION RESOURCES

## 5.3.1 BACKGROUND

Vegetation resources were assessed as a VC due to the potential for Cedar LNG to result in changes to:

- the abundance of plant species of interest;
- the abundance or condition of ecological communities of interest;
- wetland functions; and
- native vegetation health and diversity due to air emissions.

These changes arise from vegetation clearing and ground disturbance and increased sulphur dioxide and nitrogen dioxide air concentrations leading to eutrophication and acidification. Effects on vegetation resources on federal lands, effects to cultural heritage and current use of lands and resources for traditional purposes from effects to vegetation resources are discussed in section 6.9 of this Report, Requirements of the *Impact Assessment Act*.

### *5.3.1.1 Regulatory Context*

At the provincial level, the *Water Sustainability Act* guides the protection of watercourses, riparian ecosystems and wetlands. The Environmental Mitigation Policy and supporting procedures outline a hierarchical approach to avoiding and mitigating effects from projects and can apply in any setting, including wetlands and other ecosystems.

The *Oil and Gas Activities Act* and associated Environmental Protection and Management Regulation (EPMR) also include conservation measures for fish habitat and wildlife habitat, biodiversity and the water values of riparian management zones and protections for old-growth management areas. The EPMR provides the statutory authority to the Minister responsible for administering the *Wildlife* and *Water Acts*, or a delegate, to take actions that contribute to the management and protection of environmental values. The Environmental Protection and Management Guideline (EPMG) is a reference document for oil and gas applicants and permit holders subject to the EPMR. While the EPMR and the EPMG generally apply only to crown land and Cedar LNG is on private land, Section 21 of the LNG Facility Regulation states that Section 19 of the EPMR applies to the restoration of private land after operations cease at an LNG facility. Section 19 of the EMPR requires:

- Stabilizing any cut and fill slopes, and re-contouring to re-establish pre-disturbance drainage patterns and minimize erosion potential;
- Restoring surface soil to similar, pre-disturbance productivity; and
- Establishing a healthy, self-sustaining, and ecologically appropriate vegetative cover, preferably using native species locally found and adapted to site conditions to encourage supporting natural regeneration processes.

Key federal legislation to protect ecosystems and habitats for wildlife and fish populations include the *Species at Risk Act, Migratory Birds Convention Act* and *Fisheries Act*. The Federal Policy on Wetland Conservation commits federal departments to the goal of no net loss of wetland functions on federal lands.

#### *5.3.1.2 Boundaries*

The spatial boundaries used in the assessment of effects on the vegetation resources VC are depicted in Figure 9, below, including the Project footprint, LAA and the extent of the RAA:

- Facility footprint or area of disturbance (46.3 hectares [ha]) includes the marine terminal footprint (11.7 ha) and transmission line right-of-way (34.6 ha);
- Facility area extends approximately 500 m offshore;
- Marine terminal LAA and RAA are 281.5 ha and 1997 ha, respectively; and
- Air emissions LAA and RAA are 64,198 ha and 160,027 ha.

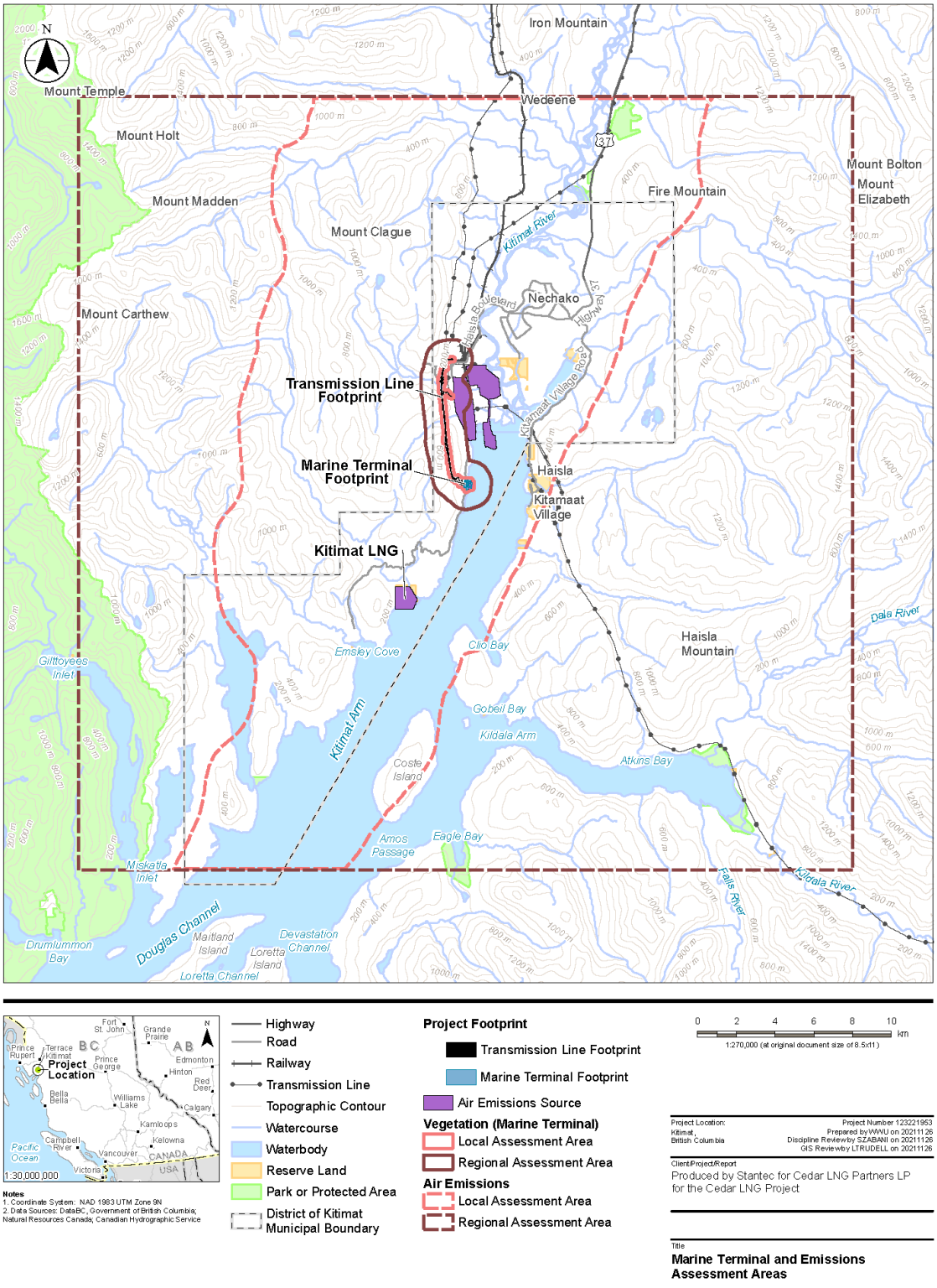


**Figure 9: Marine terminal and emissions local and regional assessment areas used in the Vegetation VC.**

## 5.3.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.3.3.

### *5.3.2.1 Existing Conditions*

Data and information used to characterize existing conditions were gathered through a review of traditional knowledge and traditional use information, previous EAs, field studies conducted for Cedar LNG and relevant literature, including available information on vegetation communities and effects sensitive to air emissions and soil acidification.

#### 5.3.2.1.1 Mapped Ecosystems

Approximately 1,427.2 ha (72 percent) and 246.7 ha (88 percent) of the marine terminal RAA and LAA, respectively are vegetated ecological communities. The marine terminal RAA and LAA are disturbed, particularly in the eastern portions. Sparse, unvegetated, and/or anthropogenic areas are approximately 570.2 ha (29 percent) of the marine terminal RAA and 34.8 ha (12 percent) of the marine terminal LAA. The proportion of anthropogenic area (317.7 ha, or 16 percent) in the marine terminal RAA consists of industrial facilities near Kitimat, urban areas, and roads. The 16.9 ha or 6 percent anthropogenic portion of the marine terminal LAA is north-eastern, near Kitimat, largely urban/industrial and includes the Rio Tinto Aluminum Smelter. Low elevation areas of the marine terminal RAA and LAA have been logged in the past 50 years and are fragmented by logging roads. The resultant second-growth vegetation characterizes the landscape.

#### 5.3.2.1.2 Plant Species of Interest

Traditional use plant species may be found in all naturally occurring areas, as well as disturbed portions of the marine terminal LAA and RAA. A total of 38 and 30 plant species identified by the Haisla as traditionally gathered were found in the marine terminal RAA and LAA, respectively; 13 of the 18 berry species identified as being currently gathered by the Haisla Nation were documented in the marine terminal LAA. No plant species at risk were identified in the marine terminal LAA and RAA; five invasive plant species occur within the marine terminal RAA.

#### 5.3.2.1.3 Ecological communities of interest

The marine terminal RAA includes four blue-listed upland ecological communities at risk, one red-listed flood association, two blue-listed flood listed association and two blue-listed wetland associations. Four blue-listed upland communities occur in the marine terminal LAA. The LAA and RAA both include six old forest communities, occupying 75 ha (27 percent) and 528 ha (26 percent) respectively. Old forest is more prominent at higher elevations in the western portion of the RAA and LAA further from the coast where logging has been less prevalent. The marine terminal RAA does not overlap any provincially designated old growth management areas.

#### 5.3.2.1.4 Wetland functions

Steep, well-drained slopes throughout the marine terminal RAA and LAA limit wetland formation. As a result, wetlands occupy an area forming 61.7 ha (3 percent) of the marine terminal RAA and 7.4 ha (3 percent) of the marine terminal LAA. Six wetland ecological communities (including bogs, fens, marshes, swamps, and shallow open water classes), occur in the marine terminal RAA, with unclassified bog wetlands comprising the greatest spatial extent (31.6 ha or 2 percent). Four wetland ecological communities (including bogs, fens, swamps, and shallow open water classes), occur in the marine terminal LAA.

### *5.3.2.2 Potential Project Effects*

The Application considered the activities that would generate changes in abundance or condition of plant species of interest, changes in abundance or condition of ecological communities of interest, changes in wetland functions and changes in native vegetation health and diversity due to air emissions.

During construction, key interactions with potential adverse effects include site preparation and clearing, construction of land and marine-based infrastructure and vehicle traffic. Operation activities include pre-treatment; liquefaction, storage and offloading of natural gas at the floating LNG facility; facility and infrastructure maintenance and vehicle traffic. Decommissioning activities include decommissioning land-based infrastructure and vehicle traffic.

#### 5.3.2.2.1 Assessment of Change in abundance of plant species of interest

Vegetation clearing activities during the construction phase would result in a residual change in the abundance of plant species of interest. Traditional use species, invasive species and plant species at risk were considered.

Of the 38 traditional use species identified in the marine terminal RAA, 23 are present in the Project footprint. The traditional use plant species that will be removed from the Project footprint are all species common to the marine terminal LAA and RAA and are not limited to the Project footprint; most were identified in the marine terminal RAA (beyond the Project footprint). All traditional use plant species that were identified in plots that only occur in the Project footprint (but not beyond) are shrub and herb species; therefore, they are likely to persist in the transmission line right-of-way where vegetation is maintained at low heights.

Vegetation clearing could also contribute to the risk of invasive plant introduction or spread within the marine terminal LAA, transported via vehicles and/or equipment. Cedar identified that mitigation measures for edge effects, such as the implementation of invasive plant management in the Construction Environmental Management Plan (CEMP) would reduce these effects to a manageable level.

No effects are predicted for plant species at risk because none were identified during field or desktop surveys in the marine terminal LAA, and no critical habitat for federally listed plant species at risk was identified in the marine terminal LAA.

#### 5.3.2.2.2 Assessment of Change in abundance or condition of ecological communities of interest

Vegetation clearing in the Project footprint during site preparation of the construction phase can reduce the abundance of ecological communities of interest. The condition of ecological communities could also be affected due to edge effects. Cedar predicted a reduction of 3.8 ha of four blue-listed upland forest communities in the Project footprint and a potential change in condition of 23.6 ha of ecological communities at risk within the marine terminal LAA. This represents potential change in condition of 10 percent of the extent of these ecosystems at risk in the marine terminal RAA. Cedar also predicted a 12.3 ha reduction in the extent of old forest and a potential change in condition of 75.0 ha of old forest within the marine terminal LAA. This represents potential change in abundance or condition of 12 percent of the old forest in the marine terminal RAA.

Cedar predicted that the residual effect to the change in the abundance of ecological communities of interest would be low because the regional community's extent is sufficient to sustain the affected communities without active management. The change in abundance occurs primarily in the transmission line right-of-way during construction. There is a low potential for change in condition of ecological communities at risk, due to edge effects, to extend into the marine terminal LAA throughout all phases.

#### 5.3.2.2.3 Assessment of Change in wetland functions

Vegetation clearing in the Project footprint during site preparation can cause an adverse change in wetland functions, including hydrological, biogeochemical and habitat functions. A total of 0.6 ha of wetland communities may be cleared: 0.5 ha in the transmission line access road and less than 0.1 ha each in the marine terminal footprint and transmission line right-of-way. An additional 6.8 ha of wetlands in the marine terminal LAA may be subject to edge effects that reduce wetland functions, representing 12 percent of the occurrence of these wetlands in the marine terminal RAA. Cedar noted that although there is a high likelihood that some change in wetland functions will occur within the Project footprint, this disturbance will likely be reduced in the final design.

#### 5.3.2.2.4 Assessment of Change in native vegetation health and diversity due to air emissions.

The potential effects from air emissions were analyzed for operations, the phase of peak air emissions. The Kitimat LNG Project was included in the assessment, but the certificate holder for this project has now indicated publicly that it will not be advancing the project. The project-alone case estimates are unaffected by this change, but the base case and application case numbers would be over-estimates.

**Sulphur dioxide:** Cedar predicted that sulphur dioxide air concentrations would exceed the empirical critical level of 10 µg/m3/year in the base case and the application case but not the project-alone case. The sulphur dioxide exceedance area for the base case and application case falls within the traditional territories of Haisla, Gitga'at, and Kitselas. The maximum predicted concentration in the project-alone case is 1.3 µg/$m^3$/year. The model predicted an additional

73.6 ha of vegetated area to exceed the critical level in the application case compared to the 5,176 ha exceeded at baseline. This represents a project-related increase in vegetated exceedance area of 1 percent from baseline conditions. Most of the additional area predicted by the model to exceed the critical level is upland forest, wetland, and vegetated anthropogenic units (pipeline and transmission line right-of-way), with minor components of floodplain and montane ecosystems. The total vegetated exceedance area in the application case is 5,249.5 ha, which represents 11 percent of the vegetation air emissions LAA.

Project-related increase in exceedance area occurs in bog ecosystems and old forest with a higher likelihood of containing lichens and mosses. A total of 15.9 ha of additional exceedance area is composed of dry forest and bog ecosystems compared to 1,492.4 ha at baseline. A total of 14 ha of additional exceedance area is composed of old forest compared to the 1,429.4 ha at baseline.

**Nitrogen Dioxide:** Cedar predicted that the nitrogen dioxide critical level of 30 µg/m$^3$/year would not be exceeded in the application case. The residual change in native vegetation health and diversity due to nitrogen dioxide air emissions is therefore negligible in magnitude, as no vegetated ecological communities will be affected.

**Acidification:** The model predicted acid deposition that may result in soil acidification to exceed calculated critical loads in the base case and the application case but not in the project-alone case. The acidification exceedance area for the base case and application case falls within the traditional territories of Haisla, Gitga'at, and Kitselas. Exceedances are modelled to occur within the Kitimat valley to the north of the Project. The model predicated an additional 76.2 ha of vegetated area to exceed calculated critical loads of acidity compared to 5,100.7 ha exceeded at baseline. This represents a project-related increase in vegetated exceedance area of 2 percent from baseline conditions. The total vegetated exceedance area in the application case is 5,176.9 ha, which represents 11 percent of the vegetated air emissions LAA.

**Eutrophication**: The model predicted nitrogen deposition that may result in soil eutrophication to exceed calculated critical loads in the base case and the application case but not in the project-alone case. The exceedances are modelled to occur in the area surrounding the Rio Tinto Aluminum Smelter and LNG Canada Export Terminal, to the north of the Facility Area. In the application case, no additional vegetated area was predicted by the model to exceed calculated critical loads of nutrient nitrogen compared to the 567.2 ha exceeded at baseline. The total vegetated exceedance area in the application case was 616.9 ha, which represents 1 percent of the vegetated air emissions LAA.

#### *5.3.2.2.5 Positive Effects*

Cedar did not identify any positive effects of the project on the Vegetation Resources VC.

### *5.3.2.3 Mitigation Measures Proposed in the Application*

Cedar proposed the following mitigation and enhancement measures to address the effects of Cedar LNG on vegetation resources:

- Clear boundaries delineated prior to site preparation where construction may occur. This may be via physical flagging or electronic delineation where appropriate;
- Standard best management practices (BMPs) to control the spread of invasive species;
- Natural revegetation or active reclamation on Crown land, as per the CEMP; reclamation on private land to follow lease agreements;
- If requested by Haisla, incorporate traditional use plants into reclamation planning for temporary construction areas on Crown land;
- Implement windthrow management strategies such as edge stabilization techniques in areas of old growth forest on Crown land;
- Incorporate erosion and sediment control best practices into the CEMP to manage surface water and avoid sedimentation in sensitive vegetation communities;
- Manage vehicle and equipment emissions by conducting regular maintenance; and
- Use diesel fired vehicles equipment during construction and emergency power generators during operation powered by low sulphur fuel.

In addition, Cedar integrated key design decisions into the Project to help reduce the effects on the Vegetation Resources VC, such as:

- During detailed design, work with engineering teams to reduce impacts to wetlands;
- Use electricity from the BC Hydro grid for the facility during operations to reduce emissions; and
- Locate natural gas pre-treatment and liquefaction equipment and LNG storage on the floating LNG facility to reduce the size of the Project footprint.

During Application Review, Cedar also proposed a Follow-up Program under the IAA for wetlands, which is described further below.

### 5.3.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of the vegetation resources VC for Cedar LNG were identified:

- Wetlands;
- Air emission effects; and
- Vegetation management.

Indigenous nations did not raise specific concerns regarding terrestrial vegetation. Comments regarding marine plans are discussed in Section 5.6: Marine Resources of this Report.

#### 5.3.3.1 Wetlands

ECCC noted that wetland protection, including avoidance, minimization, and offsetting of project effects is standard best practice for impacts to wetland function. ECCC recommended that Cedar develop a Wetland Management Plan to address all direct and indirect loss of wetland habitat area and function in consideration of ECCC's Operational Framework for the Use of Conservation Allowances. To address potential effects to wetland functions ECCC recommended offsets where effects cannot be avoided, which is consistent with the federal government's overall goal of no net loss of wetland functions. ECCC recommended offsetting regardless of the Project's location on non-federal lagoons. Further, ECCC recommended that Cedar provide an assessment of potential indirect effects on ecologically important wetlands and wetland function. ECCC recommended the assessment for wetlands consider all species at risk with potential to be affected, specifically, bat foraging and roosting habitat. ECCC further requested that mitigation for residual effects to wetlands include project effects on habitat functions for species at risk.

Cedar responded that of the 0.6 ha of wetlands predicted to be directly affected by the Project, less than 0.1 ha may not be reclaimed and is predicted to be permanently lost. The majority (0.5 ha) of the wetlands predicted to be directly affected by the Project are expected to be temporarily disturbed and left to naturally revegetate or be actively restored following Project decommissioning. Cedar noted that none of the wetlands that occur within or adjacent to the Project footprint are subject to the Federal Policy on Wetland Conservation and none are "ecologically important" as defined by ECCC's regional guidance on the Federal Policy on Wetland Conservation. Mitigation measures are also proposed in the CEMP to avoid potential effects to wetlands located adjacent to or within the Project footprint. Cedar affirmed their commitment to working to avoid wetlands in the final design of the transmission line access roads.

Cedar proposed mitigation measures for potential direct effects on wetlands and wetland functions, which would entail: reviewing opportunities for avoidance and minimization during the detailed engineering design stage, delineating clearing areas to prevent over-clearing, and implementing sediment and erosion control practices during construction. Cedar noted that these mitigation measures would also help reduce effects on species that use wetland habitats; including bats, amphibians and birds and will further reduce potential effects on wetland habitat function. Potential indirect effects on wetlands adjacent to the Project are proposed to be avoided through standard construction stage environmental mitigation and management measures. Cedar concluded that the no net loss goal of the federal policy does not apply to the wetlands occurring in the Project footprint and therefore did not propose offsetting measures. Cedar also proposed a follow-Up program for wetlands that would include a comparison of the area and type of wetland disturbed by the final design to the predictions in the EA, as well as triggers to adjust or add mitigation measures to manage potential indirect effects. Cedar noted that, if required by published regional ECCC guidance, it would work with Haisla to develop a wetlands compensation plan.

ECCC maintained the recommendation that Cedar commit to: the preparation of a wetland management plan that would include establishment of performance standards for wetland habitat function, including consideration of any habitats proposed to be left to naturally revegetate. The wetland management plan should include adaptive management measures and offsetting for the unavoidable loss or alteration of wetland functions (both direct and indirect), including consideration of the loss of amphibian suitable habitat, as well as any other key wildlife functions (such as for bats and migratory birds).

In consideration of the concerns raised, the EAO recommends a condition (9) requiring Cedar to develop a CEMP, which would include measures to reduce effects to wetlands in final project design. The EAO also recommends mitigation measures under the IAA for vegetation, including a Follow-up Program for wetlands, as described in section 5.3.4.1 below. The EAO also notes that if Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits. The OGC would administer this permitting process. OGC permitting conditions would be expected to address reclamation of wetlands consistent with the EPMR and EPMG, as described in section 5.3.1.1 above.

The EAO did not include offsetting for the effect on wetlands as recommend by ECCC, or fully incorporate the recommendations of ECCC into the Follow-up Program for wetlands. The EAO is of the view that the proposed condition, expected permitting process and the follow-up program would provide adequate means to mitigate effects on wetlands (including through reclamation), verify the predictions on wetlands during the EA and provide a mechanism for the addition of mitigation measures, if required. The EAO also notes that should ECCC publish regional guidance requiring the development of a wetlands compensation plan, Cedar has committed to develop one with Haisla. The EAO has considered the comments and views of ECCC in its characterization of residual effects on wetlands in its analysis and conclusions below.

#### *5.3.3.2 Vegetation Management*

ECCC recommended that Cedar incorporate a Vegetation Management Plan into the CEMP that includes all mitigation, monitoring, and follow-up measures for vegetation and invasive plant species management and reclamation.

Cedar noted that it is committed to the development of a CEMP that documents the implementation of mitigation measures during construction and guidance for vegetation management but did not propose any further follow-up programs associated with vegetation resources. While there is moderate uncertainty regarding the predictions for change in native vegetation health and diversity due to air emissions, Cedar is of the view that residual effects are small, as is the Project's contribution to cumulative effects and that there is insufficient uncertainty in the vegetation effects to warrant a follow-up program.

The EAO notes that the proposed requirement for a CEMP would require invasive plant management, erosion, and sediment control best practices to manage surface water and avoid

sedimentation in sensitive vegetation . The EAO considered this issue addressed for the purpose of the EA.

#### *5.3.3.3 Air emission effects*

The ECCC requested Cedar provide more information on the effects of sulphur and acid deposition on rare and at-risk moss and lichen species. Moss and lichen species at risk may be present in the Project area, despite no detections during field surveys. In addition, ECCC noted that a 26 percent increase in eutrophication of vegetated ecosystems from the base case to the application case was predicted in the Terrestrial Air Emissions TDR. ECCC requested that Cedar provide information on the associated implications for birds, bats, and amphibians that forage in the wetlands predicted to have effects from the Project.

Cedar confirmed that it predicted a 171.4 ha project-related incremental increase in the vegetated area exceeding the 4 kg/ha/year nitrogen deposition empirical critical load from base case to application case. Of this 171.4 ha, 48.0 ha is wetland. However, the critical load modelling for eutrophication predicts no increase in area with soils exceeding calculated critical loads of nitrogen. Therefore, the effects of eutrophication to wetland habitat functions are expected to be limited.

Regarding the 48.0 ha exceeding the empirical critical load, 31.1 ha is within estuarine communities, which are not sensitive to eutrophication and therefore there are no anticipated effects to wildlife habitat functions. The remaining area is yellow cedar bog forest (12.7 ha), with small areas of unclassified wetland (2.3 ha), and western redcedar swamp (1.9 ha).

Wetlands that receive a larger fraction of their total water budget in the form of precipitation are more sensitive to the effects of nitrogen deposition. In bog forests, nitrogen enrichment is likely to decrease the survival of species adapted to low nitrogen levels (including dwarf shrub, lichen, and peat mosses), while increasing the cover of shrub species (such as grasses or minerotrophic mosses). For swamps, fewer effects are expected, and they may potentially include increased shrub and grass cover. With expected changes to vegetation structure trending towards increased shrub and grass cover, wildlife species that forage on these plant types are expected to benefit (for example, shrubs provide moose browsing or grasses as spring forage for bears). Species that forage in open wetland habitats or along edges may lose foraging habitat where shrub cover increases (for example, birds and bats that forage for insects along wetland edges).

Cedar acknowledged that project-related sulphur dioxide atmospheric concentrations and acid deposition may have small incremental effects on the 36 non-vascular plant and 22 lichen species of conservation concern potentially occurring in the RAA. Lichens and cyanolichens are sensitive to wet and dry acid deposition. Cyanolichens are particularly sensitive to acid deposition; old forests offer the highest quality habitat for this group of species and may also provide marbled murrelet nesting habitat. In the sulphur dioxide atmospheric concentration exceedance area of old forests, there is potential for epiphytic lichens and mosses to decrease

in population size, health, or occurrence. No non-vascular plant or lichen species at risk are confirmed but may exist in this area. The area exceeding the acid deposition threshold may impact non-vascular plant and lichen species at risk, however, the characterization of effects does not change for Project or cumulative effects.

The EAO notes that mitigations proposed to address emissions to air quality, including the CEMP, permitting process and proposed federal conditions and Follow-up Program (as described in Section 5.1: Air Quality of this Report) would also address the effects of sulphur and acid deposition on vegetation. The EAO considers these mitigations adequate to manage air emission effects on vegetation and is of the view that this issue is adequately addressed for the purpose of the EA.

### 5.3.4 THE EAO'S ANALYSIS AND CONCLUSIONS

This section presents the EAO's conclusions on the potential adverse residual effects from Cedar LNG on the vegetation resources VC.

#### *5.3.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[17], the EAO proposes a provincial condition requiring the development of a CEMP (Condition 9) that would include:

- Invasive plant management;
- Erosion and sediment control best practices to manage surface water and avoid sedimentation in sensitive vegetation communities; and
- Reducing wetland impacts in final project design.

The EAO also notes that if Cedar LNG receives an EAC and federal IAA approval, it would be subject to an OGC permitting process. OGC permitting conditions would be expected to address reclamation of vegetation consistent with the EPMR and EPMG, described in section 5.3.1.1 above. The EAO also notes that mitigations proposed to address emissions to air quality, including the CEMP, permitting process, and proposed federal conditions and follow-up program (as described in Section 5.1: Air Quality of this Report) would also address the effects of air emissions on vegetation.

The EAO also recommends the following Mitigation Measures under IAA:

- Delineate clearing boundaries prior to site preparation to keep clearing activities within the designated Project footprint (via physical flagging or electronic delineation where appropriate);

[17] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

- Control the spread of invasive species following most recent Environmental Protection and Management Guidelines;
- Naturally revegetate or actively reclaim temporary construction areas on Crown land that are not required for operations (reclamation on private land to follow lease agreements);
- If requested by Haisla, incorporate traditional use plants into reclamation planning for temporary construction areas on Crown land;
- Implement windthrow management strategies such as edge stabilization techniques in areas of old growth forest on Crown land;
- Identify sensitive areas to be flagged and vegetation and soils to be retained or salvaged with required methods and monitoring; and
- Develop and implement a wetlands compensation plan with Haisla Nation if required under published federal ECCC guidance.

In addition, the EAO also proposes a Follow-up Program for wetlands under the IAA, which would include:

- A description of design and construction measures to reduce effects on wetlands;
- An update of wetland area disturbed by the final design (for example, within areas of clearing and/or grading) based on ortho-rectified post-construction air photographs or as-built survey data;
- An update of the wetland area adjacent to the transmission line or marine terminal footprint that may be subject to indirect effects, to be monitored for effectiveness of mitigation measures;
- A description of a construction monitoring program for wetland mitigations to be completed during each year of construction activities, including triggers to adjust or add mitigation measures to manage potential indirect effects. This is anticipated to consist of monitoring water quality of site runoff and integrity of culverts and erosion and sediment control measures adjacent to wetlands;
- A comparison of the area and type of wetland disturbed by the final design to the predictions of the EA;
- Maps showing the comparison and the area to be monitored; and
- An analysis of the accuracy of the characterization criteria.

#### *5.3.4.2 Residual Effects*

After considering the proposed mitigation measures, the EAO concludes that Cedar LNG would result in the following residual adverse effect to the vegetation resources VC:

- Change in abundance of plant species of interest (traditional use and invasive plants). No effects are predicted for plant species at risk because none were identified during field and desktop surveys in the marine terminal LAA;
- Change in abundance or condition of ecological communities of interest;
- Change in wetland functions; and
- Change in native vegetation health and diversity due to air emissions effects.

Residual effects on vegetation resources as they relate to specific federal topics (for example, federal lands and the current use of lands and resources for traditional purposes) are discussed in section 6.9 of this Report. Wetlands potentially affected by Cedar LNG are not subject to the Federal Policy on Wetland Conservation. The potential for effects on SARA-listed wildlife species from effects on wetlands is discussed in section 5.4: Wildlife.

**Table 15: Characterization of residual effects for vegetation resources**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low | Resiliency is low due to existing industrial projects and historical logging in the marine terminal RAA, which have reduced the abundance and distribution of traditional use plant species, ecological communities of interest and wetland functions while increasing pollutants. Ecological communities at risk face forest harvesting and climate change threats on the provincial scale. Each new project with air emissions increases effects on native vegetation health and diversity. Lichen communities are particularly vulnerable to acidifying emissions and lichen richness has been affected in the air emissions RAA. Soils which have not currently exceeded the critical load of acid or nitrogen deposition are vulnerable to further inputs. |
| Direction and Magnitude | Adverse and Low | With the proposed mitigation measures in place, Cedar LNG is anticipated to have low magnitude adverse residual effects associated with the marine terminal and supporting infrastructure and transmission line.<br><br>**Plant species of interest:** Loss of TU plants and potential increase in invasive plant species are predicted to be low in magnitude because losses of TU plant species from the Project footprint are not anticipated to affect the viability of the species in the marine terminal RAA. Impacts of invasive species are anticipated to be reduced to a manageable level through management and mitigation measures.<br><br>**Ecological communities of interest:** Low magnitude reductions in blue-listed upland forest communities, blue-listed ecological communities and the extent of old forest are predicted. A measurable change in abundance from existing conditions of ecological communities at risk is predicted, although the regional community's extent is considered sufficient to sustain the affected communities without active management. The change in abundance occurs primarily in the Facility footprint during construction. With the proposed mitigations, the potential for change in condition of ecological communities at risk due to edge effects to extend into the marine terminal LAA is low at all phases.<br><br>**Wetland functions:** The change in wetland functions is low in magnitude and the potential for edge effects on wetland functions outside of the Project footprint is low. A half hectare of wetland is predicted to be lost during the lifetime of the Project and reclaimed; 0.1 ha is expected to be permanently lost. An additional 6.8 ha of wetlands may be subject to edge effects that reduce wetland functions. The regional wetland functions are predicted to be |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | sufficient to sustain the affected communities without active management. The change in wetland functions will be measurable in the Project footprint. There is low potential for edge effects to wetland functions outside of the Project footprint with the proposed mitigation measures in place. The affected wetland ecosystems are ranked as secure (yellow-listed) in the province.<br><br>**Air emissions effects:** The incremental effects of the Project include an increase from baseline in the vegetated area exceeding sulphur dioxide empirical critical level (1 percent), acid deposition calculated critical loads (2 percent), nitrogen deposition calculated critical loads (0 percent) and nitrogen deposition empirical critical load (26 percent). Of the 171.4 ha exceeding the nitrogen deposition empirical critical load, 31.1 ha is within estuarine communities (saltmarsh), which has a much higher empirical critical load (63 kg/ha/yr) than the general 4 kg/ha/yr threshold used in the assessment. |
| Extent | Local | Residual effects will extend into the Project footprint and LAA. |
| Duration | Permanent | **Plant species of interest:** The transmission line right-of-way will revegetate once this project component is decommissioned, therefore revegetation to existing or near existing conditions will extend beyond the duration of the Project.<br><br>**Ecological communities of interest:** Once the transmission line is decommissioned, it will take a minimum of 50 years for the plant assemblage to make up the ecological communities at risk, which is considered a permanent effect.<br><br>**Wetland functions:** The less than 0.1 ha of wetland occurring in the proposed marine terminal footprint may not be reclaimed at the end of project life. The remaining 0.5 ha of wetland will take at least 50 years or more for the bogs to regenerate trees of a similar structure in the wetland. This is considered a permanent effect.<br><br>**Air emissions effects:** The residual changes in native vegetation health and diversity due to nitrogen deposition, eutrophication and acidification are predicted to be permanent. The decrease of sulphur dioxide deposition is associated with the recovery of lichen communities, that ranges in time from years to decades. |
| Reversibility | Reversible/<br><br>Irreversible | The residual effect for plant species of interest is reversible for the transmission line right-of-way but irreversible for the other project components because decommissioning follows planning for future use of the Project Area. Old forest losses, loss of ecological communities at risk and loss of wetland area and function are considered irreversible due to the duration of time required to reverse these effects. The residual change in native vegetation health and diversity due to nitrogen deposition is considered reversible once emissions cease. |
| Frequency | Continuous | The residual effect occurs in a single event (during construction) for the loss of TU plants and an irregular frequency (edge effects) for the increase in invasive plants in all phases. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | The residual changes in native vegetation health and diversity due to nitrogen deposition, sulphur dioxide emissions and project-related acid deposition and subsequent soil acidification are predicted to be continuous during operations.<br><br>Though no additional vegetated ecological communities will be affected by eutrophication exceedances due to project emissions, the Project will bring soils in the LAA closer to the eutrophication critical load. The residual change is projected to be continuous during operation. |
| Risk (likelihood and consequences) | Likelihood: Three residual adverse effects have a high likelihood: reduced abundance of traditional use plants in the marine terminal LAA; change in ecological communities of interest in the Project footprint (none from the marine terminal); and change in wetland functions in the Project footprint (extent is uncertain due to potential wetland avoidance in the transmission line and for wetland functions to remain intact). There is a medium likelihood that a decline in the vegetation health and diversity will occur from sulphur dioxide atmospheric concentrations and acid deposition in the emissions LAA and there is uncertainty as to how native vegetation will respond in the operation timeframe.<br><br>Consequence: Although measurable changes in plants and ecological communities of interest, wetland functions and native vegetation health and diversity are predicted due to air emissions from existing conditions, the regional extent of these parameters is sufficient to sustain the affected species and communities without active management. Therefore, the consequence is considered minor.<br><br>Risk: Based on the medium to high likelihood and minor consequence of residual effects on vegetation resources, the risk level would be low. | |
| Uncertainty | **Plant species of interest**: Uncertainty is overestimated because the effects assume total loss of TU plants within the Project footprint, but some areas will remain vegetated. Mitigation measures may also result in an overestimated uncertainty for the change in abundance of invasive plants. The effects to plant species at risk may be underestimated.<br><br>**Plant communities of interest:** Uncertainty is overestimated for old forest as the quantification of effects assumes that polygons mapped as old forest are all old forest, regardless of field-verification.<br><br>**Wetland function:** There is uncertainty regarding the extent of the change in wetland functions because of potential for wetland avoidance with the transmission line component and for wetland functions to remain intact.<br><br>**Air emissions:** Although there is high confidence in the reliability of site specific and regional information, there is moderate confidence given the uncertainty of the actual vegetation responses to air emissions over the operation phase. The risk and uncertainty are likely overestimated for the change in native vegetation health and diversity due to acid deposition and potential acidification because modelling incorporates conservative assumptions, both in the dispersion modelling and in the calculated critical loads. Modelling incorporates conservative assumptions, both in the dispersion modelling and in the calculated critical loads, also leading to the likely overestimation of effects.<br><br>Overall uncertainty regarding residual effects on vegetation resources is low. There is a good understanding of the cause-effect relationship between the Project and the VC and | |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | sufficient data is available to support the conclusions on the maximum extent of potential effects considered here. | |
| Significance | The EAO predicts that adverse residual effect on vegetation resources would not be significant because effects are low magnitude and following the application of avoidance and mitigation measures, the long-term viability of plants and ecological communities of interest, including those of cultural or traditional importance, will persist in the marine terminal RAA and there will be no loss of wetland functions of ecologically important wetland. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.3.4.3 Cumulative Effects Assessment*

An assessment of cumulative effects on vegetation resources was undertaken because the Project is assessed as having residual effects on vegetation resources and residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities. The past, present and reasonably foreseeable future projects and activities that were considered in the cumulative effects assessment are:

- Coastal GasLink Pipeline;
- LNG Canada Export Terminal;
- LNG Canada Load Interconnection Project (BC Hydro);
- Pacific Northern Gas Pipeline;
- Rio Tinto Aluminum Smelter;
- Rio Tinto Terminal A Extension;
- Former Eurocan Pulp and Paper Mill;
- Kitimat LNG;
- Minette Substation;
- Moon Bay Marina; and
- Various forestry activities.

All projects and activities that are known to occur within the marine terminal RAA are assumed to have potential to interact cumulatively with Cedar LNG effects on the abundance of plant species of interest, abundance, or condition of ecological communities of interest and wetland functions. The projects and activities with the potential to interact cumulatively with Cedar LNG effects on native vegetation health and diversity due to air emissions are those with emissions sources included in the air quality modelling.

**Change in abundance of plant species of interest**

The likelihood is considered high that there will be an adverse residual cumulative effect of reduced abundance of traditional use plants that will occur in the marine terminal RAA. Though the traditional use species are widespread species, secure (yellow-listed) in the province, continued land development will further decrease availability. The likelihood is low that

invasive plants will increase in the marine terminal RAA after considering standard mitigations. The likelihood of the Project contributing to a cumulative residual effect is considered high (although small in magnitude compared to the overall residual cumulative effect). Cumulative residual effects are not considered to be significant.

**Change in abundance or condition of ecological communities of interest**

There is a high likelihood of a residual cumulative change in abundance or condition of ecological communities of interest. The western hemlock/western redcedar-salal upland forest will be reduced by 46 percent and 7 percent in the marine terminal LAA and RAA, respectively. Mature forest component will be reduced by 40 percent in the marine terminal RAA. According to the Conservation Data Centre, the ecological communities at risk affected by the Project have experienced short-term declines of 10 to 50 percent and long-term declines between 10 to 50 percent (30 to 70 percent for the Western hemlock/Amabilis fir-Deer fern community). Therefore, ecological communities at risk affected by the Project are considered highly vulnerable or highly to moderately vulnerable. The likelihood of the Project contributing to a cumulative residual effect is considered high (although small in magnitude in comparison to the overall cumulative residual effect). Cumulative residual effects are not considered to be significant.

**Change in wetland functions**

The likelihood of residual cumulative effects on wetland functions is considered high since adverse changes in wetland functions have already occurred. While there is low magnitude loss of wetland functions, the wetland ecosystems affected by the Project are ranked as secure (yellow-listed) in the province. The likelihood of the Project contributing to a cumulative residual effect is considered high (although it is small in magnitude in comparison to the overall cumulative residual effect). Cumulative residual effects are not considered to be significant.

**Change in native vegetation health and diversity due to air emissions effects**

There is a high likelihood that a decline in the vegetation health and diversity, particularly for lichen species, has already occurred due to cumulative sulphur dioxide atmospheric concentrations in the air emissions RAA. There is a medium likelihood of a decline in the vegetation health and diversity will occur due to the cumulative effects of soil acidification and eutrophication in the air emissions RAA. Though soil acidification has not been observed in Rio Tinto's soil monitoring as of 2018, acidification may develop over time as soil buffering capacity is exhausted and effects to vegetation health and diversity may follow. The likelihood of the Project contributing to a cumulative residual effect is considered high (although it is small in magnitude in comparison to the overall cumulative residual effect). Cumulative residual effects are not considered to be significant.

#### *5.3.4.4 Interactions between Effects*

Under section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25(2) of the Act (2018)[18] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects to vegetation resources are described above in section 5.3.4.2.

The vegetation resources VC assessment was linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Air Quality — air quality modelling results and mitigations were used to inform the assessment of effects to vegetation resources due to air emissions;
- Wildlife — wildlife information informed the wetland function assessment, specifically for habitat function, where applicable;
- Freshwater Fish — freshwater fish assessment informed the wetland function assessment, specifically for habitat function, where;
- Land and Resources Use — land tenure information was considered to inform mitigation measures, with different mitigations proposed for crown lands and private lands zoned for industrial uses;
- Climate Change — information from "Effects of the Environment" on the Project also informed the existing conditions description of the vegetation resources assessment; and
- The Impact of Effects — the impact on vegetation, on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and section 6.9 of this Report, respectively.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

In addition, the EAO notes that the effects of all biophysical VCs including vegetation, air quality, wildlife and freshwater fish, are considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6). This assessment considers linkages within each of the biophysical and human realms and considers effects in a holistic

[18] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function.

#### *5.3.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of effects on vegetation resources.

In the Application, Cedar noted that information on traditional knowledge and traditional use of vegetation by the Haisla was collected through publicly available sources for the marine terminal RAA. Haisla granted permission to Cedar to use the traditional land use study prepared for the LNG Canada Export Terminal to describe vegetation resources traditional knowledge and traditional use in the marine terminal RAA. The traditional territories of Gitga'at Kitselas and Haisla overlap with the air emissions LAA. The results from the effects assessment for the change in native vegetation health and diversity due to air emissions were compared to the traditional territories and reported with the modelling results. Cedar recognized that an absence of identified traditional knowledge information on vegetation from potentially affected Indigenous nations does not indicate an absence of traditional use, occupation, or interest within the marine terminal RAA.

During the EA, Indigenous nations did not submit any comments on vegetation resources.

#### *5.3.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or significant cumulative effects on the vegetation resources VC. This conclusion considers: the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations and Cedar; the proposed mitigation measures identified in the provincial TOC (including Condition 9: Construction Environmental Management Plan); and recommended Mitigation Measures under the IAA for vegetation resources (Appendix 1).

# 5.4 WILDLIFE

## 5.4.1 BACKGROUND

This chapter assesses the potential effects Cedar LNG would have on wildlife. The Application evaluated the potential effects associated with a change in habitat, a change in movement, and a change in mortality risk associated with each Cedar LNG phase.

The subcomponents selected for the wildlife VC assessment include:

- Mammals;
- Migratory birds;
- Non-migratory birds;
- Amphibians;
- Species of conservation concern; and
- Species of Indigenous cultural use and value.

Effects to wildlife would occur in federal jurisdiction. These effects are considered in this section, specifically including:

- Effects on freshwater aquatic species as defined in SARA, as required under Section 2(a)(ii) of the IAA (including coastal tailed frog and western toad); and
- Migratory birds under Section 2(a)(iii) of the IAA.

Effects on wildlife in relation to effects to the health, social or economic conditions of the Indigenous peoples of Canada and current use of lands and resources for traditional purposes and cultural heritage are discussed in section 6.9 of this Report.

The following key species and species groups were assessed for potential wildlife effects:

| Key Wildlife Species | Wildlife Species Groups |
|---|---|
| Grizzly Bear | Bats |
| Moose | Old forest songbird community |
| Pacific marten | Young forest songbird community |
| Marbled murrelet | Marine birds: shorebirds, dabbling ducks, diving ducks, loons, and cormorants, and alcids[19] |
| Coastal tailed frog | |
| Western toad | |

[19] Alcids belong to the family of web-footed diving birds with short legs and wings which includes the auk, murres, and puffins.

#### 5.4.1.1 Regulatory Context

The Application identifies both federal and provincial legislation and policy used to guide the assessment of potential adverse effects on wildlife. The following federal and provincial regulatory guides were used:

- Federal Migratory Birds Convention Act (MBCA), which protects migratory birds, their nests and eggs, and designated critical habitats of migratory birds listed under the Species at Risk Act (SARA);
- SARA provides for the recovery of wildlife species that are extirpated, endangered, or threatened as a result of human activity, and manages species of special concern to prevent them from becoming endangered or threatened;
- BC Wildlife Act (Section 34), which prohibits the possession, take, injury, molestation, or destruction of a bird, its occupied nest, or eggs;
- BC Oil and Gas Activities Act (including the Environmental Protection and Management Regulation), which specifies requirements and environmental objectives that must be followed when conducting oil and gas activities;
- BC Conservation Framework, which provides rankings of species and ecosystems of conservation priority. All wildlife in BC is listed under this framework and have a ranking;
- BC Conservation Data Centre (CDC), which tracks wildlife species and their provincial conservation status as well as occurrence and distribution data. All wildlife species in BC are tracked by this data centre;
- BC Environmental Mitigation Policy and Procedures, which are designed to support existing authorization processes by providing guidance for the identification of environmental values and implementation of measures to mitigate environmental impacts; and
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which is an independent body of experts responsible for identifying and assessing wildlife species considered to be at risk reports its results to the Canadian government and the public. Wildlife species that have been designated by COSEWIC have the potential to qualify for legal protection and recovery under SARA.

#### 5.4.1.2 Boundaries

The spatial boundaries used in the wildlife assessment were comprised of:

- Project footprint, which is the area of disturbance (46.3 ha) that includes the marine terminal footprint (11.7 ha) and the transmission line footprint (34.6 ha);
- The FLNG facility, which is approximately 125 ha and extends approximately 500 m offshore;
- Marine terminal LAA defined by a 1 km buffer around the Cedar LNG physical works and is 1,997 ha (of which 1,759 ha is terrestrial habitat [non-ocean areas]) (see Figure 10);
- Marine Terminal RAA defined by a 15 km buffer around the Cedar LNG physical works area and the transmission line corridor (98,626 ha) (see Figure 10);

- Shipping LAA defined by a 1 km buffer around the Marine Shipping Route and is confined by the high-tide line (55,695 ha) (see Figure 11); and
- Marine Shipping RAA defined by a 10 km buffer around the Marine Shipping Route and is confined by the high-tide line (312,677 ha) (see Figure 11).

The temporal boundaries included the construction, operations, and decommissioning phases.

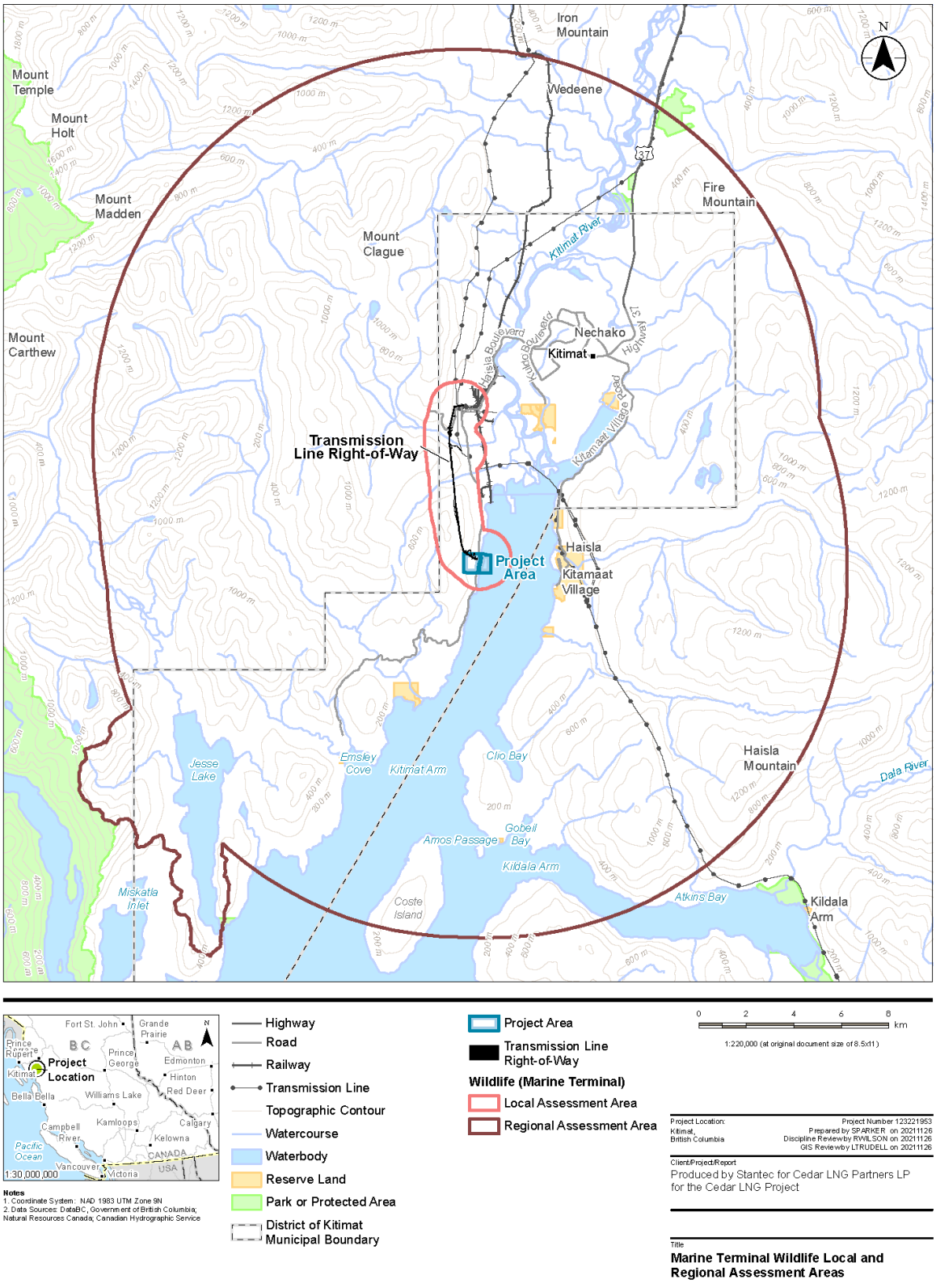


**Figure 10. Wildlife Marine Terminal LAA and RAA.**

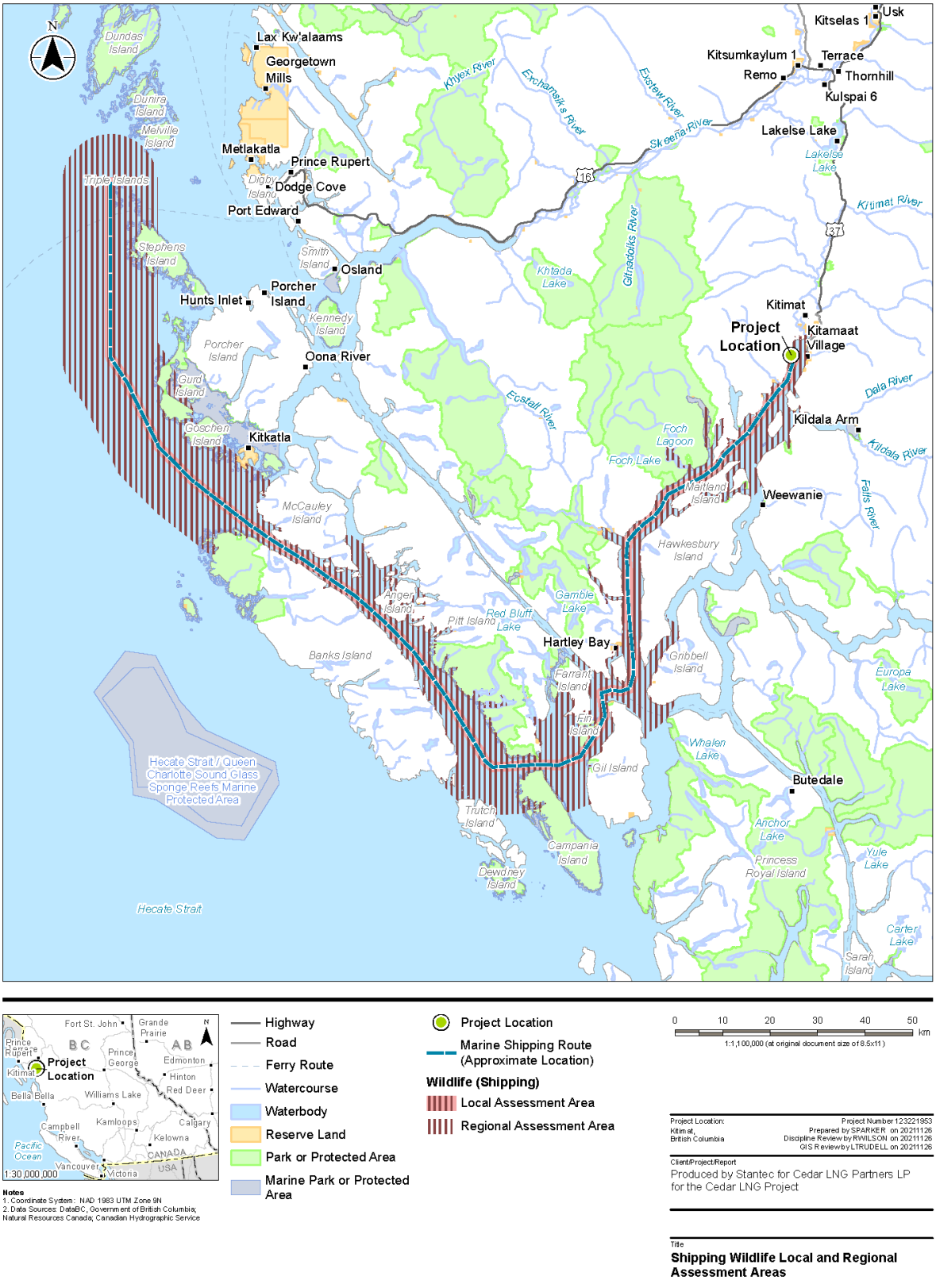


**Figure 11. Wildlife Marine Shipping LAA and RAA.**

### 5.4.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.4.3.

#### *5.4.2.1 Existing Conditions*

Baseline information on wildlife to characterize current conditions was established from existing data and reports, project-specific field studies, and habitat suitability models (quantitative and qualitative). Traditional knowledge and traditional use were also used for baseline information.

#### *5.4.2.2 Wildlife and Wildlife Habitat*

The Marine Terminal RAA is comprised of multi-aged coniferous forests and rocky shoreline supporting a variety of wildlife species. Forests below 400 m elevation are characterized by a shrub layer of forage species (such as salmonberry or blueberry) for wildlife such as bears, moose, black-tailed deer, and band-tailed pigeon. Mature and old forests support habitat for marbled murrelet, western screech owl, northern goshawk, and olive-sided flycatcher. Lastly, higher elevation areas support habitat for mountain goat and wolverine species.

According to previous provincial data and Indigenous knowledge studies, 25 species of terrestrial mammal (including eight bat species) have been detected in the Kitimat area. Of these, five are species of conservation concern (Table 16) and others are used by Indigenous nations for traditional, subsistence, as well as cultural and spiritual values. The terrestrial species that occur within the Marine Terminal RAA and are harvested by Haisla and other potentially affected Indigenous nations include grizzly bear, black bear, beaver, moose, black-tailed deer, wolf, mink, river otter, muskrat, and red squirrel. Refer to sections 11 to 19 of the Application for further details on wildlife species hunted and trapped as provided by each Indigenous nation.

The Application identified that 15 bird species of conservation concern (Table 16) are likely to occur within the Marine Terminal and Marine Shipping RAAs. Geese, ducks, and swans were recorded as culturally important birds harvested by Indigenous nations.

Cedar noted the following observations from field studies:

- A 2021 field survey program confirmed an active bald eagle nest within the Marine Terminal LAA;
- Seven species of amphibian were detected within the Marine Terminal RAA: northwestern salamander, rough-skinned newt, wood frog, long-toed salamander, Columbia spotted frog, coastal tailed frog, and western toad. Of which, coastal tailed frog and western toad are identified as species of conservation concern (Table 16);

- Twelve individuals of three marine bird species (including the marbled murrelet) and 28 individuals of 11 marine bird species (including western grebe which is on the April 2021 BC Red List) were detected on the west side of Kitimat Arm;
- Site surveys identified three areas in the northern portion of the Marine Terminal LAA where two adult and six juvenile western toads, and one adult Columbia spotted frog were observed;
- Black bear was the one species documented by remote cameras within the Marine Terminal LAA; and
- One hundred thirty-one detections of 48 species were recorded incidentally between formal survey periods in the Marine Terminal RAA. These included 11 mammals, three amphibians, and 34 birds where four are of conservation concern (grizzly bear, western toad, coastal tailed frog, and marbled murrelet). While no wildlife habitat features were identified during targeted transect surveys, one potential bear den and two raptor stick nests were recorded.

Cedar completed habitat suitability modeling in the Marine Terminal LAA for grizzly bear (spring feeding and fall feeding), moose (winter shelter and winter feeding), Pacific marten (all-year living), and marbled murrelet (summer breeding). Results are described below in section 5.4.2.4. For further details on the wildlife habitat suitability modelling and figures, refer to the Wildlife TDR in the Application.

**Table 16: Species of Conservation Concern Likely to Occur within the Marine Terminal and Shipping Regional Assessment Areas**

| Common Name | Scientific Name | Conservation Status | | | Relevant RAA | |
|---|---|---|---|---|---|---|
| | | British Columbia | Canada | | Marine Terminal RAA | Marine Shipping RAA |
| | | CDC[1] | COSEWIC[2] | SARA[3] | | |
| **Mammals** | | | | | | |
| Fisher | *Pekania pennanti* | Blue | - | - | ✓ | - |
| Grizzly Bear | *Ursus Arctos* | Blue | Special Concern (2002) | Special Concern (2018) | ✓ | - |
| Little brown myotis | *Myotis lucifugus* | Yellow | Endangered (2013) | Endangered (2014) | ✓ | - |
| Mountain goat | *Oreamnos americanus* | Blue | - | - | ✓ | - |
| Wolverine, *luscus* subspecies | *Gulo gulo luscus* | Blue | Special Concern (2014) | Special Concern (2018) | ✓ | - |
| **Amphibians** | | | | | | |
| Coastal tailed frog | *Ascaphus truel* | Yellow | Special Concern (2011) | Special Concern (2003) | ✓ | - |
| Western toad | *Anaxyrus boreas* | Yellow | Special Concern (2012) | Special Concern (2018) | ✓ | - |
| **Birds** | | | | | | |
| Band-tailed pigeon | *Patagioenas fasciata* | Blue | Special Concern (2008) | Special Concern (2011) | ✓ | - |
| Brant | *Branta bernicla* | Blue | - - | - - | - | • ✓ |
| California gull | *Larus californicus* | Blue | - - | - - | - | • ✓ |
| Common murre | *Uria aalge* | Red | - - | - - | - | • ✓ |
| Common nighthawk | *Chordeiles minor* | Yellow | Special Concern (2018) | Threatened (2010) | ✓ | - |
| Western grebe | *Aechmophorus occidentalis* | Red | Special Concern (2014) | Special Concern (2017) | - | • ✓ |
| Short-billed dowitcher | *Limnodromus griseus* | Blue | - | - | • ✓ | - |
| Surf scoter | *Melanitta perspicillata* | Blue | - | - | - | ✓ |
| Red-necked phalarope | *Phalaropus lobatus* | Blue | Special Concern (2014) | - | - | ✓ |

| Common Name | Scientific Name | Conservation Status | | | Relevant RAA | |
|---|---|---|---|---|---|---|
| | | British Columbia | Canada | | Marine Terminal RAA | Marine Shipping RAA |
| | | CDC[1] | COSEWIC[2] | SARA[3] | | |
| Double-crested cormorant | *Phalacrocorax auritus* | Blue | - | - | - | ✓ |
| Marbled murrelet | *Brachyramphus marmoratus* | Blue | Threatened (2012) | Threatened (2003) | ✓ | ✓ |
| Ancient murrelet | *Synthliboramphus antiquus* | Blue | Special Concern (2014) | Special Concern (2006) | - | ✓ |
| Cassin's auklet | *Ptychoramphus aleuticus* | Red | Special Concern (2014) | Special Concern (2019) | - | ✓ |
| Tufted puffin | *Fratercula cirrhata* | Blue | - | - | - | ✓ |
| Great blue heron, *fannini* subspecies | *Ardea herodias fannini* | Blue | Special Concern (2008) | Special Concern (2010) | ✓ | ✓ |
| Northern goshawk, *laingi* subspecies | *Accipiter gentilis laingi* | Red | Threatened (2013) | Threatened (2005) | ✓ | - |
| Western screech-owl, *kennicottii* subspcies | *Megascops kennicotti* | Blue | Threatened (2012) | Threatened (2005) | ✓ | - |
| Peregrine falcon, *pealei* subspecies | *Falco peregrinus pealei* | Blue | Special Concern (2017) | Special Concern (2003) | ✓ | - |
| Black swift | *Cypseloides niger* | Blue | Endangered (2015) | Endangered (2019) | ✓ | - |
| Olive-sided flycatcher | *Contopus pertinax* | Blue | Special Concern (2018) | Threatened (2010) | ✓ | - |
| Barn swallow | *Hirundo rustica* | Blue | Threatened (2011) | Threatened (2017) | ✓ | - |
| Evening grosbeak | *Coccothraustes vespertinus* | Yellow | Special Concern (2016) | Special Concern (2019) | ✓ | - |

NOTES:

[1] CDC = British Columbia Conservation Data Centre
[2] COSEWIC = Committee on the Status of Endangered Wildlife in Canada
[3] SARA = *Species at Risk Act*

#### 5.4.2.3 Potential Project Effects

Potential effects associated with wildlife (inclusive of terrestrial wildlife and marine birds) were identified in the Application as changes in habitat (direct and indirect), movement, and mortality risk. The details of these potential effects are discussed below.

#### 5.4.2.4 Change in Habitat

##### 5.4.2.4.1 Grizzly Bear

Grizzly bear is listed as a species of special concern on Schedule 1 of SARA. Cedar conducted habitat suitability modeling for grizzly bear, identifying approximately 721.6 ha of effective spring feeding habitat[20] and 730.9 ha of effective fall feeding habitat at baseline in the Marine Terminal LAA. Cedar LNG construction is predicted to decrease grizzly bear habitat due to site clearing. At the same time, Cedar LNG predicted to increase habitat due to the creation of the herbaceous or shrubby habitat that makes good forage sites for grizzly bear under the transmission line. The net effect of these changes on effective habitat in the Marine Terminal LAA is a decrease in spring habitat by 2.3 percent (16.5 ha) and a decrease in fall habitat by 10.1 percent (74.1 ha). The Marine Terminal RAA and LAA contain 8,615 ha and 6.5 ha of grizzly bear Wildlife Habitat Area (WHA) 6-287, respectively; however, none of this area would be directly impacted by Project activities.

##### 5.4.2.4.2 Marbled Murrelet

Marbled murrelet is listed as threatened on Schedule 1 of SARA. A recovery strategy for the Marbled Murrelet (*Brachyramphus marmoratus*) in Canada (originally issued in 2014 and amended in 2021) has been prepared by ECCC, which includes population status and recovery objectives for marbled murrelet (Recovery Strategy). Marbled murrelet is also considered a migratory bird under the MBCA. As part of the Recovery Strategy, Geographic Location Polygons that may contain critical terrestrial (nesting) habitat for marbled murrelet have been identified.

Cedar LNG's Facility Area and transmission line corridor overlaps with a total of 6.7 ha of potentially affected terrestrial nesting critical habitat. Habitat suitability modeling for marbled murrelet habitat found that the percent of habitat overlapping with Cedar LNG had overall field rankings of low and very low suitability. The decrease in effective habitat for marbled murrelet

[20] Effective habitat is defined as the sum of high (class 1), moderately high (class 2), and moderate (class 3), which accounts for direct and indirect effects, as understood for each key species. The definition of "effective habitat" varies among the species, depending on the assessment method. This definition is applicable for grizzly bear and moose.

Effective habitat for marten and marbled murrelet is defined as the sum of high (class 1) and moderate (class 2), which accounts for direct and indirect effects, as understood for each key species. Effective habitat for marbled murrelet should be interpreted similarly to the ECCC Geographic Location Polygons where model output shows areas within which suitable nesting habitat could occur. As suitability for marbled murrelet nesting is determined by the presence of specific tree attributes that provide suitable nesting platforms (large limbs usually with thick epiphyte cover) and the habitat suitability models are based on 1:5000-scale TEM and does not contain data on these specific tree attributes.

summer breeding is predicted to occur in the southern part of the transmission line corridor, where the footprint will pass through forest that has experienced little or no previous logging.

Cedar noted that the short term (i.e., 2002–2032) recovery objective identified in the Recovery Strategy is the retention of at least 68 percent of suitable nesting habitat for marbled murrelet within the Central Mainland Coast Conservation Region, with 2002 levels as the baseline. In 2011, there was an excess of 40.5 percent (89,451 ha) above the 68 percent target within the Central Mainland Coast Conservation Region (310,427 ha). Cedar assumed that a small portion of the 40.5 percent excess has already been removed due to projects that have been constructed in the central coast of British Columbia between 2011 and 2021 (for example, Coastal GasLink Pipeline and LNG Canada Export Terminal are both in progress and interact with marbled murrelet habitat). Cedar LNG's direct effect on the potential marbled murrelet habitat area identified would represent a 0.007 percent decrease of the 40.5 percent excess.

#### 5.4.2.4.3 Moose

Cedar conducted habitat suitability modelling for moose, identifying approximately 794.0 ha of effective winter-feeding habitat and 727.4 ha of effective winter shelter at baseline in the Marine Terminal LAA. Cedar LNG is predicted to decrease moose winter feeding and shelter habitat due to site clearing and preparation. At the same time, Cedar LNG is predicted to increase habitat for both feeding and shelter due to the creation of the transmission line. The net effect in the Marine Terminal LAA for both winter feeding and winter shelter habitats are a decrease of 1.6 percent (12.8 ha) and a decrease of 2.9 percent (21.3 ha), respectively. The Marine Terminal RAA contains 5,857 ha of moose Ungulate Winter Range (UWR) area UWR u-6-009. No UWRs exist within the marine terminal LAA.

#### 5.4.2.4.4 Pacific Marten

Construction associated with Cedar LNG is predicted to reduce effective Pacific marten year-round living habitat within the marine terminal LAA by 12.6 percent (92.2 ha). Most of the change in effective habitat for Pacific marten is anticipated to occur along and near the Project's proposed transmission line right-of-way, where tree cover will be removed.

#### 5.4.2.4.5 Bats

The Marine Terminal LAA contains 5.5 percent (110 ha) of mature upland forest (structural stage 6), 26 percent (528 ha) of old upland forest, and less than 0.1 percent (1.6 ha) of mature floodplain forest at baseline. The Marine Terminal LAA has potential to provide foraging habitat for bats as it contains 3.1 percent (61.7 ha) of wetland habitat at baseline.

Construction of Cedar LNG is predicted to reduce mature forest by 4 percent (4.5 ha), old forest by 2.3 percent (12.3 ha), and wetlands by 0.9 percent (0.6 ha) within the Marine Terminal LAA (mature floodplain forest will not be directly affected). While construction will create new forest edges known to be used by bats for foraging, habitat suitability for bats is predicted to decrease during construction and operation due to indirect effects (such as noise). Utilization of artificial lighting at night during construction and operation may increase forage opportunities

for bats if insects congregate around lighting. Little brown myotis is listed as endangered on Schedule 1 of SARA.

#### 5.4.2.4.6 Old Forest Songbird Community

Mature and old forests in the Marine Terminal LAA provide summer breeding habitat for the old forest songbird community. Cedar LNG will result in the reduction of mature forest by 4.0 percent (4.5 ha) and old forest by 2.3 percent (12.3 ha), with construction of the transmission line accounting for all direct change in breeding habitat. Construction activities (for example: site preparation, forest clearing, and indirect effects (such as noise) may impact habitat effectiveness for songbirds that breed in mature and old forest within the Marine Terminal LAA. The olive-sided flycatcher is listed as threatened on Schedule 1 of SARA.

#### 5.4.2.4.7 Young Forest Songbird Community

The Marine Terminal LAA provides summer breeding habitat for the young forest songbird community through shrub, pole sapling, and young forest vegetation communities. Cedar LNG will result in the reduction of shrub forest by 2.8 percent (6.3 ha), pole sapling forest by 3.5 percent (12.0 ha), and young forest by 2.8 percent (5.5 ha). Construction of the transmission line and onshore facilities account for a direct reduction of 9.1 percent (23.8 ha) in habitat for the young forest songbird community. The Application noted construction (site preparation and clearing) and operational (facility and infrastructure maintenance) activities will result in indirect effects that could reduce habitat effectiveness for songbirds that breed in the aforementioned forest communities.

#### 5.4.2.4.8 Western Toad

Western toad is listed as a species of Special Concern on Schedule 1 of SARA. While shallow open water wetland types within the Marine Terminal LAA may support breeding for western toad and other pond dwelling amphibians, Cedar stated that conditions in other types of wetlands (such as bog, fen, swamp, and estuarine/tidal wetlands) within the Marine Terminal LAA are not suitable for western toad, (being too acidic or lacking open water). In addition, with mitigation measures (refer to section 5.4.2.3 of this Report), the predicted loss of less than 0.1 ha (0.2 percent of the Marine Terminal LAA) would likely be avoided.

The Marine Terminal LAA is comprised of 68 percent (1,365 ha) upland forest, which has potential to provide overwintering habitat for western toad. Construction will result in the removal of 2.9 percent of upland forest within the Marine Terminal LAA (40 ha), with most of the direct effects on upland habitat types along the proposed transmission line right-of-way. Mitigation measures employed will assist in reduction of indirect effects such as sensory disturbances and noise.

#### 5.4.2.4.9 Coastal Tailed Frog

Coastal tailed frog is listed as a species of special concern on Schedule 1 of SARA. The Marine Terminal LAA intersects with four watersheds: Anderson Creek, Moore Creek, Beaver Creek, and unnamed tributaries to Douglas Channel. The Marine Terminal RAA overlaps with 61.6 ha of WHA 6-067 for coastal tailed frog habitat. Coastal tailed frogs were detected in the Anderson

Creek and Moore Creek watersheds and in unnamed tributaries to Douglas Channel. These areas have suitable characteristics that could provide year-round habitat for coastal tailed frog. While no records exist for coastal tailed frog in the Beaver Creek watershed, one tributary does indicate low potential to support the species.

Riparian and instream habitat will be altered during construction at several watercourse crossings associated with transmission line access roads in tributaries to Anderson, Moore, and Douglas Creeks. Riparian clearing associated with transmission line construction will also occur around the one tributary to Beaver Creek (WC-01) that has potential to support coastal tailed frog. In addition, Cedar may require periodic water withdrawal from a watercourse in Douglas Channel watershed (WC-19) that has several prior records of coastal tailed frog. Within 30 m of watercourses known to be occupied by coastal tailed frog, grubbing/grading will be reduced. If unavoidable, additional measures may be implemented by an environmental monitor.

#### *5.4.2.4.10* Marine Birds

The Marine Shipping RAA includes several shorelines which constitute marine parks and conservation and management areas. The Marine Shipping RAA overlaps with Important Bird Area 119 and two known marine bird colonies. These two overlaps collectively support a breeding population of glaucous winged-gull, pelagic cormorant, and pigeon guillemot. While the Marine Shipping LAA overlaps with Important Bird Area 119, it does not overlap with known bird colonies, marine parks, or conservation and management areas.

#### 5.4.2.4.11 Migratory Birds

As part of the Application, migratory birds, as defined under the MBCA and Migratory Birds Regulations, were selected as a subcomponent for the wildlife VC. Migratory birds were assessed using key species and species groups and potential effects were discussed where applicable (that is, avoid vegetation clearing and grubbing during the primary nesting period for migratory birds). Cedar identified that there were 46 migratory bird species within the old or young forest songbird communities and 170 migratory bird species known to occur in the Marine Terminal LAA or RAA or the Marine Shipping RAA.

### *5.4.2.5 Change in Movement*

Change in movement may result from site preparation, clearing, construction, maintenance, and decommissioning of land-based and marine-based infrastructure and vehicle traffic. During operation, night lighting of the marine terminal and the FLNG facility may alter bird and bat movement patterns. For marine birds, the primary effect mechanism is disruption of movement on or over the water due to marine vessel traffic.

Concerns related to the disruption of wildlife movement are typically for species that move between seasonal ranges using defined travel corridors. The following species that fit this concern profile within the Marine Terminal RAA include (but are not limited to): grizzly bear, moose, western toad, mountain goat, and wolverine. The opening created by the land- and shoreline-based Project footprint within the Cedar LNG area is a wildlife crossing obstacle.

The terrestrial portion of the Facility Area will not be crossable by wildlife, other than by those species that can fly. Concentrated industrial activity, lack of cover, and fencing will deter wildlife from crossing this area during construction and operation; however, some species or individuals (for example, shorebirds or river otter) may find movement routes around the area (such as along the shoreline at night or at low tide).

Marine terminal lighting, including the flare stack pilot flame and the FLNG facility, has the potential to alter the movements of terrestrial birds, such as songbirds, within the Marine Terminal LAA. While facility lighting may be attractive to foraging bats it also has the potential to disrupt their normal flight routes.

#### *5.4.2.6 Change in Mortality*

The Application noted that the activities that may result in accidental mortality of both wildlife and marine birds (including shorebirds) were as follows: site preparation and clearing (such as machinery use); construction of land-based and marine based infrastructure (such as machinery use); facility and infrastructure maintenance during operation (such as flaring during commissioning or transmission line bird strikes); and waste management during all phases (such as contact with contaminants). Accidental mortality is also a characteristic of three other effect pathways: physical destruction of key habitat features, Project lighting, and wildlife-vehicle collisions.

Lighting on vessels, facilities, and infrastructure is an effect pathway for mortality risk for migratory birds and marine birds. For birds, the effect mechanism is individuals being either disoriented by, or attracted to, vessel, facility or infrastructure lights and the subsequent potential for a fatal strike. For example: marine birds may have to change their direction of movement to fly around LNG carriers, or they may move towards vessels if attracted to lighting at nighttime. Change in mortality risk for marine birds is expected to increase because of the presence of LNG carriers and associated lighting. Marine birds can be attracted to artificial lighting and become disoriented by, or attracted to, carrier lights. Birds may collide with lighting or lit areas and become either stranded or fatally injured. The operating land-based facilities and infrastructure, Marine Terminal, and FLNG facility and the previously discussed Cedar LNG activities comprise of the artificial light sources which create the pathway: marine transport of construction materials to the site; marine shipping and transportation; and marine transport of decommissioned infrastructure.

Cedar LNG will result in an increase in linear feature density through the transmission line right-of-way and its associated access roads. An increase in linear feature density can increase mortality risk for bears, ungulates, and furbearers due to increased human and predator access.

Increased traffic volumes due to Cedar LNG related vehicles will increase mortality risk for terrestrial wildlife during construction, operation, and decommissioning. The affected roads are Bish Creek Forest Service Road, Alcan Way, and Haisla Boulevard, which are already active

industrial use roads, plus access roads related to the construction and maintenance of the transmission line.

Wildlife-human conflict is a mortality risk as conflict wildlife may need to be destroyed. The primary Cedar LNG related activity that may result in wildlife-human conflict is waste management during all phases, specifically related to wastes that may be attractive to wildlife (such as food wastes). There is also potential for adverse wildlife encounters during the initial stages of site preparation and clearing (such as surveying); however, such encounters are less likely to be conflicts that result in wildlife mortality. This effect pathway is particularly relevant to wildlife such as bears and canids.

#### *5.4.2.7 Positive Effects*

Cedar did not identify any positive effects of the Project on wildlife.

#### *5.4.2.8 Mitigation Measures Proposed in the Application*

The Application proposed the following mitigation measures to avoid or minimize the potential adverse effects of Cedar LNG on wildlife:

- Clearing boundaries will be delineated prior to site preparation to keep clearing activities within the designated Cedar LNG footprint. This may be via physical flagging or electronic delineation, where appropriate (construction);
- Prior to clearing and/or construction, and as temporally applicable, a buffer zone around identified wildlife habitat features will be clearly delineated and marked in the field by an environmental monitor (construction);
- Wildlife habitat features (for example: dens, raptor nests, mineral licks) discovered during construction will be reported to Cedar's environmental manager and feature-specific mitigation will be developed by an environmental monitor (construction);
- Cedar personnel will not work within identified wildlife habitat feature buffers during sensitive timing windows. For any work within the buffer zone during a sensitive timing window, Cedar will consult with an environmental monitor to determine whether additional feature-specific mitigation is required (construction);
- Cedar LNG lighting will be designed in a manner that is consistent with the OGC Light Control Best Practices Guideline and will consider the following measures to reduce risk of injury or mortality and change in movement for bats, marine, and migratory birds (operation):
  - Directional or shielded lighting to reduce the vertical or horizontal distribution of light,
  - Adaptive controls and variable lighting regimes (for example: timers, dimmers, motion sensors);
- A wildlife management plan will be incorporated into the CEMP and will include wildlife-related mitigation measures, monitoring plans, and reporting requirements (all phases);

- Vegetation clearing and grubbing should occur outside of the primary nesting period for migratory birds (April 11 – August 8 in Nest Zone A2). Where clearing and grubbing cannot be avoided during these periods, Cedar will incorporate mitigation measures (for example: pre—clearing bird nest surveys, establishment of setbacks around protected nests to protect birds and their eggs (construction and operation);
- Year-round protection is required for specific nests protected under the Wildlife Act (for example: eagle, osprey, heron). If a nest protected under the Wildlife Act is identified, setbacks and restricted activity periods will be specified by an environmental monitor according to provincial guidance (construction);
- Grubbing and grading should be avoided within 30 m of amphibian breeding sites during the breeding and post-breeding dispersal periods for amphibians (beginning in April, with post-breeding dispersal extending through to October). If grubbing and grading activities cannot be avoided during this period, an amphibian salvage and relocation program will be implemented, and additional measures may be specified by an environmental monitor (such as installation of silt fencing to direct dispersal away from work areas) (construction);
- Grubbing and grading should be limited within 30 m of a watercourse known to be occupied by coastal tailed frog at all times of the year. If grubbing and grading cannot be avoided within 30 m of a watercourse known to be occupied by coastal tailed frog, additional measures may be specified by an environmental monitor in the CEMP (for example: additional sediment control measures or use of clear-span bridges to cross the watercourse) (construction);
- Fences will be installed around the Marine Terminal area to exclude wildlife and reduce potential for onsite human-wildlife interactions (construction);
- Waste management practices to reduce the potential to attract wildlife to the facility will be incorporated into the CEMP (all phases); and
- Project-related wildlife mortalities and conflict animals will be reported as required to appropriate authorities. Reporting requirements and contact information will be provided in the CEMP (all phases).

In addition, Cedar has integrated certain key design decisions into the Project to help reduce the effects on wildlife, such as:

- Locating natural gas pre-treatment and liquefaction equipment and LNG storage on the FLNG facility (construction and operation), which reduces the size of the Project footprint; and
- Locating the Marine Terminal on private property that had been previously used as a log sort, which reduces the incremental area of wildlife habitat disturbance.

During Application Review, Cedar also proposed a Follow-up Program for wildlife, which is described further below in sections 5.4.3 and 5.4.4.

### 5.4.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of wildlife for Cedar LNG were identified:

- Operations monitoring;
- Amphibians
- Bats;
- Migratory birds;
- Marbled murrelet;
- SARA-listed species; and
- Bird strikes.

#### *5.4.3.1 Operations Monitoring*

Gitxaała, Lax Kw'alaams, Kitselas, Metlakatla, and ECCC expressed the need for wildlife monitoring and mitigation during the operation phase of Cedar LNG. It was requested that Cedar continue to monitor effects on terrestrial and marine wildlife and mitigation effectiveness throughout the life of the Project. ECCC also requested additional information on mitigation and monitoring related to the effects of the transmission line and specifically on amphibians, bats, migratory birds, marbled murrelet (ECCC concerns regarding bats, migratory birds, and marbled murrelet are discussed in greater detail in their own subsections below).

In response, Cedar proposed a Follow-up Program for wildlife, including the following components:

- Commitment to documenting habitat loss associated with construction and compare the results to the Application predictions;
- Report on amphibian salvage activities (pond-dwelling amphibians and coastal tailed frog) during construction;
- Coastal tailed frog visual presence/not detected surveys and eDNA sampling; and
- Track and report annually on wildlife interactions/mortality with annual reporting during construction and in the first two years following start of operations for the facility and transmission line; and
- Cedar will report on any observed instances of bird strikes by LNG carriers, as coordinated and discussed with BC Pilots.

Cedar noted that it would provide reports to THE AGENCY, ECCC, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla and meet with these same Indigenous nations to discuss reports upon request. Cedar also noted that proposed mitigation measures for wildlife during operations are related to Project design and therefore will be implemented by Cedar prior to operation (for example: lighting design and perimeter fencing). Cedar specified that it will be responsible for adherence to permit conditions related to environmental protection associated with permits during operation.

In consideration of the concerns raised, the EAO recommends a Follow-Up Program for wildlife as a federal Mitigation Measure under the IAA, as described in section 5.4.4.1 below. With this recommendation, the EAO is satisfied this issue is adequately addressed for the purpose of the EA.

#### *5.4.3.2 Amphibians*

ECCC requested additional information related to the salvage and relocation of pond-dwelling amphibians, including western toad and coastal tailed frog, including:

- What considerations have been given to the adverse effects related to salvage and relocation of amphibians;
- Were the provincial best management practices taken into consideration and if so, how were/will they be incorporated;
- Were species-specific sensitivities taken into consideration (e.g., adverse effects to coastal tailed frog and other amphibians due the loss of riparian habitat); and
- For coastal tailed frog, how was the use of a 30 m setback/search area determined? Some adults can move up to 45 m from their stream and female adults have been found to move approximately 68 m from stream in unharvested sites.

Cedar responded with the following information:

- The 30 m setback for coastal tailed frog streams was selected based on guidance for managing disturbance to the core riparian area around coastal tailed frog streams, as described in the Develop with Care Fact Sheet #17 for coastal tailed frog;
- The identification and mapping of known and suitable amphibian habitat was completed for the Application. However, Cedar will review, confirm, and potentially revise the mapping in preparation for the implementation of the follow-up program for amphibians. The review and confirmation process will include new or additional information that would be obtained from as part of permitting associated with working in or about a stream;
- As described in the Follow-up Letter, Cedar will prepare a comparison of as-built versus predicted change in habitat for key species and species groups used in the Application,

which includes western toad (breeding and overwintering habitat) and coastal tailed frog (year-round habitat);

- Cedar predicts that project-related effects on amphibian habitat will be limited, as described in the Application. Specifically, 0.1 ha of wetland habitat suitable for western toad is predicted to be directly affected. Potential effects on watercourses and adjacent riparian habitat have already been reduced substantially through the use of design features such as clear span towers over Anderson and Moore creeks, each of which are known to support coastal tailed frog. Riparian restoration is expected to be a requirement as part of permitting under the Water Sustainability Act; and
- Cedar will incorporate Best Management Practices for Amphibian and Reptile Salvages in British Columbia into the follow-up program for amphibians.

The EAO notes that it has recommended federal Mitigation Measures and a Follow-up Program for wildlife with specific measures for western toad and coastal tailed frog. The EAO considered this issue to be adequately addressed for the purpose of the EA.

#### *5.4.3.3 Bats*

ECCC and Lax Kw'alaams requested additional information related to Project-related adverse effects on wildlife trees and habitat for bats including:

- Implementing wildlife tree reserves to provide roosting and habitat until new roosts are recruited;
- Where appropriate, implementing selective harvest or green tree retention practices to help ensure long-term availability of roost trees for bats;
- Avoid clearing vegetation in candidate bat roost and hibernacula sites during the appropriate timing windows; and
- Use of Qualified Professionals (QP) in developing mitigation measures.

In response, Cedar noted that clearing has been minimized to the greatest extent possible using a FLNG design. Cedar was of the view that the measures identified by ECCC were better suited for situations where trees can be retained rather than areas with powerlines. Cedar committed to developing a CEMP including a wildlife management plan with pre-clearing surveys for bats. Cedar also stated that when preparing the CEMP, additional guidance for wildlife tree management would be considered. Cedar committed to having a QP involved in the development and implementation of the CEMP for the portions of that plan that require resource specific expertise (such as bat roosts and hibernacula). Cedar noted the Environmental Monitor and QPs would work closely on resource specific matters during construction. Cedar also proposed a Follow-up Program for wildlife covering a number of species and species groups, one of which was the SARA-listed bat species little brown myotis The Follow-up Program would include quantification of the as-built change in habitat and compare it to the predicted effect and effects characterization criteria presented in section 7.5 of the Application.

As described above, the EAO recommends this Follow-Up Program for wildlife as well as federal Mitigation Measures for little brown myotis under the IAA. The EAO also recommends a provincial condition requiring a CEMP (Condition 9) with measures for all species of bats. These include pre-clearing surveys for bat habitat features (for example, roosts, hibernacula, and maternity roosts) and restrictions on clearing vegetation in candidate bat roost and hibernacula sites during sensitive timing windows unless clearing is needed for safety considerations. In this case, a QP would determine appropriate feature-specific mitigations for effects on bats. With these recommended mitigation measures, the EAO is satisfied this issue is adequately addressed for the purpose of the EA.

#### *5.4.3.4 Migratory Birds*

ECCC expressed concern that Cedar's proposal for pre-clearing bird nest surveys as a mitigation measure for effects on migratory birds did not align with current ECCC guidelines. To reduce risk to migratory birds, their eggs and nests, ECCC recommended that Cedar avoid regional nesting periods and active nest search techniques. ECCC recommended that Cedar revise these measures to align with ECCC's guidelines.

Cedar responded that a firm commitment to avoid all clearing during the bird nesting window (April 11 to August 8) would adversely affect Cedar's ability to execute the Project safely. It would also increase the effects on other vVCs such as freshwater fish and infrastructure and services. Dry weather over summer is the preferred timing for clearing and grubbing. From a safety perspective, the fall and winter months in the Kitimat area bring heavy rainfalls, large snow events, and freezing rain conditions. In addition, Cedar noted that not being able to start clearing until August 9 would result in the need to use a larger crew (or multiple crews) to get the work done in the short amount of time before construction shuts down for the winter. Cedar noted that the size of the workforce in Kitimat has been a concern for multiple agencies and Indigenous nations.

Cedar noted that it understands that ECCC does not support the use of nest sweeps to mitigate potential effects of clearing on nesting birds. Cedar stated it would request contractors identify ways they can schedule vegetation clearing to limit the overlap with the nesting window – while executing the work safely and without causing additional environmental effects (such as water quality effects). Where vegetation clearing is required during the nesting window, Cedar will have a QP undertake point counts for songbirds, and surveys for conspicuous- and cavity-nesting species, per ECCC's guidelines.

In response to this proposal, ECCC noted that this mitigation does not align with federal avoidance guidelines related to the MBCA. ECCC recommend that vegetation clearing and other Project activities with potential to harm or disturb migratory birds, their nests and eggs should be avoided within the nesting period across all habitats.

Cedar responded that it understands that avoidance of vegetation clearing during the nesting period for migratory birds is preferable to undertaking pre-clearing surveys for nesting

migratory birds. However, it may not be possible to fully avoid clearing activities within the nesting period due to construction constraints. Cedar stated its awareness of the prohibitions set out in the MBCA, the Migratory Birds Regulations and committed to abiding by this legislation.

The EAO notes that, at the conclusion of the EA, ECCC maintained its recommendation that Cedar avoid all clearing during the bird nesting window, but that Cedar considered the logistical, environmental (for example, to water quality), and social (due to increased workforce requirements) implications of this commitment to make it not feasible. The EAO considered ECCC's outstanding concerns regarding migratory birds in its characterization of residual effects, including magnitude and uncertainty below.

Based on the comments received during the EA, the EAO proposes a wildlife management plan within the CEMP (Condition 9) that would include measures for wildlife monitoring, reporting and mitigation. The EAO also recommends federal Mitigation Measures, including a Follow-up Program for wildlife (which would cover migratory birds), as described below in section 5.4.4.1, which reflect Cedar's commitments regarding tree clearing and would require reporting on bird habitat cleared. The Follow-up Program would require Cedar to develop and implement additional mitigation measures if monitoring demonstrate that modified or additional mitigation measures are required to avoid harming migratory birds. With these measures, the EAO considered the issue addressed to its satisfaction for the purposes of the EA.

#### *5.4.3.5 Marbled Murrelet*

ECCC, Gitxaała and Metlakatla raised concerns on the loss of old growth forest and effects on marbled murrelet. ECCC recommended Cedar outline the proposed mitigation measures to address potential Project-related effects on marbled murrelet and their habitat to better understand residual effects. Gitxaała requested that the EAO provide further clarity on the effect of Cedar LNG to marbled murrelet recovery goals and species survival and Metlakatla noted that while there may be an "excess" of marbled murrelet habitat in the region, the minimum area of critical habitat was established for the purpose of preventing further population decline.

In response to ECCC concerns, Cedar noted that it could not completely avoid tree clearing during the nesting season, for safety and practical considerations described in the issue above regarding migratory birds. However, Cedar further noted that it assessed potential project effects on marbled murrelet habitat using two approaches:

- Using Geographic Location Polygons, biophysical attributes of critical habitat, and low-level aerial surveys to identify and map likely suitable nesting habitat in forests (as defined in the federal recovery strategy for this species); and
- Using Terrestrial Ecosystem Mapping (TEM) following provincial resource inventory standards, marbled murrelet habitat associations, and expert opinion to develop a 4-class habitat suitability model.

Cedar responded that it quantified potential project effects on marbled murrelet habitat using results from the TEM model, which equated to a net change in 23.8 ha of effective habitat (i.e., high and moderate suitability), inclusive of direct and indirect effects. Characteristics of 'effective habitat' align with habitat characteristics that are 'most likely' and 'moderately likely' to have biophysical attributes for marbled murrelet nesting habitat, as defined in the Recovery Strategy. However, Cedar noted in the Application that the area defined as 'effective habitat' is a conservative estimate because it was defined using TEM that does not include tree-level attributes, such as moss cover and branch size; therefore, 'effective habitat' likely contains some areas that align with ECCC's 'least likely' criteria and which might have attributes suitable for marbled murrelet nesting. If clearing cannot be avoided within 'effective habitat', Cedar will undertake surveys to confirm whether biophysical attributes are present prior to undertaking clearing during the marbled murrelet nesting period. Cedar believed the approach of focusing on 'effective habitat' that is based on a project-specific TEM habitat suitability model is a conservative approach.

To address ECCC concerns and uncertainty of project effects, Cedar proposed to:

- Not undertake tree clearing within the effective habitat areas as estimated by TEM during the nesting period (April 1 to September 14) unless a QP undertakes a ground-based survey to confirm that the biophysical attributes of critical habitat for marbled murrelet are not present, and if a forested stand is assessed as 'most likely or 'moderately likely', clearing will be delayed until outside of the nesting window; and
- Provide the as-built area of marbled murrelet effective habitat that is directly lost to clearing relative to predicted effects as provided in section 7.5.7.2 of the Application.

ECCC noted that Cedar's proposal to conduct ground-based surveys to confirm if areas mapped as effective habitat contained habitat that was 'most likely' or 'moderately likely' to meet the biophysical attributes described in the Recovery Strategy could miss habitat meeting these criteria found outside areas identified as effective habitat and that marbled murrelet may use lower quality habitat. ECCC recommended a more conservative approach in the identification and protection of marbled murrelet suitable habitat, as defined by the Recovery Strategy. ECCC further recommended that Cedar commit to additional mitigation measures to address the loss or alteration of marbled murrelet suitable habitat, including offsetting, where effects cannot be avoided. Cedar did not concur with this recommendation and maintained that its assessment and mitigations were conservative.

The EAO notes the outstanding concern of ECCC at the conclusion of the EA. In consideration of these concerns, the EAO recommends federal Mitigation Measures and a Follow-up Program for wildlife (which covers marbled murrelet), as described below in Section 5.4.4.1, which reflect Cedar's commitments regarding surveys, tree clearing and follow-up reporting. With these measures, the EAO is satisfied the issue has been adequately addressed for the purpose of the EA. Based on the advice received from the Working Group and the analysis in this Report,

the EAO is of the view that Cedar LNG does not pose a high risk to marbled murrelet species survival or recovery goals.

#### *5.4.3.6 SARA-listed Species*

Gitxaała was of the view that this Report must provide explicit information on whether the Project would frustrate efforts to reverse population declines in SARA-listed species.

The EAO notes that its approach to the wildlife assessment was to provide information on the effects of Cedar LNG on individual species and species groups in section 5.4.2.4 (Change in Habitat) and within the discussion of issues raised during the EA in section 5.4.3 because this is where the effects and issues were species-specific. The remaining sections of the report discuss effects to wildlife broadly and can be considered to apply to SARA-listed (and not listed species). Based on the advice received from the Working Group and the analysis in this Report, the EAO is of the view that Cedar LNG does not pose a high risk to any SARA-listed species.

#### *5.4.3.7 Bird Strikes*

Lax Kw'alaams and Gitxaała, and Haida raised concerns about shipping-related marine bird mortality.

Lax Kw'alaams and Gitxaała requested shipping related marine bird mortality recording/tracking (i.e., a program/process related to monitoring and reporting bird strandings and mortalities on Project vessels) and that lighting-related mitigation measures be developed and implemented.

Haida expressed concern that the area affected by Cedar LNG is a major north-south flyway for migratory birds. Haida noted that multiple species within the Project's LAAs and RAAs are already at or below thresholds rendering them of conservation concern and making any residual impact arguably substantive and unsustainable.

Cedar responded that the LNG carriers for the Project are expected to travel at 8 to 14 knots, which is equivalent to 14.8 to 25.9 km/h. Because these speeds are less than the flight speed of most birds, which is in the range of 32 to 48 km/h according to the Birds of Stanford webpage, birds should be able to avoid collisions with LNG carriers. The lack of collisions between birds and LNG carriers is supported by Cedar team member experience.

Cedar noted that Project-related marine vessel activity would cause flushing of marine birds. While Cedar noted concerns that reporting marine bird collisions or mortality associated with LNG carriers could be impracticable due to the inability of staff on the bridge to see the waterline, Cedar committed to working with the BC Coast Pilots to discuss opportunities to track and share information on potential bird strikes involving LNG carriers associated with the Project. If a workable arrangement is feasible, Cedar would summarize bird strike occurrences as part of annual reporting on wildlife during operations.

Lax Kw'alaams requested further details on the factors that would be used to determine the feasibility of bird strike monitoring.

Cedar responded that that the means of monitoring and recording bird strikes that is most likely to be feasible is for BC Coast Pilots to photograph and submit any observed bird mortalities to Cedar. Training LNG carrier staff to complete this work is not expected to be feasible as the crews of the LNG carriers will change between vessels/ transits. Cedar also believes that security and safety restrictions would prohibit the use of consultants or Cedar staff to undertake this work.

The BC Coast Pilots' primary responsibility is for the safety of waterways; therefore, Cedar can only request that they collect this information. Cedar will work with BC Coast Pilots' leadership to understand whether the pilots can fit bird strike monitoring activities within their official responsibilities. The outcomes of these discussions will be shared with Lax Kw'alaams.

In consideration of this concern, the EAO proposes that Cedar's commitment to report on any observed instances of bird strikes by LNG carriers, as coordinated and discussed with BC Coast Pilots, be part of the recommended Follow-up Program for wildlife. The EAO considers this issue to be adequately addressed for the purpose of the EA.

### 5.4.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated potential effects by considering construction, operations and decommissioning activities that could affect wildlife by a change in habitat, change in movement, and a change in mortality risk.

#### *5.4.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[21], the EAO proposes the following provincial conditions.

- CEMP, which includes the requirement for a wildlife management plan (Condition 9).

The EAO recommends the following Mitigation Measures under the IAA for the wildlife VC:

- Delineate clearing boundaries prior to site preparation to keep clearing activities within the designated Cedar LNG footprint. This may be via physical flagging or electronic delineation, where appropriate (construction);

[21] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

- Prior to clearing and/or construction, and as temporally applicable, clearly delineate and mark a buffer zone around identified protected nests of species of federal interest (construction);
- Do not undertake tree clearing within the marbled murrelet effective habitat areas as estimated by TEM during the nesting period (April 1 to September 14) unless a ground-based survey is undertaken as directed by a QP to confirm that the biophysical attributes of critical habitat for marbled murrelet are not present (construction);
- Identify ways to schedule vegetation clearing to limit the overlap with the nesting window – while executing the work safely and without causing additional environmental effects (such as water quality effects). Where vegetation clearing is required during the nesting window, have a QP undertake or supervise point counts for songbirds, and surveys for conspicuous- and cavity-nesting species, per ECCC's guidelines to avoid harm to migratory birds;
- Personnel will aim to not work within buffer zones around actives nests during the nesting period. However, for any work conducted within the buffer zone during a nesting period, Cedar will consult with a QP to determine whether additional feature-specific mitigation is required and implement those mitigation measures (construction);
- Design Project lighting to reduce risk of injury or mortality and change in movement for wildlife and marine resources considering the following measures (all phases):
  - Directional or shielded lighting to reduce the vertical or horizontal distribution of light,
  - Adaptive and variable lighting regimes measures (timers, dimmers, motion sensors), with consideration of red-shifted lighting;
- Pre-clearing surveys for little brown myotis habitat features (e.g., roosts, hibernacula, and maternity roosts) if clearing is required during sensitive timing windows;
- Where work is required to be completed during sensitive timing windows (e.g., due to safety considerations) that will affect a candidate little brown myotis roost, hibernacula, or maternity roost site as identified in pre-clearing surveys, a QP will determine appropriate feature-specific mitigations for effects;
- Avoid clearing, grubbing and grading within 30 m of a western toad breeding sites during the breeding and post-breeding dispersal periods (beginning in April, with post-breeding dispersal extending through to October). If grubbing and grading activities cannot be avoided during this period, implement an amphibian salvage and relocation program. Additional measures may be specified by a QP (such as installation of silt fencing to direct dispersal away from work areas) (construction); and
- Limit clearing, grubbing and grading within 30 m of watercourse known to be occupied by coastal tailed frog at all times of the year. If grubbing and grading cannot be avoided within 30 m of a watercourse known to be occupied by coastal tailed frog, implement an

amphibian salvage and relocation program. Additional measures may be recommended by a QP (for example: additional sediment control measures or use of clear-span bridges to cross the watercourse) (construction).

In addition, the EAO also proposes a Follow-up Program for wildlife under the IAA, which would include:

- Comparison of the as-built change in habitat to the effects predicted in the Application for the following species and species groups with annual reporting and post-construction reporting:
  - Little brown myotis(roosting and foraging habitat);
  - Marbled murrelet (summer breeding habitat);
  - Old forest songbird community (summer breeding habitat);
  - Young forest songbird community (summer breeding habitat);
  - Coastal tailed frog (year-round habitat; see additional detail below); and
  - Western toad (breeding);
- Verification of potential project effects on marbled murrelet summer breeding habitat using results from a habitat suitability model;
- Cedar will undertake surveys for, and salvages of, pond-dwelling amphibians in each year of construction if there is potential to cause injury or mortality. Cedar will prepare an annual report on salvage and relocation. If injury or mortality occurs, incidents will be included in the report;
- Cedar proposes to track and report wildlife interactions, injuries, and mortalities associated with the facility and transmission line. Perimeter searches of facilities can be undertaken on a semi-regular basis, but logistical challenges with monitoring the transmission line exist. As such, Cedar proposes to document the discovery of birds of federal interest that may collide with the transmission line using a chance find procedure during inspections and maintenance of the transmission line. For each chance find, Cedar will investigate available lines of evidence that may have led to the collision to determine whether additional mitigation could be used to reduce future potential risk;
- As part of the mitigation measure above, Cedar will document the location, date, species (if discernible), and evidence of cause for bird strandings or mortalities associated with lit infrastructure to reduce future potential risk. Monitoring is for the first two years of operation and reporting will occur annually in the first two years of operations;
- Cedar will report on any observed instances of bird strikes by LNG carriers, as coordinated, and discussed with BC Pilots; and
- Reports will be provided to THE AGENCY, ECCC, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla.

#### *5.4.4.2 Residual Effects*

After considering the relevant mitigation measures, the EAO concludes that Cedar LNG would result in the following residual adverse effects on wildlife:

- Change in habitat;
- Change in movement; and
- Change in mortality risk.

Regarding effects within federal jurisdiction, the effects to freshwater aquatic species (coastal-tailed frog and western toad) and migratory birds below are captured by the characterization of residual effects below, because these are pathways of effects to these species.

**Table 17: Characterization of residual effects for wildlife.**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low to Moderate | The Marine Terminal RAA has been subject to a variety of human disturbances associated with past and present industrial operation since the 1950s. Wildlife may be sensitive to any further degradation in environmental quality. According to provincial data and Indigenous knowledge studies, 25 species of terrestrial mammal have been detected in the Kitimat area and five are species of conservation concern (Table 16). Other species are used by Indigenous nations for traditional, subsistence, and cultural and spiritual values. Indigenous nations have reported the importance of wildlife species for traditional use including hunting and trapping and as keystone species.<br><br>The Application identified that 15 bird species of conservation concern (Table 16) are likely to occur within the Marine Terminal and Marine Shipping RAAs. Geese, ducks, and swans were recorded as culturally important birds harvested by Indigenous nations. While the Marine Shipping Route is currently relatively undisturbed by anthropogenic effects, it is also considered highly sensitive to any negative impacts on wildlife (marine birds) due to the potential for changes to negatively impact cultural, |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | harvesting, and other traditional practices of Indigenous nations. |
| Direction and Magnitude | **Habitat:** Adverse and Moderate<br><br>**Movement:** Adverse and Low to Moderate<br><br>**Mortality Risk:** Adverse and Low to Moderate | **Habitat:** Project activities during construction (such as: site preparation and clearing, alteration of shoreline and intertidal habitat), operation (such as: indirect loss or alteration of habitat effectiveness through sensory disturbance and traffic), and decommissioning (such as removal of the FLNG facility and onshore infrastructure) result in direct and indirect loss of habitat but is not expected to exceed the resilience and adaptability limits of the environment or affect wildlife populations.<br><br>**Movement:** The presence of the fence would pose a barrier to movement for some species and not others. In either case, effects are unlikely to affect the sustainability of regional wildlife populations or exceed the resilience and adaptability limits of the environment. Effects from the transmission line are expected to be low as wildlife could still use this area.<br><br>**Mortality Risk:** The residual effects are expected to be low to moderate for the Project phases The effect pathways identified for a change in mortality risk include physical destruction of key habitat features and accidental mortality (through project lighting, increased linear feature density, vehicle-wildlife collisions and wildlife-human contact), These may result in unintentional mortality if the affected feature is active (such as nests) or occupied (such as dens). |
| Extent | **Habitat:** Local | **Habitat:** Project activities during construction, (e.g., direct removal or alteration of vegetation, vegetated beachland, and intertidal habitat), operation (e.g., sensory disturbance and vehicle traffic), and decommissioning (e.g., marine transport of decommissioned infrastructure) are expected to change wildlife habitat, directly and indirectly |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | **Movement:** Local for physical barriers and regional for effects on corridors<br><br>**Injury or Mortality:** Local and regional | within the LAA. Residual effects will extend to the Project area and LAA.<br><br>**Movement:** Site preparation and clearing, construction of land- and marine-based infrastructure, and vehicle traffic may result in alteration or impediment of movement. Marine vessel traffic and sensory disturbance associated with marine-based infrastructure may affect marine bird movement. Residual effects are expected to extend to the LAA and RAA.<br><br>**Injury or Mortality:** Physical destruction of key habitat features (such as site preparation and clearing, facility, infrastructure maintenance during operation, and decommissioning of land-based and marine-based facilities) may result in accidental mortality. The residual effects are expected to extend to the LAA and RAA. l |
| Duration | Long-term to permanent | The effects of direct habitat loss would persist in the long-term until the Project is decommissioned and habitat regenerates and, therefore, could be considered effectively permanent because some types of habitat (such as forest) may never regain its former characteristics. The residual effects on wildlife from movement and mortality would be long-term over the life of the Project. |
| Reversibility | **Habitat:** Irreversible/Reversible<br><br>**Movement:** Reversible<br><br>**Mortality Risk:** Reversible | **Habitat:** Residual effects to old growth forest habitat or areas that may no be reclaimed following decommissioning (because of lease requirements) are considered irreversible as habitat loss may never regain its former characteristics. Other habitat effects (such as lighting) would be reversible following decommissioning of the Project.<br><br>**Movement:** Potential residual effects associated with movement from the described Project activities are considered reversible following |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | decommissioning and removal of barriers to movement.<br><br>**Mortality Risk**: While single mortality events are by nature irreversible, the risk to mortality and effects on species would be reversible once Project activities affecting mortality risk cease (for example: Project lighting and wildlife-vehicle collisions). |
| Frequency | **Habitat:** Infrequent and continuous<br><br>**Movement:** Continuous<br><br>**Mortality Risk:** Infrequent and continuous | **Habitat**: Direct habitat effects would be infrequent during construction (such as site clearing/preparation) and decommissioning (for example: vehicle traffic or decommissioning of infrastructure and marine transport of decommissioned infrastructure). Effects of sensory disturbance would be continuous through construction and operations of the facility.<br><br>**Movement:** Residual effects would occur at a continuous event during all Project phases.<br><br>**Mortality Risk:** Effects of mortality risk are considered to be infrequent and continuous. |
| Risk (likelihood and consequences) | Likelihood – High likelihood of residual effects on wildlife during all Project phases due to unavoidable habitat loss and sensory disturbance associated with described activities.<br><br>Consequence – Low to moderate consequence based on the magnitude of effects on wildlife and through application of mitigation measures.<br><br>Risk – Based on the likelihood and consequence of residual effects on wildlife it was determined that there would be a moderate level of risk. | |
| Uncertainty | The uncertainty in effects to the wildlife VC is considered to be moderate. The EAO has a low to moderate level of confidence in the residual effects characterizations presented here based on the data provided (that is, project-specific surveys and habitat suitability models), the approach to establishing baseline conditions, the feedback received from the Working Group during the EA, and the proposed federal Mitigation Measures and provincial conditions. | |
| Significance | In consideration of the above analysis, proposed provincial conditions and federal Mitigation Measures that would be implemented, and the magnitude and extent of effects, the EAO concludes that Cedar LNG would not have significant residual effects on wildlife. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.4.4.3 Cumulative Effects Assessment*

Past and present physical activities with the potential to cumulatively interact with Cedar LNG include:

- Former Eurocan Pulp and Paper Mill;
- Former Moon Bay Marina;
- Coastal GasLink Pipeline (TransCanada Corp);
- Fairview Container Terminal Phase 1 and 2A (DP World/Prince Rupert Port Authority), (Marine Shipping);
- LNG Canada Export Terminal;
- LNG Canada Load Interconnection Project (BC Hydro);
- MK Bay Marina;
- Northland Cruise Terminal (Prince Rupert Port Authority);
- Northwest Transmission Line;
- Pacific Northern Gas Pipeline;
- Prince Rupert Ferry Terminal;
- Prince Rupert Grain Terminal (Prince Rupert Grain Ltd.);
- Prince Rupert LGP Export Terminal (Pembina Pipeline Corp.);
- Prince Rupert Marine Fuels Project (Wolverine Terminals ULC);
- Rail activities;
- Ridley Terminals Ridley Terminals Inc.;
- Ridley Island Propane Export Terminal (AltaGas Lt.);
- Rio Tinto Aluminum Smelter;
- Rio Tinto Terminal A Extension;
- Various forestry activities;
- Various fishing and aquaculture activities; and
- Westview Wood Pellet Terminal (Pinnacle Renewable Energy Inc.).

Reasonably foreseeable physical activities with the potential to contribute to cumulative effects with Cedar LNG include:

- Cedar Feed Gas Connector Pipeline;
- Fairview Container Terminal Expansion – Phase 2 B (DP World/Prince Rupert Port Authority);
- Kitimat LPG Export Project (Pacific Traverse Energy);
- Ksi Lisims LNG Project;
- Pacific Northern Gas Pipeline Looping Project (Pacific Northern Gast Ltd.);
- Port Edward Small Scale (Port Edward LNG);
- Pacific Trail Pipelines (Chevron Canada Limited/Woodside Energy Ltd.);

- Ridley Island Export Logistics Platform Project (Ridley Terminals Inc.); and
- Vopak Pacific Canada Storage and Export Facility (Vopak Development Canada Inc.).

**Change in Habitat**

**Wildlife**

The primary cumulative effect pathways for change in habitat for wildlife within the Marine Terminal RAA and the Marine Shipping RAA are vegetation clearing (direct effects) and sensory disturbance in onshore areas (indirect effects). The contribution of these disturbances to residual cumulative effects within the Marine Terminal RAA for the terrestrial key species and species groups is predicted to be low in magnitude as the Project would not result in the creation of new permanent transportation corridors (roads are one of the identified threats to western toad habitat and grizzly bear habitat the transmission line will be left to regenerate naturally following decommissioning, and the marine terminal will be constructed and operated in a disturbed setting). The overall residual cumulative effects on habitat for terrestrial key species and species groups are expected to be low to moderate in magnitude, extend into the Marine Terminal RAA, be long-term to permanent and not significant.

**Marine Birds**

The primary cumulative effect pathways for change in habitat for marine birds within the Marine Terminal RAA and the Marine Shipping RAA are indirect effects generated by added vessel traffic along the shipping route. Within the Marine Shipping RAA, residual effects from Cedar LNG shipping will add to vessel traffic from LNG shipping for other projects (such as LNG Canada), cruise ships, and BC Ferry routes that will intersect Cedar's shipping route.

Residual cumulative effects on marine bird habitat, during all project phases combined, are predicted to be medium in magnitude within the Marine Terminal RAA (construction and decommissioning) and the Marine Shipping RAA (during all project phases) due to expected vessel traffic within the Marine Shipping RAA. As there are no known marine bird colonies within the Marine Shipping LAA and as Cedar's shipping route is already established with existing disturbance, cumulative effects are unlikely to affect the sustainability of regional marine bird populations. Residual cumulative effects are expected to be long-term to permanent and not significant.

**Change in Movement**

**Wildlife**

The primary cumulative effect pathway for change in movement for wildlife within the Marine Terminal RAA is habitat fragmentation. Past and present human development has resulted in habitat fragmentation and an associated disruption and alteration of wildlife movement patterns with the Marine Terminal RAA. The primary contributors to future cumulative effects

on movement are gas pipelines, energy export facilities, and their supporting infrastructure. With the expansion of urban and industrial areas over time, concentrated disturbances will affect local wildlife movement gradually. With future projects and activities, further habitat fragmentation is expected. With implemented mitigation, the overall cumulative effect on movement (future condition) is characterized as adverse, moderate magnitude, defined by the Marine Terminal RAA, long term, continuous, and partly reversible (that is, urban development and major roads are permanent effects) and not significant.

**Marine Birds**

The primary cumulative effect pathway for change in movement for marine birds within the Marine Shipping RAA is disruption of movement on or over the water due to marine vessel traffic. Although levels of habituation with existing marine traffic is possible, marine bird flushing distance in response is influenced by many factors (for example: species/individual sensitivity, sea state, flock size) and flushing is assumed to be unavoidable under existing conditions and in the future. The primary contributors to future cumulative effects on marine bird movement are marine traffic associated with export facilities and passenger transport. Should the aforementioned projects having an interaction with marine bird movement proceed, an increase in existing shipping volumes (approximately 2,358 vessels) within the Marine Shipping RAA could occur. Consequently, future flushing events will increase although they are expected to be infrequent, relatively brief, and localized in nature (as the disturbance source is moving rather than stationary).

Regional marine bird populations are unlikely to be affected by temporary disruption of movement with present and future marine shipping. With mitigation, the overall cumulative effect on marine bird movement (future condition) is characterized as adverse, low magnitude, defined by the marine shipping RAA, long term, irregular, reversible, and not significant.

**Change in Mortality Risk**

**Wildlife**

The primary cumulative effect pathway for change in mortality risk for wildlife within the Marine Terminal RAA include vegetation clearing, vehicle collisions, and human access. The common sources of mortality risk for wildlife include vehicle traffic, backcountry access development, transmission lines, and hunting and trapping. White-nose syndrome (bats) has not yet been detected in BC. Mortality risk with future projects and activities will peak during vegetation clearing (incidental take of birds and small mammals) but will persist long term where new access is created (road mortality, human access) or transmission lines are built (bird strikes).

Excluding grizzly bear (that is, increased risk of conflicts and other adverse human interactions from increased future development), regional wildlife populations should not be affected from past, present, and future developments. With mitigation, the overall cumulative effect on wildlife mortality risk (future condition) is characterized as adverse, moderate magnitude,

defined by the Marine Terminal RAA, long term, continuous, and partly reversible (that is, vehicle collisions associated with permanent road networks and major transmission lines will not be reversed), and not significant.

**Marine Birds**

The primary cumulative effect pathway for change in mortality risk for marine birds within the Marine Shipping RAA is lighting on vessels, facilities, and infrastructure. The primary contributors to future cumulative effects on marine bird mortality risk are infrastructure (facilities) within Kitimat Arm and marine traffic associated with export facilities and passenger transport. With the predicted increase in future marine traffic (2.1 percent) and new infrastructure development, the risk of light-influenced bird strikes with marine vessels and infrastructure will increase in the future but are anticipated to be rare events due to the low abundance of susceptible species groups (such as petrels) within the Marine Shipping RAA. Further, the cumulative additional mortality from vessel strikes is unlikely to result in declines in the sustainability of marine bird populations.

Mortality risk associated with present and future marine shipping is unlikely to affect regional marine bird populations. With mitigation, the overall cumulative effect on marine bird mortality risk (future condition) is characterized as adverse, low magnitude, defined by the Marine Shipping RAA, long term, irregular, reversible, and not significant.

#### *5.4.4.4 Interactions between Effects*

Under Section 22(1) of IAA (2019), the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including
    iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the Act (2018)[22] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects to wildlife are described above in section 5.4.4.2.

The wildlife assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Acoustic – noise abatement mitigation measures were referenced, where applicable, in in the assessment;

[22] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

- Vegetation Resources – vegetation mapping results were used to provide quantitative data in the assessment of potential effects on habitat for grizzly bear, moose, Pacific marten, bats, old forest songbird and young forest songbird communities, western toad, and coastal tailed frog;
- Freshwater Fish – informed the assessment of potential effects on habitat for coastal tailed frog;
- Marine Resources – informed existing conditions (that is, shoreline type and number of marine parks and conservation and management areas) for marine birds along the shipping route;
- Land and Resource Use – information on past and current conditions (that is, artificial light in the project area) informed existing conditions; and
- Marine Use – information on industrial vessel traffic along the existing shipping lane was used to inform the assessment on marine bird movement.

The impact of effects on the wildlife VC on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and Section 6.9 of this Report, respectively.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

In addition, the EAO notes that the effects of all biophysical VCs including vegetation resources, freshwater fish, and marine resources, are considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6). These assessments consider linkages within the biophysical realms and consider effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function.

#### *5.4.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of effects on wildlife.

In the Application, Cedar used the following sources of Indigenous Knowledge in assessing the wildlife VC:

- Traditional land use study prepared for the LNG Canada EA to describe wildlife traditional knowledge and use in the RAA (used at the request of Haisla);
- Traditional Haisla Ownership, Use and Occupancy of the Stewardship Areas Along the Alcan and BC Hydro Transmission lines in Haisla Traditional Territory;

- Stewards of the Land, Haisla Ownership and Use of their Traditional Territory, and their Concerns regarding the Northern Gateway Project and Proposed Tanker Traffic in Douglas Channel and Kitimat Arm;
- The LNG Canada Proposed Terminal Site and Tanker Route within Haisla Traditional Territory: Haisla TLUS and Socio-Economic Profile;
- Draft Gitxaała Nation Use Study, prepared for the Cedar LNG Project;
- Gitga'at Marine Use Plan;
- Final Report: Kitselas First Nation Traditional Use and Occupancy Study for the Vopak Project, Ridley Island, Prince Rupert Harbour Region;
- Kitsumkalum First Nation Indigenous Land Use Study Regarding the Vopak Pacific Canada Project; and
- Final Argument of the Council of the Haida Nation. In the Matter of Enbridge Northern Gateway Project Joint Review Panel OH-4-2011, Norther Gateway Pipelines Inc.

In its selection of species and species groups to be assessed in the wildlife VC, Cedar selected species that would be representative of keystone species (such as grizzly bear) and species of Indigenous cultural use and value (such as moose).

During the EA, Gitxaala, Metlakatla, Lax Kw'alaams, Kitselas, Kitsumkalum, and Haida provided comments on the assessment of effects to wildlife, including proposed mitigation measures and characterization of residual and cumulative effects, and conclusions. The information provided is summarized above in Section 5.4.3 and Section 7.0. Regarding cumulative effects specifically, Lax Kw'alaams noted that further information about overall cumulative loading on wildlife within the study area and accurate descriptions of overall cumulative effects loading on each VC was further required. Key ways in which the EAO took these comments into account in the marine resources assessment included:

- In the residual effects characterizations: rating the uncertainty of the residual effects assessment as moderate;
- Recommending a CEMP including measures for measures for wildlife monitoring, reporting and mitigation, specifically including measures for bats and a carcass surveys;
- Recommending a Follow-Up Program for wildlife under the IAA including measures for bird strikes and documenting information on bird strandings or mortalities associated with lit infrastructure; and
- Recommending Mitigation Measures under the IAA for lighting to reduce risk of injury or mortality and change in movement for wildlife.

The EAO also notes that Indigenous nations' views and comments on the effect of wildlife on Indigenous nations' Indigenous interests are discussed in Part C of this Report.

#### *5.4.4.6 Conclusions*

The EAO is satisfied that Cedar LNG will not have significant adverse residual or significant cumulative effects on the wildlife VC (including effects on wildlife freshwater aquatic species as defined in SARA and migratory birds). This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including Condition 9: CEMP and recommended Mitigation Measures and Follow-up Program under the IAA for wildlife (Appendix 1).

# 5.5 FRESHWATER FISH

## 5.5.1 BACKGROUND

Freshwater fish and fish habitat have been identified as valued components (VC) because they have high cultural, ecological, economic, and recreational importance to the Haisla Nation, other Indigenous nations, regulators, stakeholders, and the public. This chapter assesses the potential effects of Cedar LNG on freshwater fish including:

- Changes to water quality;
- Changes to fish habitat; and
- Changes to fish health and/or mortality risk.

Key potential effects of Cedar LNG on freshwater fish and fish habitat would be acidification and eutrophication of waterbodies and streams, increased total suspended solids (TSS) to watercourses due to construction, operation, and decommissioning activities, and riparian clearing along the transmission line right-of-way, all of which have potential to affect fish habitat and fish health.

Freshwater Fish and Fish Habitat effects wouldoccur in federal jurisdiction. These effects are considered in this section, specifically including:

- Changes to freshwater fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*; and
- Effects on freshwater aquatic species as defined in the *Species at Risk Act* (SARA), as required under IAA.

Freshwater fish effects on federal lands, including the effect of changes in water quality due to nutrient deposition is considered in section 6.9 of this Report. Effects on freshwater fish in relation to effects to the health, social or economic conditions of the Indigenous peoples of Canada and current use of lands and resources for traditional purposes and cultural heritage are discussed in section 6.9 of this Report.

### *5.5.1.1 Regulatory Context*

Canada's *Fisheries Act*, and SARA are the primary federal laws providing protection for fish and fish habitat. Project activities that have the potential to cause death of fish or the harmful alteration, disruption, or destruction (HADD) of fish habitat, would require an authorization under paragraph 35(2)(b) of the *Fisheries Act*. Environment and Climate Change Canada (ECCC) administers Section 36 of the *Fisheries Act,* which prohibits the unauthorized deposition of deleterious substances into waters frequented by fish. The SARA prohibits killing, harming, harassing, capturing, or taking species listed (in Schedule 1 of the SARA) as threatened, endangered, or extirpated and provides protection for critical habitat that supports these species. The DFO's Standards and Codes of Practice specifies procedures, practices, or

standards for avoiding the death of fish or the harmful alteration, disruption, or destruction of fish habitat.

The *Water Sustainability Act*, *Wildlife Act*, *Oil and Gas Activities Act*, *Environmental Management Act, and the British Columbia Water Quality Guidelines for Protection of Aquatic Life (BCWQG-FAL)* are the primary provincial laws and guidelines applicable to this project. The *Water Sustainability Act* regulates any changes in and about the stream which includes modification to the land, vegetation, the stream flow, and any impact to the stream channel. If approved by the OGC however, the *Water Sustainability Act* allows proponents to divert, store, and use surface water for up to 24 months. However, the OGC can also issue water licences that allow for diversion, storage, and use for longer periods of time if necessary.

The *Wildlife Act* establishes the legal framework for protecting certain habitats and wildlife species (including fish). Under the *Oil and Gas Activities Act*, the Environmental Protection and Management Regulation directs strategies for oil and gas projects to follow for protection of fish and fish habitat. The *Environmental Management Act* governs the discharge of waste to the terrestrial and/or aquatic environment, limiting the quality and quantity of waste discharge to these environments. The BCWQG-FAL are guidelines to safe levels of substances to protect aquatic life, and therefore provide policy direction to those making decisions affecting water quality.

#### *5.5.1.2 Boundaries*

The Application predicted Cedar LNG's effects on freshwater fish and fish habitat in the LAA, which included the Project footprint (areas that the marine terminal, proposed transmission line right-of-way, and access roads overlap freshwater watercourses and waterbodies) plus up to 100 m upstream and 300 m downstream from potentially affected stream riparian habitat. The freshwater fish LAA also extends up to 1 km downstream of potentially affected habitat in Moore Creek, and Anderson Creek, as well as crossings of 12 unnamed tributaries to Beaver, Moore, and Anderson Creeks.

The RAA includes the full watershed on each stream and creek that interacts with the Project footprint including Beaver, Moore, and Anderson Creeks, as well as unnamed tributaries to Douglas Channel. The freshwater fish RAA includes the LAA and the geographical extent of potential cumulative effects with other past, present, or reasonably foreseeable projects on freshwater fish habitat.

For the acidification and eutrophication assessment, the LAA is the area within the predicted sulphur plus nitrogen deposition level as predicted by air quality modelling for the project's "Project alone" scenario. The Project Alone scenario is the sulphur and nitrogen deposition from the project and not from any outside sources such as pre-existing projects in the area. The RAA for the acidification and eutrophication assessment encompasses the LAA sulphur and nitrogen deposition level, as well as the area where potential cumulative air deposition from

Cedar LNG, Rio Tinto Aluminum Smelter, LNG Canada Export Terminal Project, and the Kitimat LNG Project[23] would be expected to occur (covering approximately 160,027 ha; see Figure 1).

The temporal boundaries for Cedar LNG included the construction, operations, and decommissioning phases.



[23] The Kitimat LNG Project was originally included in air modelling predictions, but the certificate holder for this project has now requested that its environmental assessment certificate be cancelled, but the certificate holder for this project has now indicated publicly that it will not be advancing the project. Therefore, Cedar updated its modelling to remove emissions from the Kitimat LNG Project in its estimates. The estimates in this Report reflect those without the Kitimat LNG Project.

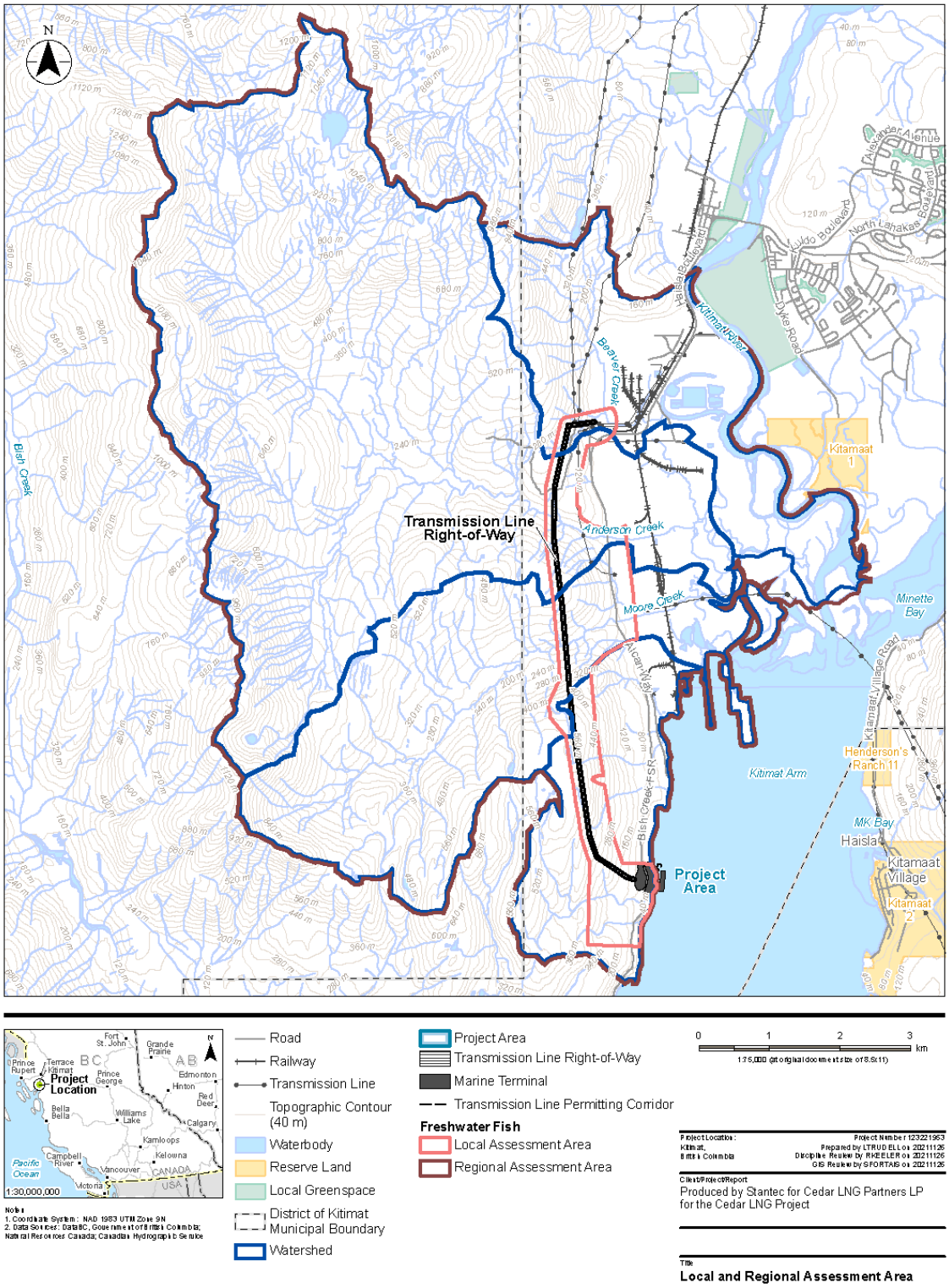


**Figure 12: Local and Regional Assessment Area.**

## 5.5.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.5.3.

### *5.5.2.1 Existing Conditions*

Cedar used desktop studies, Indigenous Knowledge, and conducted baseline studies on freshwater fish and fish habitat over two years (September 2019 and May/June 2021) to characterize existing conditions.

Desktop reviews identified that none of the 16 fish species identified in the RAA were listed under SARA. However, oolichan of the Central Pacific Coast population are designated endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and are under consideration for listing under SARA. Potential watercourse crossings were identified within the freshwater fish LAA, and crossings were identified for fish-bearing streams including Anderson Creek, Moore Creek, an unnamed tributary to Beaver Creek, and an unnamed tributary to Moore Creek.

During the field assessment in 2021, 52 potential watercourse crossings were assessed along the transmission line right of way. Two watercourses, one lake, one wetland, and 34 non-classified drainages (NCD) were identified during the field assessment that would be intersected or bordered by the transmission line right-of-way. Of the watercourses along the proposed transmission line right of way, three were considered fish-bearing (S3 Tributary to Beaver Creek, Anderson Creek, and Moore Creek) and 11 non-fish-bearing. Anderson Creek and Moore Creek support populations of anadromous and resident fish but have barriers to anadromous fish downstream of the proposed transmission line crossing. Moore and Anderson creeks are inaccessible to fish at the transmission line crossing locations and are therefore assumed to be fish bearing upstream of these barriers. Access roads associated with the construction of the proposed transmission line right-of-way intersect watercourses at 27 locations, two of which are fish bearing streams, 21 non-fish-bearing streams, and 4 NCDs.

### *5.5.2.2 Potential Project Effects*

Potential effects to fish and fish habitat due to project activities as described by the Application are:

- Changes to water quality;
- Changes to fish habitat;
- Changes to fish health and/or mortality risk; and
- Effects on freshwater aquatic species as defined in the *Species at Risk Act*, as required under IAA (2019).

Details of these potential effects are described below.

### *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. The assessment indicated that potential changes to water quality could result from increased TSS, changes in nutrient concentrations, introduction of deleterious substances, and deposition of sulphur and nitrogen compounds from air emissions.

During construction, increased TSS and changes in nutrient concentrations in all identified watercourses could occur during site preparation in the construction phase, and from facility and infrastructure maintenance during the operation phase. Introduction of deleterious substances resulting from spills or blasting residues are also an effect pathway during the construction phase. With the implementation of best management practices (BMPs) to reduce sediment and erosion during site preparation and while working in areas of exposed soil during construction, Cedar noted that TSS levels are expected to meet guidelines established within the Land Development Guidelines (DFO 1993) during storm events and the British Columbia Water Quality Guidelines for Aquatic Life (BCWQG-FAL) for dry periods during all project phases. During decommissioning, removal of culverts and bridges could increase risk of sedimentation of watercourses, which is a risk to fish bearing watercourses (access roads will intersect two S3 fish-bearing streams AC-01 and AC-11).

Cedar did not predict residual effects would occur as a result of changes in nutrient concentrations or the introductions of deleterious substances due to the implementation of mitigation measures, including a Construction Environmental Management Plan (CEMP) with sediment and erosion control measures and a spill response plan, and limits on riparian clearing, as described further below in section 5.5.2.3.

Acidification and eutrophication are potential residual effects that were assessed in the Application. Air quality models predicted the sulphur and nitrogen deposition level of 100 sulphur + nitrogen eq/ha/yr (molar equivalent of sulphur + nitrogen per hectare per year) to occur over an existing industrial area (LNG Canada, Rio Tinto), the Kitimat River estuary and the adjacent marine environment in Kitimat Arm. Outside of the LAA (but within the RAA), three lakes and five streams were assessed for acidification sensitivity.

It was determined that one lake (LAK028) had a high sensitivity, with an acid sensitivity of Class 1, and critical load class of highly sensitive (<0 to 20 m milliequivalents (meq)/$m^2$/year). One stream (Moore Creek, STR 14) had a moderate sensitivity based on critical load values with an acid sensitivity class of 2, and a critical load value of 60.29 meq/$m^2$/year. However, the predicted exceedance of critical load for LAK028 under base case is mostly caused by existing emission sources. Regarding critical load exceedances, the respective increase in the magnitude of exceedance between the base and application case at sites LAK028 was 0.9 percent. No predicted changes were determined in the eutrophication assessment for any of the modelled scenarios (base case, project alone case, and application case).

### *CHANGES TO FISH HABITAT*

Riparian clearing due to construction of access roads and vehicle crossings has the potential for effects on fish habitat but is anticipated to be limited due to the following factors:

- No new vehicle crossings are planned for any fish-bearing watercourses; and
- Access roads that would cross two fish-bearing watercourses have functioning crossings already present so the extent of upgrades and/or riparian clearing will be limited.

Cedar considered impacts to fish habitat that could result from direct habitat destruction, riparian clearing, and withdrawal of water from watercourses. Cedar did not predict there would be any direct effects to fish habitat used at any life stage of any resident fish or anadromous fish species, or any effect to fish bearing streams downstream because all watercourses within the marine terminal area that would require realignment are not fish bearing.

Cedar predicted that total riparian clearing within the total riparian management area would amount to:

- 3.8 ha in non-fish bearing watercourses along the proposed transmission line right-of-way;
- 2.6 ha of the S6 watercourses (non-fish bearing) overlapped by the marine terminal area;
- 1.0 ha on Moore Creek (fish bearing) along the proposed transmission line right-of-way, and;
- 0.5 ha of an unnamed tributary to Beaver Creek (fish bearing) along the proposed transmission line right-of-way.

Riparian clearing predicted for about 1.5 ha around fish-bearing watercourses could impact visibility, shade, food and nutrient inputs; however, Cedar predicted that residual effects on fish habitat would be negligible because remaining, uncleared riparian vegetation can provide these functions. Riparian vegetation would also be replanted during decommissioning.

Cedar is considering withdrawal of water from three watercourses as a contingency. However, these watercourses are non-fish-bearing, and all flow directly into Douglas Channel. Therefore, no residual effects on freshwater fish habitats are anticipated.

Overall, due to clearing of riparian vegetation and the installation of access road crossings, unavoidable residual effects are expected. However, the riparian effects are anticipated to be reversible at the end of decommissioning, following replanting of riparian vegetation.

### *CHANGES TO FISH HEALTH AND/OR MORTALITY RISK*

Cedar considered the potential for effects to fish health and mortality from increased TSS concentrations, destruction of fish or eggs during instream work, changes in flow, and acidification and eutrophication of the watercourses.

No instream works, channel realignments, or water withdrawals in fish bearing watercourses are expected to occur for land-based infrastructure construction, including access road and transmission line right-of-way crossings. As a results, no residual effects to fish health and mortality are expected to occur.

Implementation of BMPs is predicted to effectively reduce sediment and erosion during site preparation. Therefore, TSS is expected to meet the guidelines established within the Land Development Guidelines (DFO 1993) during construction and, due to these mitigation practices, residual effects to fish health due to increased TSS are expected to be low in magnitude.

Acidification and/or eutrophication of freshwater lakes and streams could cause a change in the production of aquatic invertebrates and food available for fish due to deposition of sulphur and nitrogen compounds from project air emissions during operation. However, as described above, changes in the critical sulphur and nitrogen loads as a result of the Project were predicted to be small.

### *CHANGES TO FRESHWATER FISH AND FISH HABITAT, AS DEFINED IN SUBSECTION 2(1) OF THE FISHERIES ACT AND EFFECTS ON FRESHWATER AQUATIC SPECIES AS DEFINED IN THE SPECIES AT RISK ACT*

IAA requires that effects within federal jurisdiction be considered. These include the following effects addressed in the freshwater fish VC:

- 2(a) a change to the following components of the environment that are within the legislative authority of Parliament:
    - (i) fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act.*
- 2(a) a change to the following components of the environment that are within the legislative authority of Parliament:
    - (i) aquatic species, as defined in subsection 2(1) of the Species at Risk Act.

Cedar stated that the Project is not anticipated to result in:

- Death of fish by means other than fishing as per Section 34.4 of the *Fisheries Act*,
- HADD of fish habitat under Section 35 of the *Fisheries Act*, or
- Introduction of a deleterious substance in contravention of Section 36(3) of the *Fisheries Act*.

The potential for Cedar LNG to impact water quality, fish habitat and fish health is described above. Changes in fish habitat may result from increased sedimentation, increased acidification, and riparian clearing. The characterization of this effect is described below in Section 5.4.4.2.

No channel realignments, water withdrawals or new instream works are proposed in fish-bearing watercourses for land-based infrastructure construction, including transmission line crossings and new access roads. Therefore, Cedar stated that freshwater aquatic species listed

under the SARA would not be affected by the Project. In addition, no species of fish listed under SARA are present in the RAA.

***POSITIVE EFFECTS***

Cedar did not identify any positive effects of the project on the freshwater fish VC.

#### *5.5.2.3 Mitigation Measures Proposed in the Application*

The mitigation measures proposed in the Application to reduce effects to the freshwater fish VC include:

- Implementation of a CEMP, which will include:
  - management practices and mitigation measures to reduce sediment erosion, and runoff into watercourses;
  - monitoring of fish habitat and water quality to ensure TSS levels remain within guidelines established within the Land Development Guidelines (DFO 1993) during storm events and the BCWQG-FAL for TSS and turbidity during dry periods;
  - establish designated equipment refueling areas and develop a spill response plan to prevent spills and reduce the risk of deleterious substances entering waterbodies;
- Riparian clearing will be limited to the extent necessary to meet Project safety and design and the necessary limits will be determined by a professional;
- Clearing boundaries will be delineated using flagging or electronic delineation prior to site preparation to keep clearing activities within the designated project footprint; and
- Watercourse crossing structures will follow DFO's Interim Code of Practice: Temporary Steam Crossings (DFO 2020a) and include mitigation measures in the Fish-stream Crossing Guidebook (FLNRO, ENV, and DFO 2012).

In addition to the identified mitigation measures listed, Cedar has integrated certain key design decisions into the Project to help reduce the effects on freshwater fish, including:

- Limiting interactions with freshwater surface water by locating the gas-treatment, LNG production, and LNG storage in the FLNG facility;
- Reducing vegetation removal and riparian clearing by having large spans between transmission line towers for the crossings of Moore and Anderson Creeks; and
- Electrifying the Project to reduce potential acidifying and eutrophying emissions (sulphur and nitrogen deposition).

### 5.5.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group and Indigenous nations, the following key issues related to the assessment of the freshwater fish VC for Cedar LNG were identified:

- Benthic Invertebrate assessments;
- Water quality considerations; and
- Fish Offsetting.

#### *5.5.3.1 Benthic Invertebrate Assessments*

Lax Kw'alaams commented that the standard for stream habitat characterization is a benthic invertebrate assessment including characterization of benthic macroinvertebrate communities, as an indicator of stream health and as an important food source to the fish. Yet, a benthic invertebrate assessment was not included in the fish assessment. Lax Kw'alaams also commented that due to increases in TSS, benthic invertebrate assessments before, during, and after project activities would be beneficial.

Cedar responded that benthic invertebrate assessment was not conducted for Cedar LNG because there were limited potential interactions between project activities and freshwater fish habitats. Benthic communities are often monitored as indicators of ecosystem level impacts to fish and fish habitat. Given the absence of interactions between the Project and fish-bearing streams, benthic macroinvertebrate parameters were not included in the assessment. Also, that project interactions with freshwater fish habitat are limited. There are no instream works, water withdrawals, or effluent discharges proposed for fish-bearing watercourses. As a result, potential effects related to changes to benthic macroinvertebrates and associated "change in food supply" for fish are limited. As a result, benthic macroinvertebrate monitoring would not be warranted.

Lax Kw'alaams did not have further comments on this issue. The EAO considers this issue to have been adequately addressed for the purpose of the EA.

#### *5.5.3.2 Water Quality Considerations*

ECCC recommended that Cedar consider developing a monitoring plan for acidification and eutrophication and ENV noted that Cedar should be prepared to participate in joint monitoring initiatives along with other permitted emitters in the airshed.

Cedar responded that a Follow Up Program for the freshwater fish VC and freshwater water quality would not be initiated since confidence in the assessment of specific project effects and residual effects is high and that no substantial adverse residual effects are predicted. As described in Section 5.1: Air Quality, Cedar committed to joining the Kitimat Airshed Group prior to construction and has begun the process to become a member.

ECCC, ENV and DFO all raised concerns regarding Cedar's proposal that water quality for TSS during storm events would meet the Land Development Guidelines for the Protection of Aquatic Habitat. ENV and ECCC recommended that Cedar should evaluate any potential

changes in water quality during construction and operation using the BCWQG-FAL and the Canadian Council of Ministers of the Environment (CCME) guideline for total particulate matter. ENV noted that the BCWQG-FAL include a short-term guideline, which is designed for short-term events like spills and construction, and a long-term guideline which is designed for indefinite exposure. ENV further stated that BCWQG-FAL are science-based thresholds derived from empirical data and apply to both the construction and operation phases and that if appropriate mitigations are in place, there should be no exceedance of the BCWQG-FAL for TSS.

Cedar acknowledged the differences between the thresholds in the Land Development Guidelines for the Protection of Aquatic Habitat and Canadian Environmental Quality Guidelines – Total Suspended Sediments. Cedar was of the view that the Land Development Guidelines were developed to be specifically applied to land development (construction) activities while the Canadian Environmental Quality Guidelines are broadly applicable to water quality. Cedar committed to having the receiving environment meet B.C. WQG for turbidity and TSS while and stormwater runoff would meet the Land Development Guidelines.

In consideration of the concerns raised and the potential effects of Cedar LNG on water quality and freshwater fish, the EAO proposes a provincial condition requiring the development of a CEMP (Condition 9), that would include surface water quality mitigation measures, including sediment and erosion control. The EAO also recommends a condition (16) that would require Cedar to participate in the Kitimat Airshed Group, or successor airshed monitoring programs, if any are established by the Province that include participation from industry. The EAO also proposes Mitigation Measures under the IAA that would reduce effects to water quality. This includes implementing mitigation measures to reduce sediment erosion and runoff into watercourses and ensuring TSS levels within stormwater runoff remain within guidelines established within the Land Development Guidelines and that the receiving environment meets BCWQG-FAL for turbidity in all project phases. See Section 5.5.4.1 for further details on the recommended mitigation measures. With these proposed conditions and mitigation measures, the EAO is of the view that potential impacts to freshwater fish from water quality effects of Cedar LNG have been adequately addressed.

#### *5.5.3.3 Fish Offsetting*

Lax Kw'aalaams commented that the Application describes that "fish production in the region is not at a greater risk due to additional changes in fish habitat" due to previous fish habitat offsetting. However, this would also have to assume offsetting has been successful (i.e., replacement of loss of function) and does not consider climate change impacts that increase risk in any changes to fish habitat. They requested that Cedar:

- provide information about the success of past fish habitat offsetting; and
- identify how climate change contributes to risk in any changes to fish habitat.

Cedar responded that the Project has been designed to fit into the local environment and minimize the potential environmental effects, including avoiding effects to fish-bearing

watercourses. After detailed freshwater fish and fish habitat assessments for all watercourses potentially impacted by the Project were conducted, it was determined that there are no predicted impacts to streams, or other freshwater fish habitats, that would require an authorization under paragraph 35(2)(b) of the *Fisheries Act*. As a result, Cedar is not proposing any fish habitat offsetting. Cedar also responded that generally, potential effects to fish and fish habitat related to climate change are associated with changes in flow and water temperature pathways. As none of the streams directly impacted by the Project are fish-bearing, climate change would not be expected to contribute to risk for the assessment of effects on freshwater fish habitat.

Lax Kw'alaams did not provide further comments on this issue. The EAO considered the issue adequately addressed for the purpose of the EA.

### 5.5.4 THE EAO'S ANALYSIS AND CONCLUSIONS TO FISH AND FISH HABITAT

The EAO evaluated the potential effects to freshwater fish by considering construction, operation, and decommissioning activities that could potentially result in residual adverse effects to freshwater fish habitat and health, including consideration of changes to freshwater fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*; and effects on freshwater aquatic species as defined in the SARA, as required under IAA.

#### *5.5.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[24], the EAO proposes the following provincial conditions:

- CEMP, that would include water quality mitigation measures, including sediment and erosion control;
- A condition (16) that would require Cedar to participate cumulative effects initiatives including in the Kitimat Airshed Group, or successor airshed monitoring programs.

The EAO also recommends the following Mitigation Measures under the IAA:

- Implement mitigation measures to reduce sediment erosion and runoff into watercourses (all Project phases);
- Stormwater runoff water quality will meet total suspended solids (TSS) guidelines established within the Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993) and these discharges will not cause the receiving environment to

[24] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

exceed BCWQG-FAL for turbidity, considering both short-term and long-term exposures (all phases)

- Limit riparian clearing to the extent necessary to meet Project safety and design and the necessary limits will be determined by a professional (construction);
- Delineate clearing boundaries using flagging or electronic delineation prior to site preparation to keep clearing activities within the designated project footprint (construction);
- Watercourse crossing structures will follow DFO's Interim Code of Practice: Temporary Steam Crossings (DFO 2020) and include mitigation measures in the Fish-stream Crossing Guidebook (FLNRO, ENV, and DFO 2012) where these standards are determined to be applicable by a professional (construction); where the Code of Practice is not applicable to the stream crossing, the crossing will be constructed in compliance with the Fisheries Act).

#### *5.5.4.2 Residual effects*

After considering the mitigation measures, the EAO predicts that Cedar LNG would result in residual adverse effects on the fish and fish habitat VC, including changes to freshwater fish and fish habitat, via the following effects:

- Changes in water quality including:
  - Increased levels of TSS in streams due to site preparation, clearing, and construction;
  - Deposition of sulphur and nitrogen compounds in lake areas and streams from project emissions during operation;
- Changes in fish habitat from riparian clearing which would include:
  - Increases in TSS from soil erosion;
  - Changes in fish cover and shading; and
- Changes in fish health/mortality due to the above changes in water quality and habitat removal/alteration.

Regarding effects within federal jurisdiction, the EAO predicts that Cedar LNG would not result in residual effects to freshwater aquatic species as defined in the *Species at Risk Act*, because as described above freshwater aquatic species listed under the SARA would not be affected by the Project. Residual changes to freshwater fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act* are predicted and are captured by the assessment of the residual effects characterized below, which are all pathways of effects to fish and fish habitat.

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | **Water Quality:** Low to Moderate | **Water Quality**: Water quality is considered to have low to moderate resiliency because existing conditions show a moderate to high sensitivity to acidification inputs in |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | **Fish Habitat:** Moderate<br><br>**Fish Health/Mortality:** Moderate | waterbodies. Water temperature and pH was within optimal range for fish.<br><br>**Fish Habitat:** Of the watercourses along the proposed transmission line right-of-way, 3 were fish bearing and 11 were not. Fish habitat is considered to have moderate resiliency because existing fish habitat quality in the fish-bearing watercourses within the LSA ranged from poor to good. In general, spawning quality was moderate at the assessed fish-bearing watercourses while migration was poor due to observed barriers to fish passage.<br><br>**Fish Health/Mortality:** None of the 16 fish species present in the RAA are listed under SARA. However, oolichan have been documented in Moore Creek and the Central Pacific Coast population of oolichan are considered endangered under COSEWIC and listed as special concern provincially. Cutthroat trout is also listed as special concern provincially. These occurrences are downstream of the transmission line right of way. |
| Direction and Magnitude | Adverse and Low | Clearing, grading and construction and removal of land-based infrastructure is expected to have adverse effects on water quality, and therefore, potentially effect fish health and mortality. However, during construction, TSS is expected to stay within the Land Development guidelines, and BCWQG-FAL. Additionally, with implementation of mitigation strategies and BMPs, the magnitude of these effects should be localized and low. Effects from clearing of riparian habitat may also lead to alteration of instream habitat (cover, nutrients, shading). These would be mitigated by limiting clearing to the extent possible and delineating clearing boundaries prior to site preparation. |
| Extent | Local | Residual effects will be localized to the LAA. |
| Duration | Medium-term | Residual effects will be present during the construction and decommission phases. |
| Frequency | Infrequent | Effects from clearing, grading and construction and subsequent removal of the land-based infrastructure will be irregular events during construction and decommissioning. |
| Reversibility | Reversible | Potential adverse effects due to increased total suspended solids (TSS) from the described project activities will be reversible upon the completion of the construction and decommissioning Project phases. |
| Risk (likelihood and consequences) | Likelihood – Medium likelihood of residual effects to fish health, and habitat during construction and decommissioning activities.<br>Consequence – Moderate consequence based on the magnitude of effects being localized and mitigated by BMPs.<br><br>Risk – Based on the medium likelihood and moderate consequence of residual effects to fish habitat and health it was determined that there would be a moderate level of risk. | |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| **Uncertainty** | Uncertainty associated with residual effects to freshwater fish is considered to be low. The EAO has a high level of confidence in the characterization of residual effects, based on the proven effectiveness of mitigation measures that will be used following industry standard operating procedures and best management practices that include erosion and sediment controls. Such proven avoidance and mitigation measures include electrification of the Project to reduce potential acidifying emissions, no instream works or water withdrawals in fish-bearing watercourses, and large spans between transmission lines to reduce riparian clearing. | |
| Significance | In consideration of the above analysis of effects, the proven effectiveness of standard mitigation measures that will be utilized, and reversibility of the effects, the EAO concludes that the Project would not have significant adverse residual effects on the freshwater fish VC. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.5.4.3 Cumulative Effects Assessment*

Past and present physical activities with the potential to cumulatively interact with the Cedar Project are:

- Coastal GasLink Pipeline;
- LNG Canada Export Terminal;
- LNG Canada Load Interconnection Project (BC Hydro);
- Pacific Northern Gas Pipeline;
- Rio Tinto Aluminum Smelter; and
- Rio Tinto Terminal A Extension.

**Change in Surface Water Quality and Fish Habitat**

For the assessment of potential cumulative effects due to potential change in riparian habitat, the spatial and temporal overlap with existing or potential change in riparian habitat due to other projects was assessed. All six present projects and physical activities listed above have the potential to alter riparian habitat in the freshwater fish RAA in the same watercourses requiring riparian clearing for the Project: Beaver, Anderson, and Moore creeks. Two existing or approved projects are likely to act cumulatively with the Project in terms of potential acidification of surface waters: the existing Rio Tinto Aluminum Smelter and the approved LNG Canada Export Terminal.

The likelihood of residual cumulative effects on riparian habitat is considered high despite habitat compensation/offsetting. This is due to some adverse changes in riparian habitat which have either already occurred, and may continue to occur, as a consequence of riparian vegetation clearing due to past, present, and reasonably foreseeable future projects. In addition, there is a high likelihood of residual cumulative effects on surface water quality through acidification. This effect is due to the influence of existing projects in the area as modeled by the deposition level of 100 S+N eq/ha/yr for the base case modelling scenario.

Residual cumulative effects with the Project for both changes in surface water quality and changes in fish habitat will occur within the RAA and will be long term. However, effects are reversible once projects are completed. Cumulative effects will be infrequent during project phases, and for these reasons, the magnitude of the cumulative effects is low.

#### *5.5.4.4 Interactions Between Effects*

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25(2) of the Act (2018)25 states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects to freshwater fish are described above in section 5.5.4.2.

The freshwater fish and fish habitat VC assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Air Quality – air quality modelling results were used to inform the assessment of effects to freshwater fish due to air emissions and mitigations, where applicable; and
- Vegetation Resources – mapping wetland and riparian habitats informed the assessment to freshwater fish, where applicable.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

In addition, the EAO notes that the effects of all biophysical VCs including freshwater fish and fish habitat, air quality, and vegetation resources, are considered in the assessment of the effects on biophysical factors that support ecosystem function (Section 6.6). This assessment considers linkages within each of the biophysical realms and considers effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function.

#### *5.5.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of effects on freshwater fish.

[25] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

In the Application, Cedar incorporated information received from Indigenous nations, on freshwater fish species of importance to the Indigenous nations, as discussed in the baseline data and assessment sections of the Application.

At the request of Haisla Nation, traditional knowledge and traditional use studies conducted to inform previous EAs in the RAA, were reviewed by Cedar to characterize existing conditions and identify potential data gaps; these secondary sources of traditional knowledge and traditional use were used to augment traditional knowledge and traditional use studies provided by Indigenous nations for use in this Application.

During the EA, Lax Kw'alaams provided comments on the assessment of freshwater fish, including. The information provided is summarized above in section 5.5.3. Indigenous nations did not provide comments on residual effects ratings or proposed mitigation measures related to this VC.

#### *5.5.4.6 Conclusions*

The EAO is satisfied that Cedar LNG will not have significant adverse residual or significant cumulative effects on the freshwater fish VC (including to freshwater fish and fish habitat, as defined in subsection 2(1) of the Fisheries Act and effects on freshwater aquatic species as defined in SARA). This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 9: Construction Environmental Management Plan and Condition 16: Regional Cumulative Effects Initiatives; and recommended Mitigation Measures under the IAA for freshwater fish and fish habitat (Appendix 1).

# 5.6 MARINE RESOURCES

## 5.6.1 BACKGROUND

This chapter assesses the potential effects Cedar LNG would have on the marine resources VC, including:

- Changes in water quality;
- Changes in habitat;
- Changes in behaviour of fish or marine mammals caused by sensory disturbances; and
- Changes in fish or marine mammal injury or mortality risk.

Marine resource effects would occur in federal jurisdiction. These effects are considered in this section, specifically including:

- Changes to marine fish and fish habitat, as defined in subsection 2(1) of the Fisheries Act, as required under the IAA; and
- Effects on marine aquatic species as defined in the Species at Risk Act (SARA), as required by the IAA.

Effects on marine resources in relation to effects to the health, social or economic conditions of the Indigenous peoples of Canada and current use of lands and resources for traditional purposes and cultural heritage are also discussed in section 6.9 of this Report.

### *5.6.1.1 Regulatory Context*

In addition to requirements under the IAA, federal and provincial legislation, policy, and regulatory guidance documents were considered to assess the marine resources VC. The following federal statutes, policies, and frameworks include:

- *Fisheries Act*;
- SARA;
- *Canada Shipping Act*, 2001;
- *Canadian Environmental Protection Act*, 1999;
- Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat (2019);
- Fish and Fish Habitat Protection Policy (2019);
- Applicant's Guide Supporting the "Authorizations Concerning Fish and Fish Habitat Protection Regulations (2019);
- The Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (1998);
- Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater; and
- *Oceans Act*.

The following provincial statutes, policies, and frameworks were utilized for the Marine Resource VC:

- *Wildlife Act*; and
- *Environmental Management Act*.

The EAO notes that if Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits, including a waste discharge permit for effluent discharge under the *Environmental Management Act*. This permitting process would be administered by the OGC.

#### *5.6.1.2 Boundaries*

Project-specific effects on marine resources were assessed within the LAA and cumulative effects of past, present and reasonably foreseeable future projects were assessed within the RAA Figure 13and Figure 14 depict the extent of the RAA and LAA. The spatial boundaries for Cedar LNG are as follows:

- Facility footprint or area of disturbance (2.3 ha);
- Marine Terminal LAA with total area of 2,195 ha which includes the marine portion of the Cedar LNG Project area and a 4 km buffer;
- The Marine Terminal RAA has a broader marine area of 6,230 ha; and
- The Marine Shipping LAA and RAA are spatially identical at 312,677 ha and both are confined to the marine environment by the high-tide line. The Marine Shipping LAA is also defined by a 10 km buffer around the Marine Shipping Route.

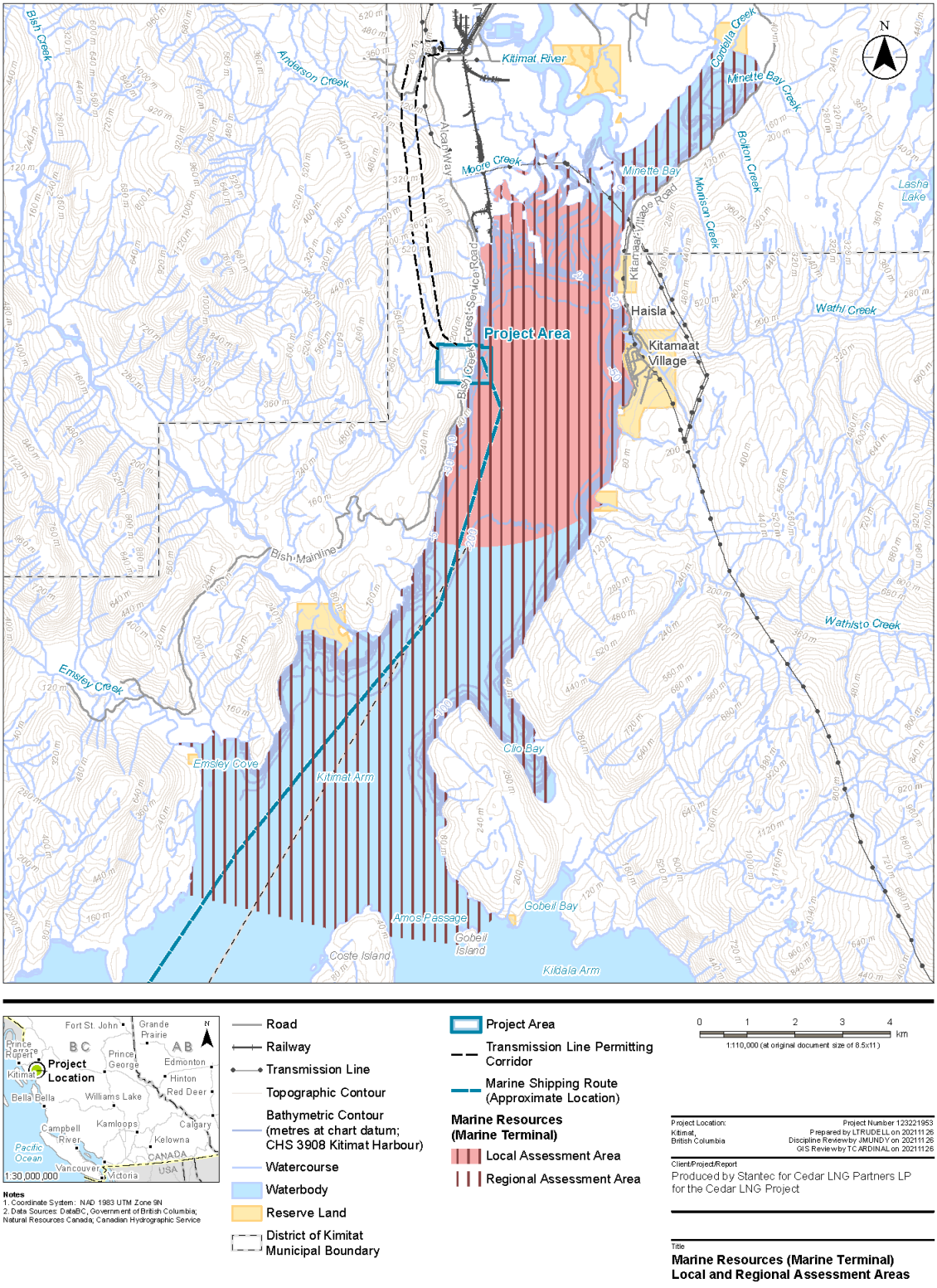


**Figure *13:* Marine Terminal LAA, RAA and Facility Area (Project Area) for the marine resources VC.**

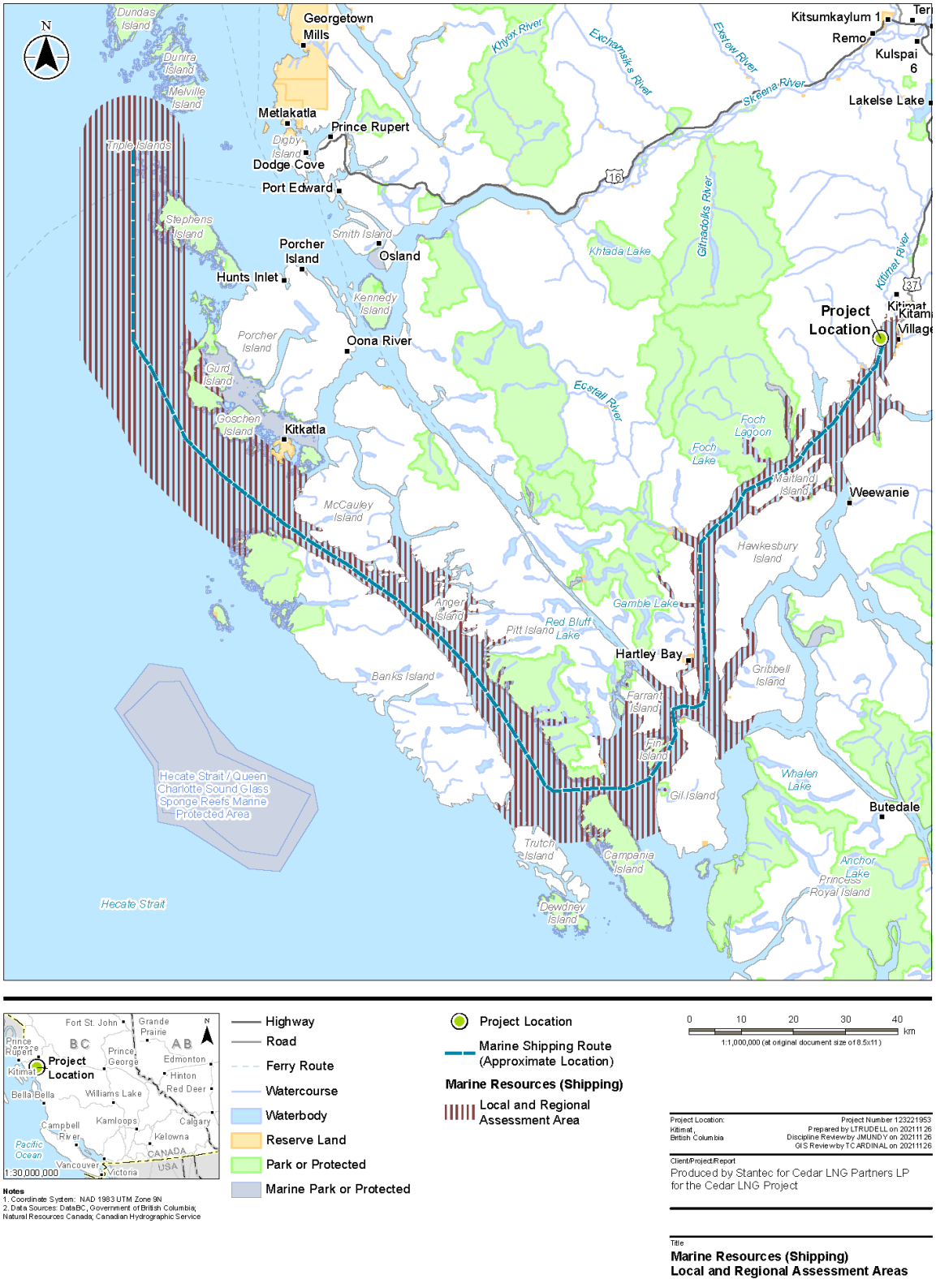


**Figure 14*:* Marine Shipping Route LAA and RAA for the marine resources VC.**

The temporal boundaries of the assessment are the period over which effects on the marine resources VC were assessed. Cedar assessed effects to marine resources over all phases of the Project: construction, operations and decommissioning.

## 5.6.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS MEASURES IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.6.3.

### *5.6.2.1 Existing Conditions*

Baseline information on marine resources was established from existing data, field studies, and both traditional knowledge and traditional use in the area.

#### *WATER QUALITY*

Measured parameters of contaminants in water and sediment are below the detection limit or applicable Water Quality Guidelines (WQG) in Kitimat Arm, with the exception of boron, cadmium, copper, and zinc in some samples. Boron is naturally elevated in the marine waters and was the only metal measured in the marine terminal LAA during project-specific sampling that exceeded WQG.

#### *MARINE FISH AND MAMMALS*

Marine fish habitat within the Marine Terminal LAA/RAA includes marine riparian habitat, intertidal habitat, subtidal habitat (foreshore), estuaries and salt marshes, and kelp and eelgrass beds. The Marine Terminal and Marine Shipping LAA/RAAs also overlap with important DFO areas for oolichan, tanner crab, and cloud sponge.

Habitat use within the Marine Terminal LAA is species and season specific. There are five species of Pacific salmon and steelhead that spawn in the Kitimat River watershed and have unique migration and spawning timings. In marine waters of the Kitimat Arm, salmon are observed year-round, with seasonal influxes during adult inbound and smolt outbound migrations.

No intertidal benthic rare species or species at risk were identified in the Marine Terminal LAA. Marine fish and invertebrate species at risk that may be present in the Marine Terminal RAA include bluntnose sixgill shark, spiny dogfish, canary rockfish, yelloweye rockfish, quillback rockfish, oolichan, green sturgeon, and northern abalone.

Traditional harvesting grounds, hunting grounds, and fishing grounds for clam, cockle, seal, halibut, rockfish, and lingcod are present in the areas around Minette Bay, the mouth of Kitimat River, Coste Island, Bish Cove, and the deeper waters of Kitimat Arm.

The marine fish and invertebrates considered species at risk that would occur in the Marine Terminal RAA and in the Marine Shipping RAA are listed in the table below.

**Table 18: Marine fish and invertebrate species at risk known to occur in the Marine Terminal RAA and in the Marine Shipping LAA/RAA**

| Taxa | SARA-Listed[1] | COSEWIC[2] | *Wildlife Act* |
|---|---|---|---|
| Northern Abalone | Endangered | Endangered | Red |
| Olympia oyster | Special concern | Special concern | Blue |
| Bluntnose sixgill shark | Special concern | Special concern | Red |
| Spiny dogfish | Not listed | Special concern | No status |
| Tope shark | Special concern | Special concern | No status |
| Green sturgeon | Special concern | Special concern | Blue |
| Oolichan | Pending | Endangered / Threatened | No status |
| Bocaccio | Not listed | Endangered | No status |
| Canary rockfish | Not listed | Threatened | No status |
| Darkblotched rockfish | Not listed | Special concern | No status |
| Quillback Rockfish | Not listed | Threatened | No status |
| Rougheye rockfish (type I and II) | Special concern | Special concern | No status |
| Yelloweye rockfish | Special concern | Threatened | No status |
| Yellowmoth rockfish | Not listed | Threatened | No status |
| Longspine thornyhead | Special concern | Special concern | No status |
| NOTES:<br>All species included in the table are known to occur in both the Marine Terminal RAA and the Marine Shipping LAA/RAA.<br><br>[1] SARA = *Species at Risk Act*<br>[2] COSEWIC = Committee on the Status of Endangered Wildlife in Canada | | | |

Humpback, Eastern Pacific grey, fin, toothed and Bigg's killer whales are commonly observed in the region. Minke whales have also been observed year-round in BC waters but in low numbers. The critical habitat for humpback whales overlaps with portions of the Marine Shipping LAA/RAA around Gil Island where the grey and fin whales exhibit more seasonal use of the area. A designated DFO important area for northern resident killer whales has also been identified in the Marine Shipping LAA/RAA.

In addition to the whale species in the area, the most common marine mammals noted in Kitimat Arm are comprised of the harbour seal, Steller sea lion, harbour porpoise, Dall's porpoise, and the Pacific white-sided dolphin. Seasonal changes in abundance and distribution of these marine mammals are related to migratory patterns and distribution of prey.

The marine mammals that are species at risk that would occur in the Marine Terminal RAA and in the Marine Shipping RAA are listed in the table below.

**Table 19: Marine mammal species at risk known to occur in the Marine Terminal RAA and in the Marine Shipping LAA/ RAA**

| Taxa | SARA-Listed[1] | COSEWIC[2] | *Wildlife Act* |
|---|---|---|---|
| Humpback Whale (North Pacific population) | Special concern | Special concern | Red |
| Fin Whale | Threatened | Special concern | Red |
| Grey Whale, Eastern North Pacific population | Special concern | Non-active | Blue |
| Minke Whale | Not listed | Not at risk | Yellow |
| Killer Whale, Northeast Pacific northern resident population | Threatened | Threatened | Red |
| Killer Whale, Northeast Pacific transient population | Threatened | Threatened | Red |
| Dall's Porpoise | Not listed | Not at risk | Yellow |
| Harbour Porpoise | Special concern | Special concern | Blue |
| Pacific White-sided Dolphin | Not listed | Not at risk | Yellow |
| Harbour Seal | Not listed | Not at risk | Yellow |
| Steller Sea Lion | Special concern | Special concern | Blue |
| Sea Otter | Special concern | Special concern | Blue |
| Sperm Whale | Not listed | Not at risk | Blue |
| Offshore Killer Whale | Threatened | Threatened | Blue |
| Northern Elephant Seal | Not listed | Not at risk | Red |
| Northern Fur Seal | Threatened | Threatened | Red |
| California Sea Lion | Not Listed | Not at risk | Yellow |

NOTES:
All species included in the table are known to occur in both the Marine Terminal RAA and the Marine Shipping LAA/RAA (with the exception of minke whale and sea otter in the Marine Terminal RAA.

[1] SARA = *Species at Risk Act*
[2] COSEWIC = Committee on the Status of Endangered Wildlife in Canada

#### *5.6.2.2 Potential Project Effects*

This section summarizes the following key potential effects on marine resources, which were assessed in the Application:

- Change in water quality;
- Change in habitat;
- Change in behaviour of fish or marine mammals caused by sensory disturbances,
- Change in fish or marine mammal injury or mortality risk;
- Changes to marine fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*; and
- Effects on aquatic species as defined in SARA.

### *EFFECT OF CHANGE IN WATER QUALITY*

Cedar LNG Project components and physical activities during all phases have the potential to result in changes to water quality which may affect marine fish health. Project activities during construction (such as marine pile installation), operation (such as liquefaction of natural gas) and decommissioning (such as dismantling of marine infrastructure) have the potential to alter marine water quality, which has the potential to affect marine fish health.

Cedar noted that site preparation and clearing during construction and dismantling of infrastructure during decommissioning could change water quality through an increase in the risk of shoreline erosion and the introduction of land-based sediment into the nearshore marine environment (i.e., through runoff). As no dredging or disposal at sea are planned during Project construction and the marine terminal would be attached to rocky substrate in the foreshore, studies such as sediment dispersion modelling were not conducted to inform the Application. Cedar assessed changes in TSS qualitatively and predicted that levels would remain within the DFO Land Development Guidelines for the Protection of Aquatic Habitat guidance of less than 75 mg/L of suspended solids above background levels during design storm events and Water Quality Guidelines (WQGs) for the protection of aquatic life during normal dry weather periods.

Changes to the marine waters may also result from marine terminal effluent discharges during construction and operation such as stormwater, ballast water, and desalination brine. Stormwater that contacts clean areas of the FLNG facility deck would be allowed to run off the deck and would not be tested. Stormwater that comes into contact with potentially contaminated areas would be captured and discharged if it meets the guidelines or treated in an oily water separator package if it does not meet guidelines prior to discharge. Stormwater from the land portion of the site would discharge to the Douglas Channel via ditches and is a separate storm system from the FLNG deck. The reverse osmosis freshwater generators would produce a continuous discharge of brine with a total suspended solids concentrations of less than 10 mg/L. These solids are marine minerals and salts that have been concentrated by the freshwater generation process. The resulting salt concentration in the discharge would be approximately 33 percent higher than background concentrations. During the operation phase, desalination brine would be discharged at a continuous rate of 28 $m^{3/}$hour. Further details regarding these discharges would be required as part of the waste discharge permit application process under the *Environmental Management Act* should Cedar LNG proceed to permitting.

While ballast water will be discharged into the Douglas Channel as the LNG is loaded, to prevent the introduction of contaminants and non-native species into the marine environment, all LNG carriers calling at the marine terminal would follow requirements for bilge and ballast water management and discharge under the *Canada Shipping Act* (2001) Ballast Water Regulations, and will implement a vessel-specific Ballast Water Management Plan that complies

with the International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004.

### *EFFECT OF CHANGE IN HABITAT*

During construction, site preparation and clearing would affect marine riparian vegetation that provide ecological benefits to fish that may cause changes to marine fish habitat. Habitat loss or alteration is described in Table 20.

**Table 20: Shoreline habitat affected by Cedar LNG.**

| Activity | Habitat Affected | Area ($m^2$) |
|---|---|---|
| *Habitat Loss* | | |
| Installation of piles to support the northern anchor block | High intertidal substrates | 6 |
| Installation of piles to support the small craft jetty | Intertidal and subtidal substrates | 41 |
| **Total Habitat Loss** | | **47** |
| *Habitat Alteration* | | |
| Shading from northern anchor block | High intertidal substrate | 108 |
| Shoreline riprap armouring | Intertidal substrate | 1,973 |
| **Total Habitat Alteration** | | **2,081** |
| **Total Habitat lost or altered** | | **2,128** |

Various outcomes will dictate which in-water marine infrastructure may be removed or remain in place with the decommissioning phase of Cedar LNG; however, it is anticipated that as all in-water surfaces are to have mature communities of algae and sessile invertebrate species, complete removal of all infrastructure would cause disturbance to marine habitat.

### *EFFECT OF CHANGE IN BEHAVIOUR OF FISH OR MARINE MAMMALS*

Cedar identified that underwater noise and artificial light were the key pathway of effects to cause effects on the behaviour of marine fish and marine mammals.

The primary sources of underwater noise from Cedar LNG would be the construction of marine-based infrastructure, marine transport of construction materials to the Project site, marine shipping and transportation, facility and infrastructure maintenance, operational stages of the Project, and decommissioning of marine-based infrastructure (to include marine transport of decommissioned infrastructure). Marine transportation associated with LNG carriers is expected to produce underwater noise from the engines, gearboxes, and propellers of moving vessels. Increased underwater noise may negatively impact marine mammals in various forms, including but not limited to causing stress and physiological responses (such as diminished

reproductive effort and lowered immune responses), impeding communication, and disrupting migration. The Application notes the scientific uncertainty surrounding the impact of underwater noise on changes in behaviour of fish or marine mammals due to limited studies in the marine environment in the case of fish and the multiple factors affecting actual reactions of marine mammals to introduced sources of underwater noise such as the intensity, type, duration of the noise, the individual, species, sex and life history and its distance from the source, the novelty of the activity, as well as state of the animal at the time of exposure. Thus, it is difficult to determine long-term impacts on individual animals or on populations.

During construction, certain activities may continue overnight and require lighting. Artificial lighting used during the hours of darkness may affect the behaviour of marine fish and marine mammals (such as seals and sea lions) in lit waters. During operations, artificial lighting at the marine terminal would be used to provide a safe working environment. During the nighttime, artificial illumination may cause a change in behaviour of marine fish and marine mammals (such as seals and sea lions).

### *EFFECT OF CHANGE IN FISH OR MARINE MAMMAL INJURY OR MORTALITY RISK*

Cedar identified that marine fish and marine mammals could be injured or killed from construction of marine-based infrastructure or from vessel strikes with LNG carriers along the shipping route. For construction, pile installation at the marine terminal/FLNG facility and small craft jetty and marine transport of materials to site may cause burial or crushing of organisms. Installation and operation of the seawater intake and waste discharges and dismantling of marine infrastructure following the end of life of Cedar LNG may also result in injury or mortality of marine fish. The Application additionally noted that underwater noise from unmitigated impact pile installation could injure marine mammals/fish or result in fish mortality.

During all phases of the Project, marine mammals could also be injured or killed by vessel strikes. Vessel strikes are defined as collisions between vessels (and/or propellers) and marine organisms, most commonly marine mammals but can also include sea turtles and basking sharks. Most injuries resulting from vessel strikes relate to either blunt force trauma or propeller lacerations; both can be fatal immediately or later, through secondary infections and internal injury. Cedar did not estimate mortality rates of marine mammals. The Application considered that many knowledge gaps still exist for vessel strikes.

### *IAA REQUIREMENTS*

The IAA requires that effects within federal jurisdiction be considered. These include the following effects addressed in the marine resources VC:

- 2(a) a change to the following components of the environment that are within the legislative authority of Parliament:
    - (i) fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act;* and
    - (ii) aquatic species, as defined in subsection 2(1) of SARA.

**Fish and Fish Habitat**

Cedar LNG has the potential to result in:

- Change in fish habitat;
- Change in water quality;
- Change in marine fish and marine mammal behaviours; and
- Change in injury or mortality risk for marine fish and marine mammals.

Details on the extent of effects are provided in the sections above.

**Aquatic Species as Defined in SARA**

The definition of aquatic species includes both wildlife species that are fish or a marine plant as defined in the *Fisheries Act*. Marine plants include all benthic and detached algae, marine flowering plants, brown algae, red algae, green algae, and phytoplankton.

The marine fish and invertebrate species that may occur in the Marine Terminal and Marine Shipping RAAs and are listed on Schedule 1 of SARA are listed above in Table 18. Three marine fish and one invertebrate species that may occur in the Marine Terminal and Marine Shipping RAAs are listed on Schedule 1 of SARA. With implementation of the identified mitigation measures for in-water work during construction and placement of the seawater intakes for operation, Cedar does not predict any direct effects on Schedule 1 listed species.

The marine mammal species that may occur in the Marine Terminal and Marine Shipping RAAs and are listed on Schedule 1 of SARA are listed above in (Table 19). Potential effects on these marine mammals including the incremental contribution of underwater noise and the increased marine vessel traffic are considered to be of moderate magnitude; however, changes in mortality risk and behavioural effects are not anticipated to adversely affect the viability of these SARA-listed populations. Despite existing levels of vessel traffic and underwater noise, marine mammal species at risk such as the humpback whale, grey whale, fin whale, and sea otter have shown substantial recovery toward pre-industrial population levels.

There are three potential pathways for Project-related effects to marine plants:

- Direct or indirect effects from construction of marine infrastructure
- Direct or indirect effects from berthing LNG vessels or Project infrastructure including physical disturbance and disturbance as a result of shading or resuspended sediments (each could also impact phytoplankton); and
- Wake-related effects as a result of marine shipping.

Species of brown, green and red algae are present within the intertidal zone of the LAA. These are located on all shoreline types including bedrock, boulder, boulder/cobble and cobble dominated habitats. There was no eelgrass or canopy-forming kelp observed during marine intertidal or subtidal surveys of the Marine Terminal LAA/RAA. These are the highest value marine plants on the coast of British Columbia from a fish habitat perspective.

During construction, Cedar noted that there would be little, if any, interaction with marine vegetation. The marine terminal has been designed to minimize any interaction with marine habitats. The strut mooring system for the FLNG has a very small footprint in the marine environment, with all potential impacts just below the higher-high tide level. Some *Fucus* spp. (rockweed) may be impacted by the installation of the northern anchor block for the strut mooring system; the intertidal footprint for these piles is approximately 6 $m^2$ and the concrete pile cap may shade up to 108 $m^2$. However, any intertidal components of this anchor block are expected to be colonized by *Fucus* spp. (rockweed) after construction is complete.

The small craft jetty has four 0.91-m diameter piles that would be installed in the intertidal area. This will affect 2.6 $m^2$ of shoreline habitat and may affect the brown, green and red algae present. It is expected that some algae will colonize the piles over time.

The strut mooring system will position the FLNG facility approximately 100 m from the shoreline in waters between 60 m and 90 m deep. As a result, LNG carriers will berth in waters where there is no potential for direct physical disturbance to marine plants or indirect disturbance due to shading or sediment resuspension.

During Application review, Cedar conducted an additional study on wake (as described in Section 5.9: Marine Use) that included an assessment of potential effects on marine vegetation. Cedar estimated wake wave heights and impacts to shoreline erosion and marine vegetation from LNG carriers for 25 shoreline sites that had the potential to provide important shoreline harvesting areas for Indigenous nations. In that study, Cedar acknowledged that vessel wake has the potential to impact natural processes such as shoreline erosion and cause adverse effects to marine vegetation such as kelp forests but found that wake heights were within the annual range of wave heights that occur naturally along the shipping route. While predicted wake height exceeded the summer mean monthly characteristics in some locations, the wake heights are less than wave heights experienced during storm events for that same period. The study noted that several of the highest wave heights had marine vegetation present and therefore the wake was not expected to affect marine vegetation. Only 4.2 percent of the shoreline along the Marine Shipping Route is characterized by silt or mud substrates and, as the wake heights are within the range of natural wave heights, there is little potential for shoreline erosion as a result of project-related vessel wake.

Marine vegetation can also be impacted by vessel wake through strong wake dislodging marine vegetation or wake-induced turbidity increases causing light limitation. Cedar noted that the majority of wake generated by project-related vessels is within the range of ambient conditions and wake is not expected to cause marine vegetation to be dislodged from shorelines along the shipping route. Additionally, turbidity effects at any one site would be low (due to depth and shape of fjord channels, short duration of exposed vegetation, infrequent vessel transits, and the small probability of those two events occurring simultaneously) and wake heights were largely within ambient conditions. These results indicated that, while marine vegetation may have greater exposure to transiting vessels at lower tides, the magnitude of any turbidity

increase is anticipated to be within the normal range caused by wind driven waves and any disturbed sediment will settle to baseline conditions quickly afterwards. As such, Cedar reported that project related vessel wake is not anticipated to cause light limitation to marine vegetation. Overall, effects on aquatic plant species would be low.

#### *5.6.2.3 Mitigation Measures Proposed in the Application*

The Application proposed the following mitigation measures[26] to avoid or minimize the potential adverse effects of Cedar LNG on marine resources:

- Incorporate erosion and sediment control best practices into the CEMP to manage surface water and avoid sedimentation of nearshore marine areas (construction);
- All measures related to protection of marine fish and marine mammals during construction, including protection of water quality, will be incorporated into the CEMP and will include monitoring plans and reporting requirements;
- Establish and maintain designated equipment refueling areas and develop a spill responses plan for construction into the CEMP to reduce potential fuel spills into the marine environment (construction);
- Pile installation in the intertidal zone for the FLNG facility strut mooring system will occur at lower tides to avoid in-water pile installation. Alternatively, Cedar may construct a cofferdam that allows piles to be installed in the dry (construction);
- If the small craft jetty is required, an underwater noise monitoring plan (as part of the CEMP) will be developed prior to construction to specify mitigation and monitoring measures for protection of marine mammals and fish during in-water pile driving. Pile driving for the small craft jetty will use vibratory methods to the extent possible. Where in-water impact pile driving is necessary, Cedar will use bubble curtains to mitigate underwater noise levels (construction);
- Lighting for the Project will be designed consistent with the OGC's Light Control Best Practices Guideline and will consider the following measures (all phases):
  - Directional or shielded lighting to reduce the vertical or horizontal distribution of light, and
  - Adaptative and variable lighting regime measures (timers, dimmers, motion sensors);
- Water intakes will be located on the bottom east (offshore) side of the FLNG barge and situated approximately 12 m below the surface, away from the shoreline, and above the

[26] Cedar has incorporated avoidance measures directly into the design of the Cedar LNG to align with Haisla Nation's business philosophy of promoting environmentally responsible and sustainable development that minimizes impacts to land and water resources.

seabed to mitigate injury or mortality of juvenile fish associated with entrainment and impingement (operation); and

- Utilize a Project-specific least risk work window of September 1 – February 15 for in-water work, if small craft jetty is required (construction).

During Application Review, Cedar also proposed a Follow-up Program for marine resources, which is described further below

## 5.6.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of marine resources for Cedar LNG were identified:

- Water quality;
- Underwater noise and artificial light; and
- Marine shipping effects.

Concerns raised by the Working Group regarding wake effects as it relates to marine resources are discussed in Section 5.9: Marine Use of this Report and in Part C and Section 6.9 of this Report.

### *5.6.3.1 Water Quality*

**Baseline Data, Effluent Effects and Monitoring**

ECCC, Lax Kw'alaams, Metlakatla, Gitga'at, and Gitxaała expressed water quality concerns regarding marine baseline data, the characterization and effects of effluent, and follow-up monitoring. These Indigenous nations requested to review management plans and mitigations related to water quality, including the CEMP and the proposed water quality monitoring program and to be kept apprised of the results of these monitoring programs. Working Group members indicated that wastewater must be tested on a regular basis by a Qualified Environmental Professional to ensure provincial and federal requirements are met, details on the wastewater management plan were requested, and that the proposed CEMP should include TSS specifics (for example: the background TSS concentrations, early warning triggers, and associated response measures to control effects from sedimentation).

ECCC requested further information regarding baseline data, specifically noting the Application should assess all adverse effects associated with liquid effluents and include baseline (pre-project) concentrations for all parameters of concern expected to change through project activities and discharges. ECCC requested additional information on contaminants of concern and parameters related to project discharges and that tabular raw data should be provided to support the effects assessments. Additionally, ECCC maintained that baseline data have limited spatial coverage when compared to expected project interactions. It was recommended that

both the incorporation of seasonal water quality sampling into the baseline sampling program conducted prior to construction and operation, and that more recent data be incorporated into the baseline assessment to better characterize sediment and water quality conditions. ECCC recommended benthic and invertebrate sampling and that the water quality monitoring include two years of baseline sampling, prior to construction, and follow-up monitoring throughout operations. ECCC was of the view that Cedar LNG was a high-risk project due to an effluent volume of greater than 50 $m^3$/day and an embayed discharge location.

Cedar provided memos that provided additional data and responses. With regard to ECCC's proposed condition for additional baseline water quality monitoring, Cedar noted it had incorporated this into a proposed Follow-up Program for marine resources. This would include additional baseline water quality sampling, prior to operations, as well as annual sampling for the first five years of operation. Cedar noted that sampling will be timed to capture natural variation in parameter concentrations.

Regarding the second proposed ECCC condition, Cedar expects that an operation-phase water quality monitoring program and a trigger response plan will be required as a condition of the waste discharge permit under the *Environmental Management Act*. The trigger response plan is anticipated to identify actions when effluent monitoring identifies an exceedance of permitted discharge limits or when an effluent-related exceedance of water quality guidelines occurs past the edge of the initial dilution zone. The specifics of this plan will be determined in consultation with the OGC during the waste discharge authorization process under the *Environmental Management Act*. Cedar noted such responses include additional mitigation measures and/or effluent treatment to reduce concentrations of the exceeding contaminant and additional monitoring effort for a period of time until the exceedance is appropriately managed. Cedar disagreed that effluent discharges from the Cedar LNG Project will likely be characterized as "high risk". While the effluent volume will exceed 50 $m^3$/day, the discharge point is expected to be in open waters. The FLNG will extend up to 100 m from the high water mark of Kitimat Arm, which is on the seaward side of a straight line drawn between any two points of land on the western shore of Kitimat Arm. As a result, Cedar expected that the risk rating for the effluent discharges would be medium; however, Cedar noted that the risk rating would be confirmed when the final FLNG layout and effluent quality and quantity are known.

In response to the request for additional details on effluent discharges, Cedar provided specific information on the characterization of contaminant concentrations within the brine effluent, the effects of brine on the receiving environment, avoidance and mitigation measures used to reduce the effects to the receiving environment (for example: using a diffuser at the end of the outfall to encourage mixing of desalination brine into the marine environment; increasing the flow-through on the desalinization system to reduce the salinity of brine; and using other effluent sources from the FLNG facility to dilute the brine's salinity concentration), and residual effects of the effluent after mitigation. Cedar noted that in order to determine which mitigation measures are required, they will conduct hydrodynamic dispersion modelling of the total

discharges and results will be provided to ECCC upon request. Results will also be used to inform development of the detailed operation-phase water quality monitoring program.

Per ECCC's request regarding mitigation measures for TSS and turbidity, Cedar provided detailed information on the water curtain which will be implemented as a safety measure intended to protect the steel and structural integrity of the FLNG facility in case of a cryogenic spill (for example: pipe rupture, improper connection make up, and minor flange/equipment weeps).

Lastly, Cedar confirmed that the CEMP will reflect CCME guidelines for turbidity and other appropriate parameters, considering both short-and-long-term exposures in response to ECCC's request on specific mitigation measures for TSS and turbidity and recommendation that Cedar update the CEMP to reflect short-term and long-term guidelines for turbidity and other parameters. Mitigation measures for TSS/turbidity will be included in the CEMP, and Cedar confirmed the plan will be written prior to construction and shared with ECCC. Cedar noted that in addition to turbidity monitoring by a qualified environmental professional/environmental monitor during construction activities, appropriate mitigation measures will be used to reduce the potential for turbid water to enter the marine environment and to reduce the extent of sediment disturbance caused by pile driving (for example: tarp placement over stockpiles of erodible materials; using erosion control fabric on slopes with erodible materials; paving, armouring or seeding erodible areas once they are at final grade; following DFO's Best Management Practices for Pile Driving and Related Operations during marine activities).

The EAO notes that, as part of the permitting process, the OGC would require detailed project design information with updated effluent modelling, effluent characterization, and detailed assessment of potential effects to environmental receptors. Effluent testing for toxicity would be expected to be a condition of a permit, if issued. Considering the concerns raised during the EA, the EAO also recommends a condition (9) requiring Cedar to develop a CEMP, including sediment and erosion control measures. This plan would need to be developed in consultation with Haisla, Gitga'at, Gitxaała, Kistelas, Kitsumkalum, Lax Kw'alaams, Metlakatla, OGC, ECCC, Northern Health, Canadian Coast Guard, Transport Canada and LWRS. The EAO also recommends Mitigation Measures under the IAA for marine resources, including a Follow-up Program, which would include additional baseline sampling and water quality monitoring (to be conducted by a QP), as well as the development and implementation of modified or additional mitigation measures if the results of the monitoring demonstrate that modified or additional mitigation measures are required to mitigate adverse federal effects on marine fish and fish habitat from changes to water quality as described in section 5.6.4.1 below. The EAO also recommended that Cedar be required to engage on the Follow-up Program with Haisla, Gitga'at, Gitxaała, Kistelas, Kitsumkalum, Lax Kw'alaams and Metlakatla.

ECCC maintained its recommendation for a greater scope of baseline and marine monitoring than that proposed in the marine resources Follow-Up Program. ECCC would have liked to see Cedar commit to conducting two years of baseline sampling; monitoring water quality quarterly

throughout the lifetime of the Project (not only the first five years), following a 5-in-30 sampling regime; analyzing, at a minimum, the parameter list in Appendix A of the BC Marine Monitoring Guidance for oil and gas and municipal wastewater, with the addition of fluoride and chlorophyll; monitoring at locations in the receiving environment directly adjacent to effluent outfalls; collecting samples near surface, mid-plume(s), at the depth of the intake, and near bottom; and monitoring sediment quality and benthic invertebrate community every three years (in addition to baseline sampling).

The EAO considered the comments and views of ECCC in its characterization of residual effects on marine water quality and its analysis and conclusions below. The EAO has confidence that the detailed design considerations undertaken in permitting would enable a marine water quality program to be determined that would be appropriate to the potential effects and risks of Cedar LNG. In combination with the proposed provincial conditions, the recommended Mitigation Measures and the federal Follow-up Programs, the EAO is of the view that there are means to verify the predictions on water quality during the EA and enable adequate mitigations to be applied, considering the adaptive management component of the proposed federal Follow-up Program.

**Waste Effluent Discharge Locations**

Lax Kw'alaams requested specifications on outfall locations of waste effluent discharges, the associated environmental considerations with these locations, and how the considerations would be brought forward into the subsequent permitting process under the *Environmental Management Act*. ECCC also recommended that Cedar provide a comprehensive characterization of all project activities and effluents that are likely to interact with water and sediment quality (i.e., locations and depths of outfalls and intakes, frequency and amount of discharge, and concentration of contaminants of potential concern in the effluent); an assessment quantitative prediction of how the project activities and effluents will change contaminant concentrations in the receiving environment, a comprehensive evaluation of how these predicated changes to water and sediment quality will impact aquatic life; and a discussion of mitigation measures to be implemented to reduce these effects.

In response, Cedar identified that the effluent discharge location(s) would be in the hull of the FLNG facility, and that technical guidance exists to assist in the development of marine discharge locations, initial dilution zones, and marine monitoring programs. The exact location would be determined during the detailed design of the FLNG facility and will be identified in the application process for the wastewater discharge permit under the *Environmental Management Act*. Cedar noted that prior to the approval of marine discharge, effluent dispersion modelling is conducted to evaluate the potential for the discharge to result in the following: bioaccumulation of contaminants of potential concern (COPCs) to a level that is harmful to aquatic receptors; accumulation of COPCs in water or sediments to acutely toxic levels; acute toxicity to fish within the initial dilution zone; acute or chronic toxicity to fish

outside the initial dilution zone; negative aesthetic qualities (such as odour or colour); dominance of a nuisance species as a result of discharge; and attraction of aquatic life or wildlife causing increase in their COPC exposure. Cedar further noted that delineation of initial dilution zones considers avoidance of various factors (for example: recreational use areas, setbacks from sensitive areas, proximity to initial dilution zones of other marine outfalls, contact between effluent and shoreline that prevents mixing or results in accumulation of COPCs) and if these guidelines cannot be met, the extent of the initial dilution zone is changed, and/or the marine outfall location is reconsidered.

The EAO notes that it considers detailed design and effluent discharge modelling to be best-placed to occur during the OGC-led permitting process described above. The EAO considers conceptual level information on water quality discharges to be appropriate at the EA stage and adequate for understanding the nature and extent of potential effects on marine resources. The EAO is of the view that the recommended provincial condition, federal Mitigation Measures, and the additional information that will be provided in permitting, as described above would provide adequate assurance that potential effects of effluent discharges on marine resources would be managed and not greater than those predicted during the EA.

**Sediment**

Lax Kw'alaams sought further information related to potential sediment suspension related to small craft jetty from vessels (i.e., tugs), and how the 2012 Kitimat sediment study supported current baseline sediment quality conditions within the Cedar LNG marine environment. Cedar confirmed that LNG carriers would be escorted by two tugs along the shipping route and that it has maintained the option to build a small craft jetty should the independent moorage facility in Kitimat no longer be available. Cedar noted that sediment suspension at the LNG carrier berth and small craft jetty from tugs is unlikely due to water depths at the berth faces. Additionally, Cedar specified that there was no anticipated resuspension of sediment from tugs due to the water depth at that location (approximately 30 m) related to the 2012 Kitimat sediment study.

The EAO considers the recommended provincial condition, federal Mitigation Measures, and the additional information that will be provided in permitting, as described above that related to marine water quality would adequately address these concerns raised.

**Marine Life Mortality**

Referencing Cedar LNG's decommissioning phase, Gitga'at sought further clarification on what controls would be implemented to ensure no mortalities of marine life or impacts in relation to water quality would occur and requested that Cedar incorporate mitigation measures outlined in the CEMP into a fish and fish habitat management plan. In addition, Kitselas requested the opportunity to review the CEMP so they could sufficiently provide comments on whether they feel water quality monitoring and treatment would be sufficient to prevent marine mammal injury or mortality risk related to wastewater.

In response, Cedar replied that a CEMP would be developed describing how the mitigation measures identified for marine resources would be implemented during construction. In addition, Cedar stated it would apply for applicable permits, approvals, and authorizations needed for appropriate Project phases which will include a waste discharge permit under the *Environmental Management Act* for stormwater and effluent discharges. Baseline water quality data, a technical assessment report, a best available technology assessment, and a monitoring plan are included in the scope of a waste discharge permit. As appropriate, these applications will reflect the mitigation measure commitments made in the Application. It is expected that the OGC will include permit conditions related to water quality monitoring and reporting, as needed.

Cedar noted that the avoidance and mitigation measures outlined in the CEMP are also expected to apply to decommissioning activities. Further, Cedar noted that there is a strong environmental regulatory framework in Canada that protects marine life, wildlife, and water quality. Cedar would apply for required permits, approvals, and authorizations needed for decommissioning in advance of that phase of the Project. Further, Cedar confirmed that the mitigation measures designed to minimize potential effects to fish and fish habitat outlined in the CEMP would be the same as those incorporated into a fish and fish habitat management plan.

Cedar confirmed the CEMP will be provided to Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, for review and comment before it is finalized.

The EAO considers the recommended provincial condition, federal Mitigation Measures, and the additional information that will be provided in permitting, as described above would adequately address these concerns raised.

**Metals in Effluent**

Gitga'at requested further information on impacts to metal content in water quality related to the oil and gas industry.

Cedar stated that it reviewed the potential effluent sources from the Project and did not expect that Project-related activities would impact metal concentrations in the marine environment. Cedar noted that the two primary effluent streams are stormwater and desalinization brine and do not include metals as constituents of concern. Additionally, permits from other gas plants and LNG facilities in BC have not identified metals in the permit conditions. The potential for metals to be present in an effluent stream will be assessed during the application process for a wastewater discharge permit under the *Environmental Management Act.* The permit includes components such as a baseline water quality sampling program, a technical assessment report (including the identification and evaluation of potential contaminants of concern), a best available technology assessment, and a water quality monitoring plan. Cedar concluded if metal concentrations of concern are present in the effluent, they will be identified and treated as appropriate prior to discharge to avoid potential impacts to aquatic receptors.

The EAO was satisfied this issue was adequately addressed for the purpose of the EA.

#### *5.6.3.2 Noise and Artificial Light*

**Underwater Noise**

Lax Kw'alaams, Metlakatla, Gitga'at, Kitselas, Gitxaała, and Haida raised concerns and requested clarification on underwater noise impacts related to vessel movements/shipping on marine mammals including justification of using Marine Terminal LAA and Marine Shipping LAA as buffers, residual and cumulative impacts that extend beyond the RAA, and pile driving. Further clarification and information inquiries (i.e., how species will be detected entering the marine mammal exclusion zone during pile driving, whether an exclusion zone would be utilized, how species will be detected entering the exclusion zone during small craft jetty construction, and why bubble curtains are not necessary) related to pile driving from Gitga'at and Kitselas were requested. These Indigenous nations requested to review management plans and mitigations related to underwater noise.

Regarding marine shipping effects, Cedar noted that the actual extent of underwater noise would be dependent on the vessel design and speed. In more open water portions of the Marine Shipping RAA (i.e., between Browning Entrance and the Triple Island Pilot Boarding Station) sound from LNG carriers with accompanying tugs may exceed the marine mammal behavioral disturbance threshold (120 dB re 1 µPa [rms]) at distances of up to 15 km or 20 km underwater. At vessel speeds of 10 knots, distance to the behavioural disturbance threshold were predicted to extend a distance of 10 km, within the Marine Shipping RAA. However, Cedar noted that during operation, one LNG vessel accompanied by up to two tugs is predicted to transit the Marine Shipping Route every 7 to 10 days (travelling both into and out of Kitimat) and the effects of underwater noise on marine organisms including fish will only occur while the ship is close enough to produce noise within the species' auditory range and there will be several days between ship passages which is expected to allow recovery to baseline conditions. Cedar did not anticipate residual effects from underwater noise are to adversely affect the viability of marine mammal populations in BC, including species at risk.

Regarding the marine terminal, Cedar noted that fish have the potential to be exposed to underwater noise through construction of the marine terminal (such as pile driving) and during operation (such as marine shipping). Pile driving activities will be conducted in the dry (where possible), restricted to vibratory methods (whenever possible), and bubble curtains will be used during impact pile driving to reduce underwater noise levels. Environmental monitors will evaluate the effectiveness of bubble curtains and additional mitigations during construction will be evaluated and implemented as needed. As it produces continuous noise opposed to impulsive, Cedar noted that vibratory pile installation would be used to the extent possible as it results in lower levels of underwater noise and a reduction in the potential effects to fish or marine mammal behaviour.

Upon DFO recommendations, a marine mammal exclusion zone (delineated using the 160 dB re 1uPa rms threshold) will be implemented during impact pile driving where Cedar will confirm the disturbance exclusion zones for cetaceans and pinnipeds with DFO prior to the start of pile driving. Cedar further stated that during vibratory pile driving, in-water construction activities will cease if a marine mammal is observed adjacent to or within the work area such that there is a risk of direct physical harm. In this case, work will only resume once the marine mammal has been confirmed to have left the immediate area or has not been sighted for 30 minutes. If impact pile driving is necessary and a marine mammal is sighted in the exclusion zone, work will also cease until the individual has left the exclusion zone or has not been sighted for 30 minutes. These measures apply to both pinnipeds and cetaceans, including those that are SARA-listed.

Regarding the potential for cumulative effects, Cedar noted that potential cumulative effects to marine fish and marine mammal behaviour are anticipated to result from the construction and operation of existing and future projects in the vicinity of the Project. Construction activities (for example: dredging, blasting, pile driving) and construction vessel movements will produce underwater noise, which could affect the behaviour of marine fish and marine mammals. During operation, vessels and tugs and existing/future vessel traffic will generate underwater noise and have the potential to affect marine fish and marine mammal behaviour. Regarding shipping noise, Cedar stated that underwater noise would decrease with distance from the source, and thus the magnitude of cumulative effects is expected to be consistent with what is observed within the RAA at baseline (i.e., moderate magnitude or less). Cedar noted underwater noise is not arithmetically additive and if a marine mammal is exposed to underwater noise from two vessels, the potential exposure time to levels in exceedance of the behavioral disturbance threshold is expected to be longer, but not expected to be more severe. Cedar stated residual cumulative effects of change in behaviour of marine mammals are conservatively categorized as medium magnitude in the Shipping RAA, but Cedar does not anticipate such to result in adverse effects to the viability of marine populations, including species at risk from its incremental contribution of behavioural effects.

In consideration of the concerns raised, the EAO recommends federal Mitigation Measures for underwater noise including establishment of a marine mammal exclusion zone and an underwater noise monitoring plan to specify mitigation and monitoring measures for protection of marine mammals and fish during in-water pile driving (if the small craft jetty is required). These Mitigation Measures are described further in in section 5.6.4.1 below. The EAO notes that underwater noise from marine shipping is predominantly determined by vessel speed. Cedar has committed to working with the Pacific Pilotage Authority and British Columbia Coast Pilots to establish guidance on safe vessel speed profiles for Cedar LNG vessels on the shipping route. Cedar notes that the safe vessel speed profile will be guidance and cannot fetter the captain's and pilot's ability to safely operate the LNG carriers.

The EAO notes that a number of initiatives target cumulative effects of marine shipping, as described in Part A, section 3.1.4. This includes Transport Canada's Cumulative Effects of Marine Shipping Northern Shelf Bioregion pilot area, which includes collaborative work with Transport Canada and Pacific North Coast Indigenous nations through an established Technical Working Group. In addition, the EAO notes that the Quiet Vessel Initiative, announced on June 30, 2021, was one of eight accommodation measures developed to address the concerns of Indigenous communities regarding the Trans Mountain Expansion Project. While focused on the Salish Sea, results through the Quiet Vessel Initiative will generate the technical evidence needed to support Canada's noise management measures in the Salish Sea and elsewhere in Canada. They will also provide guidance to industry, academia, and the International Maritime Organization (IMO) to influence future quiet vessel design standards and adoption. The EAO considers the Quiet Vessel Initiative as context for ongoing work to understand regional cumulative effects. In addition, Cedar has committed to joining the Proactive Vessel Management Initiative and has communicated with Transport Canada about becoming a member.

In consideration of the comments received, the EAO recommends that, if a small craft jetty is built, the proposed CEMP (condition 9; to be developed in consultation with Haisla, Gitga'at, and Gitxaała, Kistelas, Kitsumkalum, Lax Kw'alaams, Metlakatla, OGC, ECCC, Northern Health, Canadian Coast Guard, Transport Canada and LWRS) must include an Underwater Noise Monitoring and Management Plan and recommended federal Mitigation Measures include underwater noise mitigation measures. The EAO also recommends a condition (16) and a federal Mitigation Measure that Cedar must participate in relevant federal initiatives related to effects of marine shipping in the region so that Cedar is part of relevant conversations regarding vessels speeds and cumulative effects. Finally, the EAO also recommends a federal Mitigation Measure requiring Cedar to work with the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for Cedar vessels on the shipping route (as part of a marine transportation plan that must be developed in consultation with Indigenous nations). With these proposed mitigations measures, the EAO considered the issue to be adequately addressed for the purpose of the EA.

**Artificial Light**

Lax Kw'alaams and Gitxaała raised artificial light as an issue. Lax Kw'alaams requested additional information on monitoring measures that are being considered for disruptions to species with a strong diurnal pattern, and the potential for smaller marine mammals that may become more vulnerable to predation. Lax Kw'alaams requested follow-up monitoring on lighting during construction and operations.

Cedar stated that marine mammal species may exhibit different responses to underwater light based on their behavioural and/or foraging patterns. Species that have strong diurnal patterns may experience a disruption in their regular behaviour due to artificial light presence at night. In addition, artificial light may attract schools of fish which would present a foraging

opportunity for piscivorous marine mammals (for example: harbour seals, sea lions). Conversely, this foraging benefit could also make these smaller marine mammals more vulnerable to predation themselves. It was further noted that lighting associated with Cedar LNG will be designed in accordance with the OGC's Light Control Best Practices Guideline which includes the use of directional or shielded lighting, timers, dimmers, and motion sensors. By reducing the intensity and duration of exposure to artificial light, Cedar expects these practices will mitigate species-specific effects on marine mammal behaviour.

Upon development, Cedar noted that its CEMP will document how mitigation measures will be implemented during construction, that appropriate environmental monitoring should be conducted by a Qualified Environmental Professional (including artificial lighting), and adaptive management (in the form of lighting adjustments or further mitigation measures) will be considered if lighting is observed to have an effect on fish or marine mammals in the vicinity of the marine terminal. Cedar further noted it has not proposed any monitoring for the operation phase of the Project as the intent is to design the FLNG facility with minimal light trespass over the water. The EAO notes that the proposed CEMP (condition 9) would include mitigation measures for lighting and adaptive management. The EAO has also recommended federal Mitigation Measures that Project lighting should be designed to reduce risk of injury or mortality and change in movement for wildlife and marine resources and this mitigation measure should apply in all Project phases. With these mitigation measures, the EAO was satisfied this issue was adequately addressed for the purpose of the EA.

#### *5.6.3.3 Marine Shipping Effects*

Gitxaała, Lax Kw'alaams, and Haia raised concerns on the effects of marine shipping on marine reousrces though a variety of pathways. Gitxaała raised concerns about missing pathways of effects of marine shipping (for example: invasive species present on vessel hulls, substrate disturbance, shoreline erosion and wake effects) that are outlined in the Canadian Science Advisory Secretariat's Science Advisory Report 2020/03 on the Pathways of Effects for Marine Shipping in Canada: Biological and Ecological Effects. Gitxaała also commented that the existing conditions section on Marine Fish and Mammals is largely focused on the Marine Terminal LAA/RAA and more consideration of the Marine Shipping Route and project effects would have been appropriate.

Haida and Lax Kw'alaams raised concerns about vessel strikes. Lax Kw'alaams commented on the lack of follow-up monitoring and adaptive management of these effects and Haida commented that the West Dixon Entrance includes critical habitat for Northern Resident Killer Whale, a threatened species listed under Schedule 1 of SARA. Under SARA, critical habitat must be legally protected. The western Dixon Entrance is also situated on migratory routes for numerous Chinook Salmon stocks, which are an important food source for Northern Resident Killer Whale. Multiple species within the Project's LAAs and RAAs are already at or below thresholds rendering them of conservation concern and making any residual impact arguably substantive and unsustainable.

Regarding the Science Advisory Reort, Cedar responded that it was considered and relevant pathways of effects were integrated into the assessment and that if a pathway of effect was not considered relevant, it was not carried forward. During the EA, Cedar also requested membership in the Proactive Vessel Management (PVM) project, which as described in section 3.1, fosters collaboration between Indigenous nations and the commercial shipping industry and other stakeholders to develop voluntary measures that enhance marine safety and environmental protection.

Regarding Cedar's response on the Sciene Advisory Report, Gitxaała noted that it had overall concerns that the timelines for the EA did not allow Gitxaała to meaningfully review and discuss issues with Cedar prior to the finalization of the AIR. Issues of concern included but were not limite to scoping of effects related to marine shipping associated with the Project. As such Gitxaała noted that it would include additional discussion on any potential effect pathways included in the Science Advisory Report that Gitxaała deemed to be missing from the Application, within the Gitxaała Risk and Impact Assessment.

The EAO notes that Gitxaała Risk and Impact Assessment is contained with section 7.4 of this Report [*Note: Gitxaała's nation-specific assessment will be included in the final draft of this Report*]. Considering the comments received during the EA regarding the effects of marine shipping on a number of VCs, including marine resources, the EAO notes the number of initiatives underway address regional marine shipping effects, as described in Section 3.1 of Part A. In addition, the EAO recommends a provincial condition (16) and a federal Mitigation Measure requiring Cedar to participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region, in which industry is invited to participate. The EAO notes that effects to Indigenous interests from changes on marine resources from marine shipping are further discussed in Part C and section 6.9 of this Report. The EAO was satisfied this issue was adequately addressed for the purpose of the EA.

### 5.6.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated potential effects by considering construction, operations and decommissioning activities that could adversely affect marine resources from a change in habitat, change in water quality, change in behaviour of fish or marine mammals caused by sensory disturbances, and a change in fish or marine mammal injury or mortality risk. This included consideration of changes to marine fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act* and effects on aquatic species as defined in SARA as required under the IAA.

#### *5.6.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application and issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting /

Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[27], the EAO proposes the following provincial conditions:

- CEMP including an underwater noise monitoring and management plan and mitigations for project lighting effects (Condition 9); and
- Regional cumulative effects initiatives (Condition 16), which requires Cedar to participate in the Kitimat Airshed Group and relevant federal initiatives related to effects of marine shipping in the region.

Regarding potential effects from wastewater discharge, the EAO notes that if Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits, including a waste discharge permit for effluent discharge under the Environmental Management Act. This permitting process would be administered by the OGC. As part of this process, the OGC would require detailed project design with updated effluent dispersion modelling. Effluent testing would be expected to be a condition of a permit, if issued. Regarding marine shipping, the EAO notes that marine shipping is a federally regulated activity and navigation, vessel speeds and safety are regulated and managed by Transport Canada, the Canadian Coast Guard, and the Pacific Pilotage Authority. See Part A of this Report for further details on the Marine Regulatory Framework. The EAO is of the view that the existing federal regulation of marine shipping in combination with the proposed provincial conditions, federal key Mitigation Measures, and provincial permitting process would address the effects to marine resources identified during the EA.

The EAO recommends the following Mitigation Measures under the IAA for marine resources:

- Implementing mitigation measures to reduce sediment erosion and runoff into watercourses (all Project phases), as proposed in Section 5.5: Freshwater Fish;
- Stormwater runoff water quality will meet total suspended solids (TSS) levels within guidelines established within the Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993) and these discharges will not cause the receiving environment to exceed B.C. Water Quality guidelines for turbidity and TSS, considering both short-term and long-term exposures (all phases), as proposed in Section 5.5: Freshwater Fish;
- Establish and maintain designated equipment refueling areas and develop a spill responses plan for construction to reduce potential fuel spills into the marine environment;

[27] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

- Install piles in the intertidal zone for the FLNG facility strut mooring system at lower tides to avoid in-water pile installation or construct a cofferdam that allows piles to be installed in the dry (construction);
- If the small craft jetty is required, use vibratory pile driving methods for the small craft jetty to the extent determined to be possible by a Qualified Professional, and where in-water impact pile driving is necessary, use an effective sound attenuation device (e.g., bubble curtains) to reduce sound pressure levels (construction);
- If the Proponent opts to build a small craft jetty as part of the Designated Project, the Proponent shall manage underwater noise in a manner that avoids injury or mortality of fish and marine mammals. In doing so, the Proponent shall:
  - Conduct any in-water work required for the building of the jetty only between September 1 and February 15 of any year;
  - Use vibratory pile driving methods to install the piles required for the jetty, unless not technically feasible. Peak sound pressure levels must be maintained to below the fish mortality threshold of 207 dB re: 1 µPa 10 m from the pile during all pile driving. If impact pile driving methods are required, an effective sound attenuation device (e.g. bubble curtain around the full wetted length of the pile) must be installed and functioning prior to and during impact pile driving to reduce and maintain peak sound pressure level to below 207 dB re: 1 µPa 10 m from the pile to avoid injury to or death of fish;
  - Frequently inspect sound attenuation devices to confirm that they are functioning as intended;
  - Employ a soft start up procedure where the impact energy is gradually increased. The soft start procedure is to be employed anytime there is a break of 30 minutes or more in impact pile driving. If, during the soft start up, monitoring indicates that noise levels may exceed a peak sound pressure level of 207 dB re: 1 µPa 10 m from the pile, the work will be halted. The work will only resume after additional measures (e.g installing additional bubble curtains, etc.) are implemented to reduce hydroacoustic sound levels below threshold levels;
  - Conduct continuous hydroacoustic monitoring during pile driving to verify that underwater peak sound pressure levels do not exceed the 207 dB re: 1 µPa beyond 10 m from the pile to prevent injury or death of fish;
  - Monitor hydroacoustic sound levels from pile driving using a two hydrophone configuration (one hydrophone at the mid-point of the water column (e.g., equal distance between the surface and substrate) and another hydrophone within 2 m of the substrate). The hydrophones should be located at 10 m from the source (i.e., pile) where possible. If safety issues or overlap with bubble curtain operation restrict the deployment of hydrophones at 10 m, the hydrophones will be placed at the

nearest appropriate distance using professional judgement from the qualified professional performing this monitoring to extrapolate the peak sound pressure at 10 m;

- Establish an underwater noise exclusion zone for pinnipeds prior to impact pile driving. Exclusion zones should be large enough that stop work procedures could be implemented prior to pinnipeds entering an area of potential harm. As such, the exclusion zone should be a minimum of 75 m distance from pile driving activities for pinnipeds. This exclusion zone will be verified with onsite hydroacoustic monitoring. If monitoring reveals that the threshold for injury of 190 dB is exceeded at the 75 m pinniped exclusion zone boundary, the exclusion zone radius must be increased to a new outer limit, where hydroacoustic monitoring demonstrates that the injury threshold is not exceeded;
- Establish at minimum a 1000 m cetacean underwater noise exclusion zone (radius around the pile) prior to impact pile driving where sound levels are not to exceed 160 dBRMS re: 1µPa outside of the cetacean exclusion zone during impact pile driving. This exclusion zone will be verified with onsite hydroacoustic monitoring. If monitoring reveals that the threshold of 160 dB is exceeded at the cetacean exclusion zone boundary, the exclusion zone radius must be increased to a new outer limit, where hydroacoustic monitoring demonstrates that the 160 dB threshold is not exceeded;
- Employ an experienced and qualified marine mammal observer(s) to monitor for cetaceans and pinnipeds within the respective cetacean and pinniped exclusion zones during pile driving. Monitoring must occur at least 30 minutes prior to the start of pile driving. If a cetacean or pinniped enters their respective exclusion zone, pile driving must be suspended until the individual has left the exclusion zone or has not been sighted for 30 minutes. Pile driving activities must be carried out when environmental conditions enable effective visual monitoring of the cetacean and pinniped exclusion zones;
- Immediately halt pile driving activities if hydroacoustic monitoring indicates sound levels are in excess of the thresholds identified. Pile driving will only resume after adaptive management measures (e.g., extending the pinniped and/or cetacean exclusion zones, installing additional bubble curtains, etc.) are implemented to reduce sound levels below threshold levels.

- Design Project lighting to reduce risk of injury of mortality and change in movement for wildlife and marine resources and consider the following measures (all phases):
  - Directional or shielded lighting to reduce the vertical or horizontal distribution of light, and

  - Adaptative and variable lighting regime measures (timers, dimmers, motion sensors), with consideration of red shifted lighting;
- Locate water intakes on or near the bottom of the FLNG barge and situated away from the shoreline, to mitigate injury or mortality of juvenile fish associated with entrainment and impingement (operations);Conduct in-water work within the project-specific least risk work window of September 1 – February 15, if the small craft jetty is required (construction) and implement measures to avoid injury and/or death of fish as determined by a Qualified Professional (construction);
- Utilize an inert gas generation system for purging LNG tanks that does not require discharge of liquid effluent to the marine environment (e.g., nitrogen purging);
- Stormwater runoff water quality will meet total suspended solids (TSS) levels within guidelines established within the Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993) and these discharges will not cause the receiving environment to exceed B.C. Water Quality guidelines for turbidity and TSS, considering both short-term and long-term exposures (all phases); and
- Marine transportation plan, as described in the mitigation measures for marine use (section 5.9).

In addition, the EAO also proposes a Follow-up Program for marine resources under the IAA, which would include:

- Collecting additional water quality baseline data before the start of construction, taking into account the BC Marine Monitoring Guidance. The additional water quality data sampling will include:
  - Sampling during both ebbing tides and flooding tides;
  - Sampling during summer and winter;
  - Near surface, approximately 12 m depth, and near bottom sampling for metals, anions, nutrients, and hydrocarbons, with a focus on potential contaminants of concern to be present in effluents;
  - In situ measurements of temperature, dissolved oxygen, oxidation reduction potential, pH, specific conductivity, and turbidity;
  - Collection of conductivity-temperature-depth (CTD) profiles of the water column;
  - Monitoring at locations in the receiving environment immediately adjacent to outfalls, mid-field locations, far-field locations and reference locations not expected to be impacted by the Project.

The marine effects monitoring plan will include, at a minimum:

- Repetition of the water quality monitoring program once per year in the first five years of operations, but with sampling mid-plume (as determined by in-situ water quality) instead of at 12 m depth;

- During the first five years of operation of the Project provide the Agency, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla with copies of the annual monitoring reports. These will be accompanied by a memorandum that compares the results of the monitoring to the Canadian Water Quality Guidelines for the Protection of Aquatic Life (Marine) and the effects predictions included in the Application; and
- If the small craft jetty is required, monitoring of underwater noise during construction.

#### *5.6.4.2 Residual Effects*

After considering the mitigation measures, the EAO concludes that Cedar LNG would result in the following residual adverse effects to the marine resources VC:

- Change in water quality;
- Change in habitat;
- Change in behaviour of fish or marine mammals; and
- Change in fish or marine mammal injury or mortality risk.

Residual effects to marine fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act* and effects on aquatic species as defined in SARA as required under the IAA are captured by the assessment of the residual effects characterized below, which are pathways of effects to fish and fish habitat and marine mammals under SARA. Effects on marine plants are considered in the assessment of habitat effects.

**Table 21: Characterization of residual effects for marine resources:**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low to Moderate | The Marine Terminal RAA has been subject to a variety of human disturbances associated with past and present industrial operation since the 1950s, including the Rio Tinto aluminum smelter and the Eurocan pulp and paper mill (discharges from the mill entered the Marine Terminal RAA from the Kitimat River), a methanol plant, the municipal wastewater treatment plant, which discharges effluent into the lower Kitimat River, and log storage and handling facilities. Marine resources may be sensitive to any further degradation in environmental quality.<br><br>The Marine Shipping Route is a nursery area for Pacific salmon and herring, feeding grounds for marine mammals, and is characterized by abundant benthic invertebrate stocks. The Queen Charlotte Sound Ecosection is characterized by a wide shelf with water depths typically greater than 200 m. The Dixon Entrance Ecosection is characterized by deep waters and strong freshwater influence from the mainland river runoff. It serves as a migration corridor for salmon, and nursery areas for juvenile fish and invertebrates. While the Marine Shipping Route is currently relatively undisturbed by anthropogenic effects, it is also considered highly sensitive to any decreases in marine resources quality due to the potential for changes to negatively impact cultural, harvesting, and other traditional practices of Indigenous nations. |

| | | |
|---|---|---|
| Direction and Magnitude | **Water Quality:** Adverse and Low<br><br>**Habitat:** Adverse and Moderate<br><br>**Behaviour** Adverse and Moderate<br><br>**Injury or Mortality** Adverse and Moderate | **Water Quality:** project activities during construction (i.e., marine pile installation), operations (i.e., liquefaction of natural gas) and decommissioning (i.e., dismantling of marine infrastructure) are expected to have adverse effects on water quality thus impacting fish health and mortality.<br><br>**Habitat:** total area of habitat loss is expected to be 47 $m^2$ during construction. Further a maximum impact of 1,973 $m^2$ of intertidal habitat affected by shoreline riprap armouring is anticipated. Effects on marine plants specifically would be low because there would be little, if any, interaction with marine vegetation. The marine terminal has been designed to minimize any interaction with marine habitats. The strut mooring system for the FLNG has a very small footprint in the marine environment, with all potential impacts just below the higher-high tide level. Effects from shipping wake would also be limited.<br><br>**Behaviour:** underwater noise and artificial light are expected to affect marine mammals and fish during construction, operation, and decommissioning activities at varying levels. Underwater noise levels from shipping may exceed the 120 dB re 1 µPa rms sound pressure levels (SPL) threshold for behavioural effects from continuous noise.<br><br>**Injury or Mortality:** some mortality of marine organisms is expected during all project phases from burial or crushing of organisms during construction of the FLNG facility and seawater intake and outfall pipes. Marine mammals could also be injured or killed by vessel strikes. Based on the resilience of species, habitat availability, and the uniqueness of habitat affected, the effect from injury and mortality would result in a demonstratable change and may alter the nature of the marine resources that could exceed resilience and adaptability limits of the natural environment. |
| Extent | Site-specific/ Regional | Predicted effects will extend to marine resources as follows:<br><br>Water Quality: Site-specific<br><br>Habitat: Site-specific and LAA<br><br>• Behaviour: RAA |

| | | |
|---|---|---|
| | | Injury or Mortality: Site-specific for the FLNG and regional for the Marine Shipping Route |
| Duration | Long-term | The residual effects on marine resources from the described project activities are long-term and will last for the duration of the project. |
| Reversibility | **Water Quality and Behaviour:** Reversible<br><br>**Habitat:** Irreversible<br><br>**Change in Injury or Mortality:**<br><br>Reversible | **Water Quality and Behaviour:** the residual effects are reversible upon completion of physical work or when activity causing disturbance has ceased.<br><br>**Habitat:** residual effects are irreversible as construction (site preparation/clearing) has the potential to permanently alter or destroy marine habitat or be of long enough duration to be effectively permanent.<br><br>**Injury or mortality**: While the mortality of individual is by nature permanent, effects on populations would be considered reversible when the cause of mortality ceases (such as completion of marine terminal construction, or ceasing of marine shipping). |
| Frequency | **Change in Water Quality:** Infrequent to Regular<br><br>**Change in Habitat:** Infrequent<br><br>**Change in Behaviour:** Infrequent and Regular<br><br>**Change in Injury or Mortality:** Infrequent and continuous | **Water Quality**: residual effects would occur at an irregular event frequency during construction and decommissioning and regularly during operation.<br><br>**Habitat:** residual effects are infrequent as they occur once during clearing/site preparation during construction and decommissioning of marine infrastructure.<br><br>**Behaviour:** changes with noise are anticipated to occur as irregular events while changes with light are expected to occur as multiple regular events until removed.<br><br>**Injury or Mortality:** Effects from the operation of the FLNG would be continuous while effects from marine shipping, construction, and operation of the FLNG would be irregular events. |
| Risk (likelihood and consequences) | Likelihood – medium likelihood of residual effects to water quality during all project phases impacting fish health and injury/mortality and a medium likelihood of effects to habitat during construction (preparation/clearing) and decommissioning activities. There is a moderate to high likelihood of effects to behaviour with each project phase, but uncertainty related to actual marine mammals and fish responses to anthropogenic factors (i.e., noise and light) exists due to limited research | |

| | |
|---|---|
| | available. There is a medium to low likelihood of residual effects to injury/mortality as mortality is expected during all project phases.<br><br>Consequence – moderate consequence based on the magnitude of effects which may alter marine resources but are expected to remain below a level of effect that could exceed the resilience and adaptability limits of the natural environment and are reduced through mitigation measures and best practice management practices.<br><br>Risk – based on the likelihood and consequence of residual effects to marine resources it was determined that there would be a moderate level of risk. |
| Uncertainty | Uncertainty for water quality is considered to be moderate. The EAO has moderate confidence in the residual effects characterizations, based on the type of discharges associated with the Project and the proposed provincial conditions, federal Mitigation Measures and provincial permitting process.<br><br>Uncertainty for habitat is considered to be moderate. The EAO has moderate confidence in the residual effects characterizations based on the known features of the site, the size of the project and type of habitat impacts associated with its construction and decommissioning.<br><br>Uncertainty for behavioural effects and mortality are considered to be moderate. The EAO holds this view as behavioural impacts are difficult to predict with confidence and mortality events (particularly vessel strikes), while infrequent, can be difficult to predict. |
| Significance | In consideration of the above analysis, erosion and sediment controls, mitigation measures that will be implemented, the magnitude of effects being localized and infrequent, and the partial reversibility of these effects, the EAO concludes that Cedar LNG would not have significant residual effects on the marine resources VC. |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.6.4.3 Cumulative Effects Assessment*

**Change in Water Quality**

Potential cumulative effects from changes in water quality on marine resources were assessed based on activities in the Marine Terminal and Marine Shipping RAA. Potential cumulative effects may result from exposure to elevated levels of TSS during construction and operation with the reasonably foreseeable project: Kitimat LPG Export Project. Cumulative effects to water quality could also result from potential changes to the physical and chemical composition of marine waters from marine terminal effluent discharges during construction and operation combining with changes in water quality from past, present and future projects.

Sediment plumes for other projects are not expected to overlap spatially with the project construction activities as no sediment plumes are anticipated during project construction. Uncertainty also exists regarding potential for temporal overlap of construction activities with these projects. Further, residual changes to water quality from project-related discharges into the marine environment (such as treated sanitary wastewater) are not expected to act

cumulatively with those of other projects and activities. It is assumed that other projects will be required to meet similar effluent permit conditions and guidelines designed to protect aquatic life in marine waters, and that residual effects will be localized and limited to within or near the development footprint of each project.

The likelihood of residual cumulative effects for change in water quality is considered low. Mitigation measures implemented for the Project and other marine development projects in the Marine Terminal RAA will reduce the levels and spatial extent of TSS in the water column, and sediment plumes for the Project and other projects are expected to be small and irregular and therefore are not expected to interact cumulatively (spatially or temporally).

**Change in Habitat**

For the assessment of cumulative effects due to change in habitat in the marine terminal RAA, the spatial and temporal overlaps of residual project-specific habitat alteration or loss due to other projects or activities were assessed. Six past or existing projects and activities (former Eurocan Pulp and Paper Mill, Former Moon Bay Marina, MK Bay Marina, Rio Tinto aluminum smelter, Rio Tinto Terminal A Extension, LNG Canada Export Terminal) and one reasonably foreseeable future project (Kitimat LPG Export Project) are located within the Marine Terminal RAA and have or may cause permanent alteration or destruction of fish habitat. The only existing physical activity identified to cause ongoing change in habitat and could overlap spatially with the Marine Terminal RAA is fishing and aquaculture activities. Potential exists to impact shoreline erosion and a change in habitat along the Marine Shipping Route due to vessel wakes but are dependent upon factors such as speed and frequency of vessels, water depth, and ecosystem type (for example, wake can accelerate shoreline stability. Fishing methods that involve contact with the seafloor (such as bottom trawling) can cause permanent alteration or destruction of habitat wherever they are active. However, notably, no project-specific residual change in habitat is expected within areas of the Marine Terminal RAA where fishing is occurring.

Cumulative effects on habitat within the Marine Terminal RAA are predicted to be low in magnitude. Effects will occur multiple times (but only once at each location), will be long-term or permanent in duration, and will occur in both disturbed and undisturbed habitats. Collectively, the permanent alteration and destruction of fish habitats from all past, present, and reasonably foreseeable projects is expected to be irreversible.

The likelihood of residual cumulative effects on fish habitat is considered high, despite the widespread of habitat compensation/offsetting, some adverse changes in habitat have occurred as a consequence of past and present projects and activities and are expected to occur during construction of reasonably foreseeable projects. However, the incremental contribution of Cedar LNG to this cumulative effect is considered small and the health and overall viability of fish habitat in the Marine Terminal RAA is considered high.

**Change in Behaviour**

Potential cumulative effects from changes in behaviour of marine fish and marine mammals based on projects and activities in the Marine Terminal and Marine Shipping RAA were assessed. Potential cumulative effects on marine fish and marine mammal behaviour may result from interactions between residual effects of the Project, effects from construction and operation of other projects and activities, and ongoing commercial, recreational, and Indigenous vessel use in the Marine Shipping RAA. Primarily, potential cumulative effects on marine fish and marine mammal behaviour are anticipated to result from the construction and operation of existing projects (the LNG Canada Export Terminal, the MK Bay Marina, the Rio Tinto Aluminum Smelter and Terminal A Extension) and future projects (Kitimat LPG Export Project) located in the vicinity of Cedar LNG. Construction activities will produce underwater noise, and include dredging, blasting, pile driving, and construction vessel activities.

During operation of these projects, vessels and tugs will generate underwater noise with the potential to affect marine fish and marine mammal behaviour. Underwater noise from existing and future vessel traffic along the shipping route to the Triple Island Pilot Boarding Station will also generate underwater noise that may act cumulatively with noise from project-related vessels and includes vessels calling on ports in Prince Rupert as there will be some overlap with project-related vessels in the vicinity of the Triple Island Pilot Boarding Station.

Residual cumulative effects caused by concurrent marine construction projects and activities are characterized as low in magnitude, non-overlapping in extent, limited to the Marine Terminal RAA and will persist over the medium-term. These effects will occur in disturbed environments and are considered to be reversible following the completion/cessation of the activities that generate underwater noise.

Residual cumulative effects resulting from marine construction vessel traffic and other existing vessel traffic in the Marine Terminal RAA are predicted to be low in magnitude. Residual cumulative effects are expected to persist over the medium-term and will be reversible following the cessation of the underwater noise.

During the Cedar LNG's operation phase, residual cumulative changes in marine fish behaviour are predicted to be low in magnitude and effects are expected to be in the Marine Shipping RAA. Similar to construction vessel traffic, effects during operation are expected to include multiple areas of fish avoidance or altered swimming direction. The areas of changes are expected to be of limited overlap along the shipping route to the Triple Island Pilot Boarding Station. In these areas, the spatial extent of behavioural changes may be smaller due to habituation to underwater noises generated by frequent vessel movements over the long-term. Residual cumulative effects are expected to be short-term and reversible (animals will recover in minutes to hours) but effects will occur repeatedly over the operation life of the Project.

Residual cumulative effects of change in behaviour of marine mammals are conservatively categorized as medium magnitude in the Marine Shipping RAA due to the presence of multiple marine mammals listed under SARA. However, the incremental contribution of behavioural effects from Cedar LNG acting cumulatively with past, present, and future projects is not

anticipated to result in adverse effects to the viability of marine populations, including species at risk. This may be due to population growth rates, the resilience of the species, and factors that affect viability such as population regeneration, habitat, and ecosystem equilibrium. Given the anticipated operation life of most projects, residual cumulative effects of changes in behaviour are expected to be regular in nature, reversible, and short-term.

The likelihood of residual cumulative effects on marine fish and marine mammal behaviour is considered high. While mitigation measures implemented for the Project and other marine development projects in the Marine Shipping LAA/RAA will reduce the intensity and spatial extent of underwater noise, some cumulative changes in marine fish and marine mammal behaviour are expected in areas close to active construction sites and in the vicinity of transiting vessels. The likelihood of residual cumulative effects for change in behaviour on marine mammals is therefore considered high but is not anticipated to result in population level effects.

**Change in Injury or Mortality**

Potential cumulative effects from changes in injury or mortality risk to marine resources were based on projects and activities in the Marine Terminal and Marine Shipping LAA/RAA. From 2016 to 2020, approximately 57 piloted vessels called on the port of Kitimat annually. During operation and construction, 50 LNG vessels or 100 LNG vessel movements are anticipated annually (approximately two LNG vessel movement per week) from Cedar LNG. Existing traffic, Cedar LNG and LNG Canada together would be expected to result inapproximately 605 vessels visiting the port of Kitimat annually. Construction and operational phases are expected to result in the mortality of some marine fish and invertebrates. This residual effect is expected to act cumulatively with effects of other present and reasonably foreseeable projects and activities in the Marine Terminal RAA.

Most species likely to have been affected through construction of in-water infrastructure are abundant in the Marine Terminal RAA and have high intrinsic population growth rates, making these historical effects undetectable at the population level. Therefore, residual changes in injury and mortality risk resulting from Cedar LNG are not expected to act cumulatively with those of past projects.

Fishing is a leading cause of injury and mortality in marine fish. Numerous species are targeted within the Marine Terminal RAA. Fishing-induced injury and mortality is not expected to act cumulatively with changes in injury and mortality risk resulting from Cedar LNG. While some mortality of marine fish and invertebrates is expected to occur as a result of reasonably foreseeable projects (Kitimat LNG and the Kitimat LPG Export Project) involving construction of marine infrastructure, residual effects of these activities are not expected to act cumulatively with those of Cedar LNG.

Sources of underwater noise capable of causing injury are primarily expected during marine construction activities (and secondarily during decommissioning). The primary anticipated

contributors to cumulative effects of change in risk of injury due to underwater noise will likely be the future marine infrastructure projects that are anticipating marine construction operation in the vicinity of the Project (Kitimat LPG Export Project). Upon implementation of mitigation measures related to hearing injury prevention, cumulative change in risk of hearing injury of marine mammals in the Marine Terminal RAA are not anticipated.

Among the other projects and activities listed above, Cedar LNG wouldintroduce increased levels of vessel traffic to the Marine Shipping LAA/RAA, which may increase marine mammals' potential overall risk of injury or mortality from vessel strikes. LNG Canada and Kitimat LPG Export Project are anticipated to have shipping operation in the vicinity of Cedar LNG and are identified as primary contributors to a change in mortality risk. Due to their distant locations and shipping routes, three additional future projects (Fairview Container Terminal Expansion, Ksi Lisims LNG Project, and Vopak Development Canada Inc.) will have a lesser degree of potential overlap and contribution to Cedar LNG as vessel overlap occurs within the Marine Shipping LAA/RAA of the Triple Island Pilot Boarding Station. Existing and future vessel traffic, including both commercial and recreational vessels, may also act cumulatively with project-related vessels to produce an overall increase injury or mortality risk for marine mammals.

Future effects of marine projects within the Marine Terminal RAA are expected to be localized and limited to active construction. Most species that could be injured or killed during construction activities are abundant in the Marine Terminal RAA, and the loss of a limited number of individuals will not affect the long-term persistence of these populations. Following completion of construction works, available habitats will be colonized via recruitment and migration from nearby areas, where unavoidable mortality or alteration/disruption or destruction of fish habitat occur, offsetting measures will be implemented and will likely benefit affected species. With the implementation of mitigation measures, the cumulative effect of a change in mortality risk is predicted to be low. This effect is considered regular and long-term in a mostly disturbed environment with the ongoing operation of fisheries in the Marine Terminal RAA. While mortality is, by definition, irreversible, most of the affected species have high intrinsic population growth rates and any mortality losses are expected to be replaced within one to two generations following the completion of in-water construction activities and the population viability of fish populations will not be adversely affected.

Cedar LNG will act cumulatively with other projects and activities (past, present and reasonably foreseeable) in the Marine Shipping LAA/RAA to increase the relative risk of a marine mammal vessel strike, and residual cumulative effects of change in injury or mortality risk from increased marine vessel traffic are expected to be of moderate magnitude. Marine mammal vessel strikes are expected to occur as multiple, irregular, albeit infrequent events. In the event of a vessel strike, consequences for the marine mammal involved are assumed to range from reversible (in the case of injury) to permanent and irreversible (in the case of mortality). Based on current marine mammal population sizes and trends for species known to occur in the Marine Shipping

LAA/RAA, changes in mortality risk are considered unlikely to affect population viability, including species at risk. Populations of the most commonly struck whale species are stable or increasing (for example: grey whales, humpback whales, fin whales).

The likelihood of residual cumulative effects for change in injury or mortality risk to marine resources is considered high. While mitigation measures implemented for the Project and other marine development projects in the Marine Terminal RAA will reduce the magnitude, extent, and duration of injury and mortality to marine fish and marine mammals, some mortality is likely unavoidable.

#### *5.6.4.4 Interactions Between Effects*

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the Act (2018)[28] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects on marine resources are described above in section 5.6.4.2.

The marine resources VC assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Wildlife – informed the assessment of marine resources through wildlife species that may be found along the Marine Shipping Route;
- Freshwater fish - the assessment considered effects for anadromous and estuarine fish species;
- Marine use – information on vessel traffic was considered in the assessment of potential effects to marine resources; and
- Human Health – species of marine animals and fish in the region that are harvested as country foods by Indigenous nations were considered in the assessment.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

In addition, the EAO notes that the effects of all biophysical VCs including marine resources, wildlife, and freshwater fish, are considered in the assessment of the effects on biophysical

[28] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

factors that support ecosystem function (section 6.6). This assessment considers linkages within the biophysical realm and considers effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function.

#### *5.6.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of effects on marine resources.

In the Application, Cedar used the following sources of Indigenous Knowledge in assessing the marine resources VC:

- The traditional land use study prepared for the LNG Canada Export Terminal to describe marine resources traditional knowledge and use in the RAA;
- Stewards of the Land, Haisla Ownership and Use of their Traditional Territory, and their Concerns regarding the Northern Gateway Project and Proposed Tanker Traffic in Douglas Channel and Kitimat Arm (Powell 2011);
- Final Argument of the Council of the Haida Nation. In the Matter of Enbridge Northern Gateway Project Joint Review Panel OH-4-2011, Northern Gateway Pipelines Inc. (CHN 2013);
- Haida Nation Marine Traditional Knowledge Study – Volume 1: Methods and Results Summary (CHN 2011);
- Interim Report: Haisla Oolichan (za 'X w en) Traditional Ecological Knowledge Study (Gauvreau 2021);
- Draft Gitxaała Nation Use Study, prepared for the Cedar LNG Project (Gitxaała Nation 2021); and
- Gitga'at First Nation Traditional Use and Occupancy Study for the Cedar LNG Project: Final Report (Gitxaala Nation 2021).

These reports provided information on species of importance to Indigenous nations, important harvesting times and areas, traditional travel routes, and sensitive areas for particular species.

During the EA, Metlakatla, Lax Kw'alaams, Kitselas, Gitga'at, Gitxaała, and Haida provided comments on the assessment of effects to marine resources, including proposed mitigation measures and characterization of residual and cumulative effects, and conclusions. The information provided is summarized above in section 5.2.3 and section 7.0. Gitxaała emphasized that although potential project effects are assessed, the short-term adverse impacts (i.e., vessel strikes resulting in marine mammal mortality or deleterious spills resulting in fish death or changes to water quality and habitat) are not quantified in the assessment. In addition, regarding residual effects, Metlakatla noted that it had only moderate confidence in the finding that effects to marine resources are not significant while Lax Kw'alaams indicated their uncertainty related to the rationale associated with some criteria (such as likelihood). Key

ways in which the EAO took these comments into account in the marine resources assessment included:

- In the residual effects characterizations:
  - Identifying marine resources within the Marine Shipping Route as sensitive, based on the potential for any decreases in marine resources quality to negatively impact cultural, harvesting, and other traditional practices of Indigenous nations; and
  - Rating uncertainty as moderate (rather than low) based on the concerns raised by Indigenous nations, in addition to other Working Group members in particular regarding noise and light effects from the FLNG facility and marine shipping on marine mammals and fish and water quality effects from the FLNG facility.
- If a small craft jetty is built, recommending an underwater noise monitoring and management plan as part of the CEMP and underwater noise mitigation measures within the federal Mitigation Measures;
- Recommending a federal Mitigation Measure that project lighting be designed to reduce the risk of injury or mortality and the change in movement for wildlife and marine resources;
- Recommending a Follow-Up Program for marine resources under the IAA;
- Recommend a condition and federal Mitigation Measure, which requires Cedar to participate in relevant federal initiatives related to effects of marine shipping in the region; and
- Recommending a marine transportation plan to be developed in consultation with Indigenous nations, which would include the requirement that Cedar work with the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for Cedar vessels on the shipping route.

The EAO also notes that Indigenous nations' views and comments on the effect of marine resources on Indigenous nations' Indigenous Interests are discussed in Part C of this Report.

#### *5.6.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or significant cumulative effects on the marine resources VC (including changes to marine fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act* and effects on marine aquatic species as defined in SARA). This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 9: Construction Environmental Management Plan and Condition 16: Regional Cumulative Effects Initiatives; and recommended Mitigation Measures and Follow-up Program under the IAA for marine resources (Appendix 1).

# 5.7 EMPLOYMENT AND ECONOMY

## 5.7.1 BACKGROUND

This chapter assesses the potential adverse effects to the employment and economy VC. Employment and economy was identified as a VC to be assessed for Cedar LNG because Indigenous nations, government agencies, the public and other stakeholders noted the potential for Cedar LNG to affect the employment and economic conditions of Kitimat and the surrounding region through the creation of jobs and through economic activity associated with construction, operation, and decommissioning of the project. Potential project effects to each Indigenous nations' traditional economies are discussed in their respective sections of this Report within Part C.

Employment and economy effects as it relates to the health, social or economic conditions of the Indigenous peoples of Canada are discussed in section 6.9 of this Report, Requirements of the *Impact Assessment Act*.

### *5.7.1.1 Regulatory Context*

The employment and economy VC is related to several provincial and federal requirements, including:

- National Occupational Classification System;
- Indigenous Services Employment and Training Program; and
- First Nations Financial Transparency Act.

### *5.7.1.2 Boundaries*

Spatial boundaries for the LAA include communities with the greatest potential to experience effects on employment and economy from Cedar LNG-related requirements for labour, goods, and services. The LAA (Figure 15) is comprised of Kitamaat Village (Kitamaat 2), District of Kitimat, Terrace CA (this includes the City of Terrace, Kitimat-Stikine E Regional District Electoral Area and Kulspai 6), Kitselas 1 and Kitsumkaylum 1. The RAA (Figure 16) is comprised of the North Coast Regional District Electoral Areas A and C and the Kitimat-Stikine Electoral Areas C and E, as well as the LAA.

Cedar assessed impacts to the employment and economy VC during Cedar LNG construction (approximately four years), operation (40 years), and decommissioning phases (approximately 12 months).

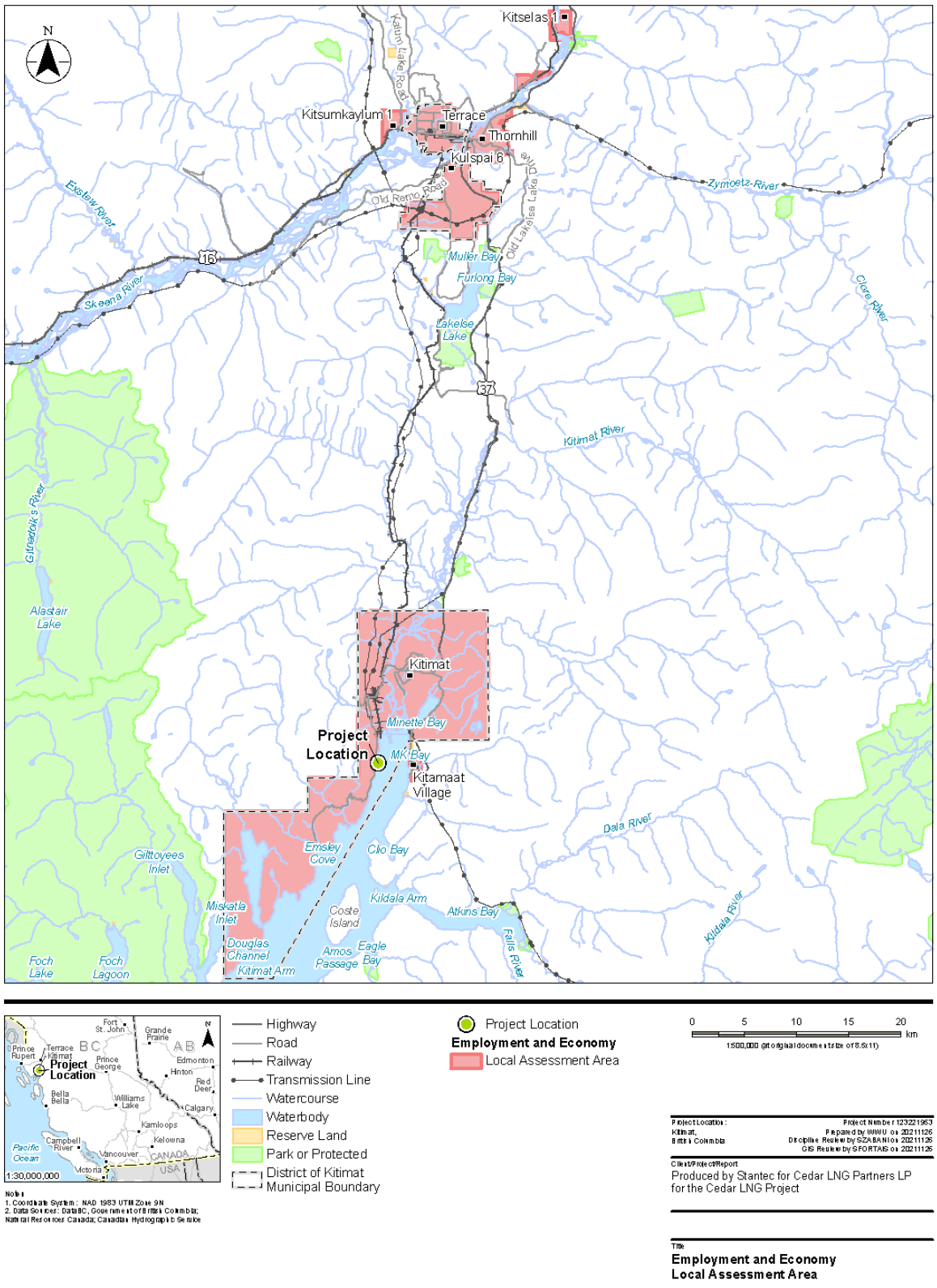


**Figure 15. LAA for the employment and economy VC.**


**Figure 16. RAA for the employment and economy VC.**

### 5.7.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.7.3.

#### *5.7.2.1 Existing Conditions*

Cedar assessed existing conditions primarily using statistical datasets and published reports; however, due to the dynamic nature of socio-economic conditions in the region, Cedar limited its use of information from previous EAs to understanding issues rather than to establish baseline conditions. Baseline conditions were established for subgroups to support GBA Plus analysis of effects wherever possible to obtain disaggregated data. Cedar noted that in 2016, the labour force of the LAA was 13,350 persons (54.5 percent male, 45.5 percent female), comprised of 2,530 persons (53.0 percent male, 47.0 percent female) of Indigenous identity (19.0 percent of the total labour force), and had a participation rate of 65.9 percent (60.7 percent among the Indigenous labour force). The LAA unemployment rate was 11.3 percent (up from 9.7 percent in 2011), 4.6 percentage points greater than the provincial average of 6.7 percent. Males had higher levels of unemployment than females (12.0 percent vs 10.5 percent among females). As with the overall LAA labour force, Indigenous unemployment rates were greater among males than females (19.8 percent vs. 17.2 percent).

#### *5.7.2.2 Potential Project Effects*

The Application identified three potential positive project effects to the employment and economy VC from Cedar LNG, each of which could result from the procurement of labour, goods and services during construction, operation, and decommissioning. These effects were changes in 1) regional employment, 2) regional business and 3) regional economy. Where possible, economic effects estimated for construction and operation were considered in terms of direct, indirect, and induced effects. Direct effects result from labour, materials and service demands from Cedar and its contractors (such as construction labour or project management). Indirect effects result from contractor expenditures on goods and services (such as employment with suppliers and manufacturers of materials used during construction). Induced effects result from spending by direct and indirect workers on consumer goods and services (such as restaurant servers or retail positions).

Cedar LNG hiring of local labour will affect local labour supply (i.e., regional employment). Qualified labour supply, participation, and unemployment rates, estimates of direct, indirect and induced employment with reference to affected industries and occupations all have the potential to be influenced by Cedar LNG. Positive effects are possible from an increase in employment during construction and operation. Cedar estimated 561 full-time equivalents (FTE) with an average income of $88,203 (FTE) and 270 FTE with an average income of $87,105 during construction and operations, respectively.

According to the Application, construction will last approximately four years with an average of 230 to 315 persons over this period and an estimate peak workforce of 350 to 500 from April to October during each year of construction (starting in second year). Operations of Cedar LNG is expected to require approximately 100 full time staff with the majority from the local population, utilizing existing housing in Kitimat and surrounding area. During operations every three to five years an additional 100 persons will also be required to perform scheduled shutdown and maintenance. The decommissioning workforce would peak at 100 to 150 workers, following which the labour demand from Cedar LNG would cease. According to the Application, the workforce in all phases will be recruited locally as much as possible. However, construction and operation will require some specialized trades and qualifications/experience that will likely be sourced from elsewhere in BC, Canada or internationally. This non-local workforce will utilize the existing third-party work camps available in Kitimat. While the availability of existing labour force required to respond to Cedar LNG labour demands is unknown, the Application noted that an estimated labour force of 870 to 1,119 persons may be available to respond to Cedar LNG's demand for direct labour.

There is also the potential that Cedar LNG may result in wage inflation from the increase in demand for labour. These effects may not be equitably distributed across subpopulations, potentially resulting in increased employment and income inequality. Within the LAA and RAA, non-Indigenous males account for the largest proportion of the existing labour force with occupations most likely to provide direct labour to Cedar LNG. In addition, males compared to females and non-Indigenous compared to Indigenous persons earn a higher mean and median wage in the LAA and RAA. To address project contributions to employment and income inequality, Cedar proposes to implement mitigation and enhancement measures targeted at increasing local content and participation among underrepresented groups (such as women and persons of Indigenous identity) within the oil and gas industry. These are described further below in section 2.3. Despite these measures, it likely that more males and non-Indigenous persons as compared to females and Indigenous persons will be employed at the project. However, due to the size of the Cedar LNG workforce relative to the size of the workforce in the LAA, Cedar does not expect the Project to measurably reduce employment and income inequality between sexes and persons of Indigenous and non-Indigenous identity across the LAA.

Cedar LNG spending will affect regional businesses. Value of local and regional spending, existing wage levels, estimates of direct, indirect, and induced labour income and income inequality all have the potential to be influenced by Cedar LNG. There is the potential for positive effects to regional businesses from an increase in revenue. Potential wage inflation and reduction in available labour may negatively affect regional businesses; however, overall, Cedar predicted that results on regional businesses would be positive because of contracting opportunities with the Project or additional business as a result of increased consumer spending from the Project's workforce.

Cedar LNG spending will also affect regional economy. Changes in regional economy may occur from economic activity in the LAA, RAA and BC during construction and operation. Cedar LNG will also pay income and property tax to various governments contributing to the local, regional and provincial tax base. The Application reported that Cedar LNG spending is estimated to result in $257 million in GDP contributions over the four-year construction phase, comprised of $107 million in direct effects (100 percent occurring in British Columbia), $94 million in indirect effects (63.8 percent occurring in British Columbia), and $56 million in induced effects (67.9 percent occurring in British Columbia). Over the 40-year operation life of the Project, annual GDP contributions are estimated at $85 million, comprised of $24 million in direct effects (100 percent occurring in British Columbia), $39 million in indirect effects (64.1 percent occurring in British Columbia), and $22 million in induced effects (68.2 percent occurring in British Columbia). The increased economic activity and increased labour demand may result in higher business costs, price of local goods and price of local services, which may affect the cost of living. However, overall, Cedar predicted that the net effects to the regional economy from the Project would be positive.

#### *5.7.2.3 Mitigation Measures Proposed in the Application*

The Application proposed mitigation measures to avoid or minimize the potential adverse effects of Cedar LNG on the employment and economy VC, including:

- Inform local residents and Indigenous nations of job and procurement opportunities during all project phases;
- Identify potential shortages of workers with specific skill requirements and training, and work with the Haisla employment department, local and regional Indigenous employment centers, local and regional training and education facilities, and communities to increase opportunities for Indigenous and local community members to obtain training required for project employment;
- Provide information to local and Indigenous employment agencies and economic development organizations to help them plan for increased demand for labour;
- Implement a gender equity and diversity policy that focuses on hiring Haisla Nation members, local and Indigenous persons, and other underrepresented populations, including women, to increase project employment among underrepresented populations
- Provide on-the-job training programs and apprenticeship opportunities;
- Workers (with the exception of summer students) 19 years and younger will be required to have completed high school or have an appropriate equivalency to work on Cedar LNG;

- Engage with the Haisla Nation and Indigenous, local, and regional economic development departments and organizations to discuss procurement opportunities during all project phases;
- Implement policies and practices to provide opportunities to local businesses and contractors;
- Consider opportunities over the life of Cedar LNG to enable Haisla and Indigenous, local, and regional businesses and contractors to have repeated or ongoing contracts; and
- Workers will be paid wages consistent with the Western Canadian labour market.

During Application Review, Cedar also proposed a Follow-up Program under the IAA for infrastructure and services, which is described in section 5.10: Infrastructure and Services. Cedar also proposed a Follow-up Program on GBA Plus, which is described in section 6.8: Human and Community Well-Being.

### 5.7.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of employment and economy for Cedar LNG were identified:

- Assessment uncertainties; and
- Effect to local and Indigenous employment.

Issues raised by reviewers relating to GBA Plus and under-represented groups are discussed in Section 6.8: Human and Community Well-Being.

#### *5.7.3.1 Assessment Uncertainties*

Northern Health brought forward concerns that Cedar should have considered existing vulnerabilities and resilience, and effects based on potential change in revenue over time from factors such as COVID-19 and LNG Canada. Gitxaała requested that more recent labour market data be used considering the large changes that have been experienced due to COVID-19. Gitxaała also noted that given Cedar's intention to prioritize local and Indigenous hiring and procurement, the Indigenous labour force in the RAA should be considered and recognized as a boundary of the proposed mitigation measure.

Regarding COVID-19, Cedar noted that, as described in the Application, substantial declines in goods-producing and service sectors occurred at the onset of the COVID-19 global pandemic. In the goods-producing sector, manufacturing and construction employment in the North Coast and Nechako Region both declined by over 25 percent between February 2020 and June 2020, linked to workforce reductions at LNG Canada and the Coastal GasLink Project and temporary

mill shutdowns. In the service sector, employment in accommodation and food services declined by over 40 percent. Between June 2020 and October 2020 construction-related employment increased to levels above pre-pandemic conditions (February 2019) with the resumption of work on LNG Canada and the Coastal GasLink Project. Employment in accommodation and food services remained lower than pre-pandemic conditions in October 2020. Cedar noted that COVID-19 has increased the inherent uncertainty about future economic conditions and the extent to which local workers/business will be able to satisfy and be interested in securing employment and contracting opportunities with the Project.

Regarding LNG Canada, Cedar stated that it is planning to start construction in late 2023 (clearing works) and as a result the Project is well positioned to leverage local labour made available from completion of the Coast GasLink Project and from the ramping down of main construction activities on LNG Canada. Given the timing of construction activities the Project will partially mitigate the magnitude of a potential regional economic 'bust' associated with the completion of these projects.

In response, Gitxaała noted that Cedar's assumption that it will be able to leverage local labour from the ramping down/completion of LNG and Coastal GasLink fails to take into account the general labour shortage facing businesses across most economic sectors that was reported in Coastal GasLink reports[29]. Northern Health raised concerns regarding Cedar's ability to develop and employ a skilled workforce, an issue LNG Canada has experienced.

The EAO noted the uncertainties raised in the assessment and has considered them in the residual effects characterizations below. The EAO also recommends a Follow-up Program for infrastructure and services to monitor and address effects on infrastructure as described in section 5.10.4.1. This program would require Cedar to collect data on the labour force, specifically the number of people working on the Project. The EAO is of the view that these issues have been adequately addressed for the purposes of the EA.

#### *5.7.3.2 Effect to Local and Indigenous Employment*

Northern Health raised concerns that prioritizing local hiring could lead to impacts to service levels (including essential services and that the effect of the Project on increasing vacancies should be discussed in greater detail, as increasing wages in the region result in competition among projects for labour. Northern Health also raised concerns that prioritizing local employment could compromise staffing of essential services in the community. Employment and Social Development Canada, Indigenous Services Canada and Gitxaała requested further details regarding workforce development opportunities, coordination with local training institutes (such as potential specialized training), and engagement with Indigenous nations to address individual Indigenous nations' interests and inform them of specific opportunities, and Cedar's efforts to promote, facilitate and/or offer training to assess socio-economic benefits (for example: human resources, gender and equality policies and procedures) stemming from Cedar LNG. Reviewers noted the potential for adverse economic effects and questioned why adverse residual and cumulative effects were not assessed.

[29] Coastal GasLink SEEMP Status Report 6 and Coastal Gaslink SEEMP Status Report 7

Cedar stated that the assessment of employment and economy included consideration of the effect of the timing of other projects and local employment conditions on regional employment, regional business, and regional economy. While Cedar LNG-related employment may be perceived as being more desirable than other forms of employment and that this could lead to increased difficulty for local businesses to recruit or retain qualified workers, the decisions of these workers to seek employment with Cedar LNG is largely outside the control of Cedar. However, to mitigate the potential for large wage differentials to be a leading contributor to labour drawdown, workers will be paid wages consistent with the Western Canadian labour market. Further, expected labour for Cedar LNG is not anticipated by Cedar to draw on support staff for health facilities in the RAA. Cedar LNG does not include construction of its own camp (non-local workers will use open lodges in Kitimat). Cedar concluded that, with the application of mitigation measures, the Project is expected to have a negligible effect on labour drawdown of health care professionals (affecting Northern Health) in the RAA.

Cedar confirmed that it intends to engage with all neighbouring Indigenous nations to understand their capacity to supply goods and services required by the Project, and to share information on jobs, contracting, and other economic opportunities. Furthermore, Cedar stated that to assist Haisla members, neighbouring Indigenous nations, and the local community with the ability to benefit from employment and related opportunities, Cedar proposed mitigation measures for employment, as described in section 5.7.2 above, including:

- Identify partnerships with local education and training facilities in the region to develop and maintain a local, skilled workforce which may include potential funding;
- Host local community information sessions to share details about what kinds of jobs are available and the training required; and
- Maintain a database of local workers and businesses to share information with as Cedar LNG advances, including training, hiring, and contracting opportunities.

In consideration of the concerns raised regarding local and Indigenous employment, the EAO proposes a condition requiring Cedar to develop a Socioeconomic Management Plan (SEMP) (Condition 14) that would detail hiring and training measures that prioritize regional hiring and procurement to reduce the increase in population associated with the Project workforce. The SEMP would also require Cedar to work with regional employment agencies and economic development organizations to assist in planning for increased demand for Construction and Operation workers, and work with regional agencies to increase opportunities for Indigenous and regional community members to obtain training required for Project participation.

The EAO also recommends mitigation measures under the IAA, as described below in section, which would include a gender equity and diversity program that focuses on hiring Haisla Nation members, local and Indigenous persons, and women to increase Project employment among underrepresented populations, and consideration of the baseline labour force participation status of under-represented groups in Kitimat and the region. With these conditions, the EAO considers this issue to be adequately addressed for the purpose of the EA. The EAO was of the view that following mitigation, net residual effects were positive and therefore did not conduct

a cumulative effects assessment.

#### *5.7.3.3 Socioeconomic Management Plan*

Gitxaała expressed concerns that the proposed Socioeconomic Management Plan (Condition 14) does not take into account the lessons learned regarding the effectiveness of similar management plans, such as the LNG Canada Community Level Infrastructure and Services Management Plan and the Coastal GasLink Socio-economic Effects Management Plan. Gitxaała has low confidence in the effectiveness of this mitigation and note that the effectiveness of such conditions is unproven and has not yet been evaluated in a rigorous way.

The EAO acknowledges Gitxaała's concerns and notes that the proposed Socioeconomic Management Plan for Cedar LNG incorporates feedback from previous experiences with similar conditions for other projects and includes specific mitigations to address the uniqueness of Cedar LNG. The SEMP includes monitoring, thresholds for additional mitigations, and adaptive management that would be based on feedback received from the community, Indigenous nations, and local and provincial government agencies. The plan requires EAO approval and will be developed in consultation with Indigenous nations, Northern Health, MUNI, City of Terrace, District of Kitimat, and Regional District Kitimat-Stikine. The EAO is of the view that the SEMP adequately addresses potential effects related to Employment and Economy for the purposes of this EA.

### 5.7.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated the potential effects to employment and economy by considering construction, operations and decommissioning activities that could affect the employment and economy VC and may result in positive or adverse residual effects.

#### *5.7.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment and the information contained in the Joint Permitting / Regulatory Coordination Plan, the EAO proposes the following provincial conditions for the employment and economy VC:

- Socioeconomic Management Plan (Condition 14).

The EAO recommends the following Mitigation Measures under the IAA for employment and Economy:

- Inform local residents and Indigenous nations of job and procurement opportunities during all project phases;
- Identify potential shortages of workers with specific skill requirements and training, and work with the Haisla employment department, local and regional Indigenous employment centers, local and regional training and education facilities, and

communities to increase opportunities for Indigenous and local community members to obtain training required for project participation;
- Provide information to local and Indigenous employment agencies and economic development organizations to help them plan for increased demand for labour;
- Provide on-the-job training programs and apprenticeship opportunities;
- Implement policies and practices to provide opportunities to local businesses and contractors; and
- Consider opportunities over the life of Cedar LNG to enable Haisla and Indigenous, local, and regional businesses and contractors to have repeated or ongoing contracts.

Mitigation measures for GBA Plus, including a Follow-up Program under the IAA for GBA Plus, are described in Section 6.8: Community and Human Well-Being. The Follow-up Program for infrastructure and services (see section 5.10) is also relevant to employment and economy because it contains reporting on workforce numbers.

#### *5.7.4.2 Residual Effects*

The EAO considered the potential for adverse residual effects to the employment and economy VC, based on the concerns raised by the Working Group that the project may not benefit groups that are under-represented in the regional labour force (for example: Indigenous people, women, youths, minorities). The EAO acknowledges that the project has the potential to maintain or fail to rectify these regional labour force trends. However, after considering the proposed provincial and federal Mitigation Measures, the EAO concludes that Cedar LNG would result in a net positive residual effect to the regional employment, regional business and regional economy that would benefit all subpopulations, regardless of gender or identity factor due to the creation of jobs and benefits to regional business and economy.

Residual effects to employment and economy effects within federal jurisdiction, including the health, social or economic conditions of the Indigenous peoples of Canada are discussed in Section 6.9: Requirements of the *Impact Assessment Act*.

**Table 22: Summary of residual effects to regional employment, business, and economy from Cedar LNG**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| **Context** | Regional employment: moderate<br><br>Regional business: moderate<br><br>Regional economy: LAA/RAA – moderate | **Regional employment:** in 2016 there was an unemployment rate in the LAA of 11.3 percent, this being an increase from 2011 (9.7 percent). The 2016 provincial unemployment rate was 6.7 percent, showing a significantly higher level of unemployment in the LAA. As such, the LAA has a moderate ability to |

| | | |
|---|---|---|
| | BC – low | accommodate increases in employment anticipated to result from Cedar LNG.<br>**Regional business:** the potential for Cedar LNG to impact businesses located in the LAA/RAA is moderate as there is a history of industrial development in the region and the construction of Cedar LNG would occur as other large projects are completing construction.<br>**Regional economy**: the context varies based on the assessment area. The potential for economic impacts is tied to the size of the economy and therefore there is a higher potential for change in the LAA/RAA than BC. |
| **Direction and Magnitude** | Regional employment: positive and moderate<br><br>Regional business: positive and moderate<br><br>Regional economy: positive and moderate | **Regional employment:** with the implementation of Cedar's mitigation and enhancement measures, the provincial conditions and federal Mitigation Measures, Cedar LNG is expected to result in positive effects with regional gains in employment and income that are moderate in magnitude given the workforce estimates.<br>**Regional business:** while there is the potential for both positive and negative effects, the negative ones have been addressed, where applicable, by the mitigation measures Cedar has proposed as well as the provincial conditions and federal Mitigation Measures. Therefore, there is a medium likelihood that project spending will result in indirect and induced business activity.<br>**Regional economy:** Cedar LNG is estimated to contribute $257 million in GDP during construction, of which $107 million is direct effects and $56 million is indirect effects. During operations, Cedar LNG is estimated to contribute an annual amount of $85 million ($24 million direct effects, $39 million indirect effects, $22 million induced effects). |
| **Extent** | Regional employment: Local/Regional<br>Regional business: Local/Regional<br>Regional economy: Local/Regional | The predicted residual effects of Cedar LNG to regional employment, business and economy are applicable throughout the LAA/RAA. |
| **Duration** | Regional employment: long-term<br>Regional business: long-term<br>Regional economy: long-term | The residual effects to regional employment, business and economy, as a result of Cedar LNG, would last throughout construction, operations and decommissioning, with the potential for positive effects to extend beyond the life of the Project. |
| **Frequency** | Regional employment: Continuous<br>Regional business: Continuous<br>Regional economy: Continuous | The effects to the regional employment, business and economy, from Cedar LNG, would occur frequently, at regularly intervals throughout construction and operations. |

| | | |
|---|---|---|
| **Reversibility** | Regional employment: reversible<br>Regional business: reversible<br>Regional economy: reversible | The residual effects on regional employment, business and economy from Cedar LNG would largely cease following the end of decommissioning, although some economic benefits could continue to be experienced beyond this time. |
| **Affected Populations** | Regional employment: disproportionate<br><br>Regional business: disproportionate<br><br>Regional economy: disproportionate | **Regional employment:** Cedar LNG will result in an increase in regional employment; however, this effect will be disproportionally distributed by variables such as gender and Indigenous vs. non-Indigenous. Non-Indigenous males are projected to experience a disproportionate proportion of employment, despite efforts to prioritize Indigenous opportunities.<br>**Regional business:** Cedar LNG will result in an increase to businesses; however, this effect will be disproportionally distributed by variables such Indigenous vs non-Indigenous. Non-Indigenous businesses are projected to gain a greater share of Cedar LNG-related contracting opportunities.<br>**Regional economy:** Cedar LNG expenditures during construction and operations will result in regional activities and tax income in the LAA/RAA, B.C., and Canada. The distribution of tax income will be disproportionate as Kitimat will receive greater tax income from municipal taxes than the rest of the LAA. |
| **Uncertainty** | Regional employment and business: the EAO's confidence in this assessment is moderate as there are a number of unknown variables that may influence the degree to which Cedar LNG will impose positive residual effects to regional employment and business.<br>Regional economy: the EAO's confidence in this assessment is high as there is a significant number of similar projects to provide data and information directly relevant to Cedar LNG's effect on regional economy. | |
| **Significance** | EAO concludes that Cedar LNG would not have significant adverse residual effects on employment and economy, considering that effects are predicted to be predominantly positive. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions. Risk (likelihood and consequences) was not assessed as the EAO concludes that Cedar LNG will not have adverse residual effects on the employment and economy VC.*

#### *5.7.4.3 Cumulative Effects Assessment*

The EAO concludes that Cedar LNG would not have adverse residual effects on the employment and economy VC; therefore, no potential for cumulative effects was identified.

#### *5.7.4.4 Interactions between Effects*

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the *Act* (2018)[30] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the employment and economy effects are described above in section 5.7.4.2.

The employment and economy VC assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Infrastructure and services: the information from labour analysis and predicted effects on cost of living, housing, and accommodations;
- Marine use: the assessment of effects on employment and economy refers to the marine use assessment of potential effects on commercial fisheries;
- Human and community well-being: the assessment of effects on employment, cost of living and income, including existing conditions and enhancement measures for these parameters;
- Effects to current and future generations: the predicted effects for regional employment, regional businesses, and regional economy; and
- The impact of changes to employment and the economy on Indigenous Interests is considered in Part C of this Report.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

In addition, the effects of all VCs including employment and economy, infrastructure and services, marine use, effects to current and future generations, are considered in the assessment of human and community well-being (section 6.8). These assessments consider linkages within the human realms and consider effects in a holistic manner. In this assessment, the EAO concluded that there would be a moderate magnitude effect on human and community well-being with effects that are both positive and adverse.

#### *5.7.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of employment and economy effects.

[30] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

Cedar noted that it reviewed information provided in the Gitxaała Nation Community Health & Socio Economic Risk Report for the Cedar LNG Project. Information provided in the report bolster's Cedar's understanding of health and socio economic conditions in the RAA.

During the EA, Kitselas, Kitsumkalum, Gitxaała, Haida, Gitga'at, Lax Kw'alaams, and Metlakatla provided comments related to employment and economy VC. These comments were considered in the assessment of effects, including the characterizations of residual effects and the specifics of the proposed provincial condition for a SEMP. The information provided is summarized above in 5.7.3. Comments included support for measures to limit the effects of workers hired on housing availability, suggestion on the geographic area referred to in the conditions, and a recommendation that Cedar participate in a regional initiative around cumulative socioeconomic effects. Indigenous nations also noted the potential for existing regional labour shortages to make it difficult for Cedar to hire workers locally and the uncertainties this created on the economic benefits predicted. Key ways in which the EAO took these comments into account included:

- Including a proposed condition that Cedar must participate in a regional social and economic management and monitoring Committee, if created by the province;
- Including within the SEMP and the proposed federal Mitigation Measures development and implementation of an accommodation policy that includes measures to ensure that accommodation for contractor construction personnel residing outside the area is exclusively within existing work camps or other temporary accommodations and does not include rental of local housing;
- Including adaptive management within the SEMP and extending the period over which it applies to decommissioning; and
- Requiring the SEMP be to the approval of the EAO and that reviewing parties (which include Indigenous nations) have at least 30 days to provide views on the plan, when Cedar consults them on the development of the plan.

The EAO also notes that Indigenous nations' views and comments on the effect of employment and economy on Indigenous nations' Indigenous Interests are discussed in Part C of this Report.

#### *5.7.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or cumulative effects on the employment and economy VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 14: Socioeconomic Management Plan; and recommended Mitigation Measures under the IAA for employment and economy, including the Follow-up Programs for infrastructure and services and GBA Plus (Appendix 1).

# 5.8 LAND AND RESOURCE USE

## 5.8.1 BACKGROUND

Land and resource use has been identified as a valued component to be assessed for Cedar LNG. This section describes the potential effects on land and resource use including the following potential effects:

- Change in private property and tenured land and resource use; and
- Change in non-tenured land and resource use.

For this assessment, tenured land use refers to an area of Crown land for which the government has granted rights to tenure holders to use the land (for example: forestry, hunting/guide outfitting, trapping). Non-tenured land use (such as outdoor recreation or hiking) does not require the granting of these rights. These are assessed as separate pathways as there are legal protections and restrictions for private land and tenured resource use that are both assessed and mitigated differently (often require permissions) than non tenured land use. The assessment also considers the potential for reduction in visual quality and subsequent effects to land users (i.e., from project infrastructure and LNG carriers). Visual quality is the extent to which the aesthetic or scenic value of a landscape is altered compared to the pre-existing or natural condition.

Land and resource use effects within federal jurisdiction including effects to the health, social or economic conditions of the Indigenous peoples of Canada, the current use of lands and resources for traditional purposes and cultural heritage are discussed in section 6.9 of this Report. Effects of Cedar LNG on Indigenous land use are also assessed in Part C this Report.

### *5.8.1.1 Regulatory Context*

There are no federal policies or regulations applicable to the assessment of land and resource use. The following provincial and municipal acts, regulations, and guidance applies to the Land Resource Use VC:

- The Land Act, manages the use of Crown land through tenures, leases, licences, permits and rights-of-way; this includes provision of authority for government to develop Strategic Land and Resource Plans;
- The Local Government Act provides the legal framework for the establishment and continuation of local government within communities; this includes provision of authority to local governments to adopt Official Community Plans;
- The Oil and Gas Activities Act (OGAA) authorizes the OGC to manage oil and gas exploration, production, and transportation activities; the OGAA and associated

regulations also define permits, rights, and obligations of oil and gas proponents. It also provides authority for specified enactments under the Land Act, Forest Act, Petroleum and Natural Gas Act, Water Sustainability Act and Environmental Management Act;

- The Water Sustainability Act is the principal law for managing the diversion and use of water resources;
- The Wildlife Act manages wildlife on public lands, including hunting and trapping31 activities;
- The Forest Act regulates the removal of timber on Crown land, including licensing permits required to clear Crown timber for oil and gas activities;
- The Liquefied Natural Gas Facility Regulation, which is a regulation under the OGAA makes provisions for noise and light control related to construction of and normal operation at an LNG facility to ensure the permit holder does not cause excessive noise or emanation of light;
- OGC Light Control Best Practices Guideline; provides recommended best practices for light control from operation associated with oil and gas facilities, including LNG facilities (OGC 2021);
- Kalum Land and Resource Management Plan (LRMP) provides guidelines and strategies for the management of land and resources in regional planning areas in British Columbia;
- Kitimat Official Community Plan Prescribes planning and development controls for building and land development within the municipal government districts (District of Kitimat 2008);
- Kitimat Municipal Code By-Law (Part 9 Planning) provides policy direction or statements with respect to the management of scenic landscape in support of recreation and tourism activities; and
- The South West Kitimat Area Plan - the District of Kitimat is creating a new local area plan for municipal lands on the west side of Douglas Channel. A Local Area Plan is an extension of the Official Community Plan applied to specific areas or issues within the municipality. The Local Area Plan process is currently not scheduled for completion.

Cedar LNG falls within the Kalum Land Resource Management Plan (LRMP) and Kalum Sustainable Resource Management Plan (SRMP), which provide guidelines and strategies for the management of land and resources within their respective planning areas. Indigenous land use plans are also relevant to Cedar LNG, including the Haisla Nation Community Plan. Refer to

[31] Commercial trapping tenures (traplines) are regulated by the Wildlife Act. A trapline allows the holder to have exclusive commercial trapping rights in a designated area. Other uses, such as logging, mining, oil and gas exploration can still occur within a trapline.

Section 6.2: Consistency with Land Use Plans of this Report, for further details on local government, provincial and Indigenous land use plans.

#### *5.8.1.2 Boundaries*

Spatial boundaries consider the geographical extent over which project activities may affect land and resource use. They are:

- The project footprint encompasses the physical footprint of onsite and offsite components (that is, the extent of planned clearing and development within the Facility Area, transmission line corridor and access roads; see Figure 17).
- The land and resource use LAA is 8,379 ha and encompasses the area where changes in access and use of lands and resources could result from the development of Cedar LNG (i.e., the Facility Area and transmission line corridor) and combines the physical extent of the combined LAAs used to assess the effects on the Acoustic, Freshwater Fish, Vegetation Resources, and Wildlife (marine terminal[32]) Valued Components where terrestrial project-related activities could conflict with land and resource use.
- The land and resource use RAA is 2,168,307 ha and encompasses the Kalum LRMP area, the communities of Terrace, Kitimat, Kitamaat Village, and other surrounding rural communities.

The period over which effects on the land and resources VC were predicted included construction, operations, and decommissioning.



[32] The wildlife marine terminal LAA is defined by a 1 km buffer around the Project Area and transmission line corridor (including access roads). See wildlife section 5.4 for more details.

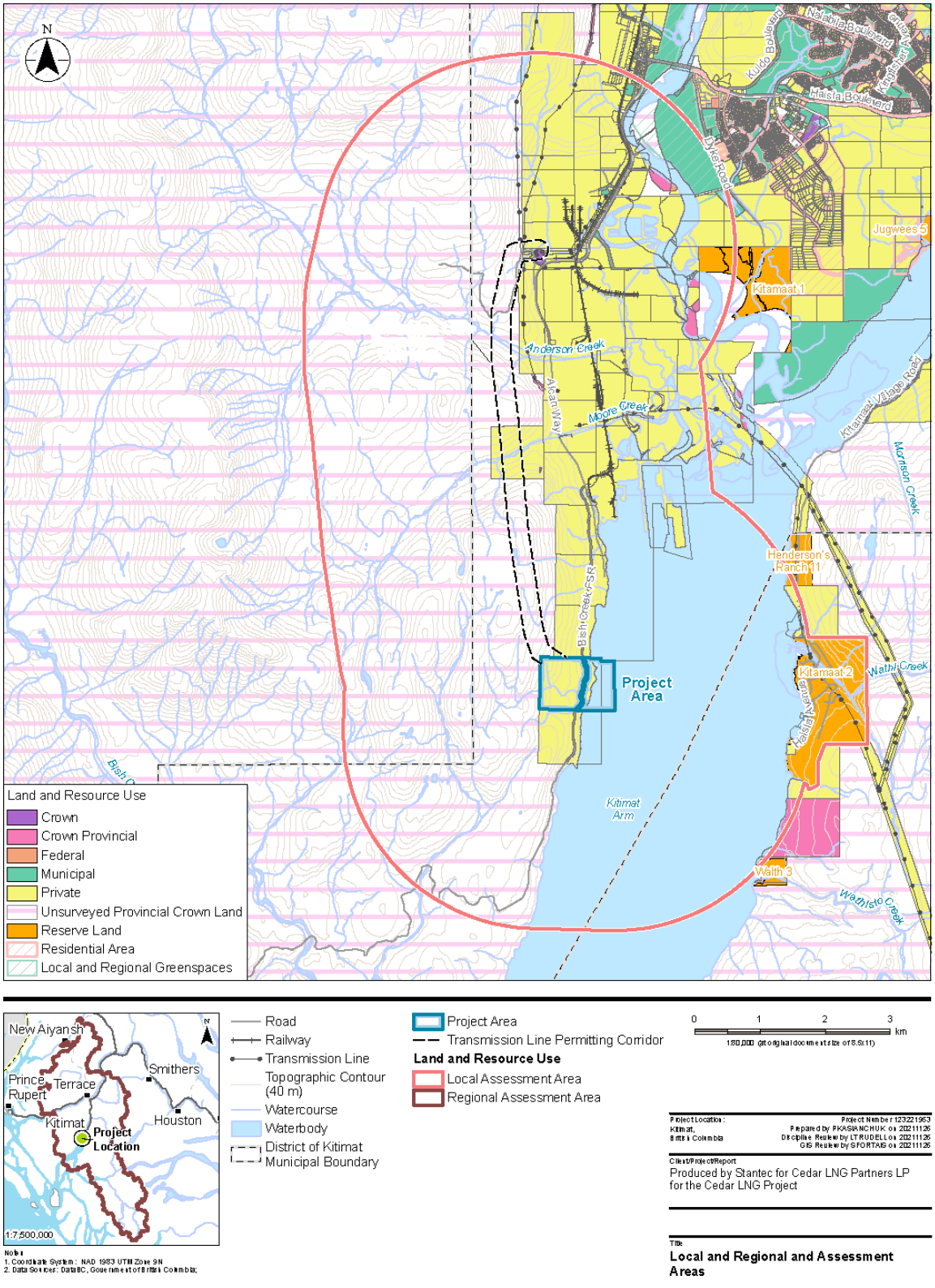


**Figure 17: Land and resource use VC local assessment area, regional assessment area and land ownership.**

## 5.8.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.8.3.

### *5.8.2.1 Existing Conditions*

Existing conditions for land and resource use was determined from primary data (such as photographs) and through secondary sources such as past research, previous studies, and other EAs. Review of traditional knowledge was also completed where applicable.

The Project is in the District of Kitimat and includes the Facility Area, transmission line corridor (approximate 8 km long transmission line corridor from the Minette Substation to the Facility Area) and access roads. The transmission line corridor crosses a mixture of private property and provincial Crown land. No federal land will be used for the Project. Table 23 below summarizes Parcel ownership within the LAA and RAA.

The Facility Area is located on private property zoned for manufacturing and the transmission line corridor is zoned for manufacturing and forestry[33]. No rezoning of land encompassed by the project footprint is required for project development.

**Table 23: Parcel Ownership in the LAA and RAA**

| Parcel Ownership Type | LAA ha (Percentage) | RAA ha (Percentage) |
|---|---|---|
| Crown | 18 (0.2%) | 8,223 (0.4%) |
| Federal | 187 (2.2%) | 2,319 (0.1%) |
| Municipal | 93 (1.1%) | 1,956 (0.1%) |
| Private | 2,217 (26.5%) | 27,461 (1.3%) |
| Un-surveyed provincial Crown Land | 5,861 (69.9%) | 2,136,508 (98.2%) |
| **Total** | **8,379** | **2,176,695** |

***TENURED LAND AND RESOURCE USE***

**Table 24: Tenured land and resource use in the LAA and RAA**

| Tenured Land Use | Project Footprint | Present in LAA | Present in RAA |
|---|---|---|---|
| Provincial parks, ecological reserves, conservancy areas, or protected area | None | None | 5 provincial parks<br>2 ecological reserves<br>3 protected areas<br>3 land blocks of the Nass Wildlife Area are located |

[33] Zoning requirements for M1 (manufacturing) and G5 (forestry) are provided under Part 9, Division 6—Industrial Zoning and Division 7—Greenbelt Zoning of the Kitimat Municipal Code.

| | | | |
|---|---|---|---|
| | | | along the northern boundary of the RAA |
| Crown Land Reserves | None | 12 Crown Land Reserves<br>9 Notations of Interest[34] (NOI) encompassing heavy industrial, gas and oil pipeline, and treaty areas | 372 additional Crown Land Reserves and NOI |
| Hunting | 1 guide/outfitter area overlaps with transmission line corridor | Two guide/outfitter areas with small percentage of their total area within the LAA | 12 licenced guide-outfitters operate in the Kalum LRMP area |
| Trapping | 1 commercial trapline overlaps with the transmission line corridor. | 5 tenure trapping areas overlap the LAA | 175 trapping tenure areas are located within the RAA |
| Oil, Gas, and Mineral Tenure | None | 3 oil and gas facility tenures<br>19 pipeline areas<br>20 well facilities (all related to LNG Canada Development Inc.)<br>1 mineral claim (196 ha)<br>1 mineral processing activity<br>1 aggregate operation/borrow pit | 1 petroleum title<br>55 pipeline areas<br>9 tenure facilities<br>22 well facilities<br>639 mineral and placer claims |
| Surface Water Licence | None | 17 surface water licences<br>17 water pipeline and conduits<br>1 water reservoir<br>18 surface water source points<br>28 new groundwater supply and monitoring wells | 265 water licences (including pending applications<br>759 surface water linear features and works<br>50 surface water source points<br>675 new groundwater wells |
| Agriculture Land Reserve | None | None | ~47,028 ha (8.5 percent) of the Kitimat Timber Supply Area in the RAA is within an Agriculture Land Reserve |
| Forestry Tenure | The project footprint is located within the Kitimat Timber Supply Area in the Coast Mountains District. | 1 timber supply area is adjacent to the LAA and 1 Tree Farm Licence (to Skeena Sawmills Ltd.) overlaps it<br>14 forest harvest authority tenures are active and pending<br>2 First Nation managed forest licence areas are in | 6 additional Tree Farm Licences<br>24 (portions)Timber Supply Areas (TSAs) and 9 free use timber permits<br>232 active forest harvest authority tenures and 15 pending<br>50 active forest notations |

[34] Notations of Interest (NOI) are administrative tools through which interests in Crown land can be established. A NOI delineates the area of interest and describes the associated use. An NOI may be used to ensure land applications are referred to a provincial agency and ensure agency involvement in planned disposition. It is not an authorization and no rights to the Crown land are conveyed by an NOI under the *Land Act*.

| | | | |
|---|---|---|---|
| | | the LAA issued to Haisla Resources General Partner Inc.<br>2 legally declared old growth management areas overlap the LAA<br>6 forest cover reserves, encompassing 27.9 ha | 5 indigenous nations managed licenced areas have been issued to Haisla Resources General Partner Inc<br>3 active managed forest licences<br>7 active woodlots<br>762 old growth management areas<br>496 non-legally defined old growth management areas |
| Forest Recreation Sites | None | None | 18 forest tenure recreation sites<br>97 forest tenure recreation trails in the Kitimat, Terrace, and Thornhill areas<br>38 active forest tenure recreation sites and recreation reserves in the vicinity of Kitimat, Rosswood, and Terrace<br>27 forest tenure special use permit areas are located within the RAA for the following uses: dryland sort, gravel pit/rock quarry, road/right-of-way, logging camp/shop/offices, industrial, waste disposal, miscellaneous land use, and miscellaneous forest use |

### *NON-TENURED LAND AND RESOURCE USE*

**Tourism and Recreation:** Existing tourism operators in the RAA include licenced guide-outfitters, licenced fishing guides, destination lodges and adventure/ecotourism/heritage and culture guiding operators. For many years, the area has drawn recreational users and tourists to engage in a variety of outdoor activities, including hiking, day-use picnicking, wildlife and nature viewing, camping, hunting, fishing, and snowmobiling.

**Recreational Values:** The project footprint overlaps five recreation feature areas with a low sensitivity rating and moderate recreational value. Twenty-seven valued recreational feature areas have been identified in the LAA (Figure 7.9.6 in the Application). Of these, 10 are given a low sensitivity rating with moderate value for recreational opportunity. Fourteen feature areas in the LAA are given a moderate sensitivity rating with moderate to high values for recreational opportunity.

**Hunting and Fishing:** The LAA encompasses two Wildlife Management Units (WMU) within Region 6–Skeena (6-3 and 6-11). The RAA encompasses an additional 13 WMU. Streams and rivers in the RAA attract anglers for its diversity of sport fish. Additionally, saltwater fishing occurs within Douglas Channel.

**Visual Landscape Quality:** The landscape character of the LAA consists of high topographic variation, varied vegetation patterns, and expansive views of water. Existing landscape disturbances include major industrial development, recent and historical forest harvesting, and varied waterfront, recreation, commercial, and community development. According to the provincial VLI, much of the southern portion of the LAA in the vicinity of the marine terminal has been identified with a visual quality objective as being Partially Retained. Seven priority viewpoints, identified as part of the LNG Canada visual quality baseline, are in the LAA. These previously defined moderate and high priority viewpoints include water-based views, community resource, and tourism and recreation resource areas. One of the high priority viewpoints is represented as a panoramic view from Kitamaat Village (See Photo 7.9.1 in Application), while another represents a view looking to the proposed FLNG facility from the shoreline along Kitimat Arm (See Photo 7.9.2 in Application). The proposed FLNG facility would likely be visible to some extent from both view locations at the mid-ground (i.e., the project components are between 1 km to 8 km from a viewpoint).

**Ambient Light:** Existing conditions for ambient light was characterized for a viewpoint looking west from Kitamaat Village to the Project Area. There are no current industrial, commercial, or residential light emitting uses in the Project Area. The closest residential houses are approximately 3 km east of the project footprint, across Kitimat Arm, in Kitamaat Village (Kitamaat 2). The ambient lighting conditions elsewhere in the LAA range from rural to urban, with Kitimat and the LNG Canada site to the north characterized as suburban/ urban, and surrounding areas as rural or natural. The Project Area is likely characteristic of a rural zone, with some sky glow filtering over from the nearby Rio Tinto aluminum smelter and future LNG Canada facility.

#### *5.8.2.2 Potential Project Effects*

***CHANGE IN PRIVATE PROPERTY AND TENURED LAND AND RESOURCE USE;***

The Facility Area is on private property held by Haisla Nation, which was acquired for the purpose of developing energy export projects. Hence, there would be limited direct effects to private property and tenured land and resource use from the development of the FLNG and associated infrastructure.

Clearing of the transmission line right-of-way and construction of the transmission line will disturb 34.6 ha of land. Construction of the transmission line may also require constructing temporary access roads between the Bish Creek Forest Service Road or Alcan Way and the right-of-way by upgrading existing resource roads and constructing new access. This will occur

on both private property and Crown land. The proposed transmission line corridor crosses 6.9 ha of private land composed of four parcels. Two of these parcels are held by Cedar through Haisla Enterprises Ltd.; the other two are owned by Rio Tinto and Kitimat LNG. Cedar intends to enter into commercial agreements for use of the private land in advance of construction of the transmission line corridor and associated access roads.

The direct residual effect for private property and tenured land use during construction and operation is limited to the project footprint and LAA. The Project is not expected to affect parks, ecological reserves, conservancy areas, protected areas, agricultural land reserves or forest recreation sites because there are none in the LAA.

The Project footprint overlaps one guiding/outfitting area and one trapline area. Cedar will continue to engage with the guide outfitters within the LAA as part of ongoing consultation and engagement to discuss mitigation measures to reduce potential project effects. Cedar identifies that a small area (0.7 percent) of one guide/outfitter area would be affected by the Project during construction. Other mitigation measures will address effects on wildlife (See Section 5.4: Wildlife of this Report). The Project footprint will overlap only a small proportion (0.8 percent) of one trapline area and Cedar states that Project effects will be mitigated through implementation of the BC Registered Trapper and Petroleum Industry Agreement on Notification and Compensation (2006).

The proposed transmission line corridor crosses 7 ha of two Crown tenure areas, one for a temporary licence (miscellaneous) and a second for an electric powerline. Land clearing for the Project will remove a portion of forest cover from the land base, totalling approximately 48 ha (i.e., the marine terminal area, and transmission line corridor). This area is outside the Tree Farm Licence in the LAA. Water licences, oil and gas tenures, and mineral tenures would not be affected by the Project.

Indirect effects on private property and tenured lands may also result from Cedar LNG. Increased transportation within the LAA will result in higher traffic volumes and increased access to private lands. Increases in noise, light emissions, and visual quality are all potential effects within the LAA. There is potential for increased vehicle traffic in tenured land use areas which may reduce wildlife harvesting success and may also reduce the quality and quantity of wildlife resources in the area (i.e., through increased access and pressure to wildlife). Pressures on guides, outfitters and trappers are also possible because of increased accessed to resources. Vandalism and other nuisances are possible as a result of increased access. Acoustic effects are assessed in more detail in Section 5.2: Acoustics of this Report.

### *CHANGE IN NON-TENURED LAND AND RESOURCE USE*

With respect to non-tenured land and resource use, the Project footprint overlaps five recreation feature areas that have been classified with a low sensitivity rating and medium recreational value. Clearing of the Project Area and transmission line corridor right-of-way will

introduce new human alterations to the landscape. However, land disturbance from clearing of the Facility Area and transmission line corridor is a small portion of the LAA (0.5 percent), therefore, Cedar identified that potential effects on recreational feature areas in the LAA are anticipated to be low, even for those of moderate importance and vulnerability.

In addition, the assessment of change to non-tenured land and resource use considered how project activities and physical works may affect the viability of, restrict access to, or cause loss of area used for, recreation. Access changes will occur due to clearing and construction activities. This may alter the ability to use lands for recreational use within the Project footprint. There is also the potential for the transmission line corridor to be used for recreational activities such as snowmobiles and ATVs. The proposed changes may disrupt recreational enjoyment of hikers, boaters, and other recreational users due to disturbance (such as noise, visual/light). Decommissioning activities may also disrupt or intrude on recreation activities but may ultimately restore access. The effect of the alterations will result in a change in the existing visual character and quality for one or more viewpoints (i.e., from Kitamaat Village and Kitimat Arm). The FLNG facility and marine terminal will be well illuminated, which is typical of industrial sites to allow for safe construction. The presence of construction vehicles and the use of light equipment for nighttime work may result in light impacts. Project lighting may result in emanating light effects including light spill (trespass), glare, and sky glow. Increased population from the work force may increase competition for outdoor recreational resources which may also affect the quality of the recreation experiences being sought.

#### *POSITIVE EFFECTS*

No positive effects from the Project on the land and resource use VC were identified.

#### *5.8.2.3 Mitigation Measures Proposed in the Application*

The list below summarizes the mitigation measures proposed by Cedar for the assessment of land and resource use:

- Engage and notify property owners of location and timing of project activities;
- Negotiate agreements for use of private property;
- Engage and notify non tenured holders of location and timing of project activities;
- Notify non-tenured holders and solicit feedback on potential issues and concerns;
- Compensate registered trappers as per provincial agreements on notification and compensation;
- Delineate clearing boundaries;
- Reclaim private property following requirements of the lease agreements with the owners;
- Allow for natural re-vegetation or active reclamation on temporary workspaces on Crown land;
- Use existing access roads, trails, and rights of way when possible;

- Access control measures, where permissible, will be used along the cleared transmission line corridor across Crown land to restrict public vehicle access;
- Work with the OGC, the Ministry of Forests, and the road permit holder to implement traffic safety measures at the project intersection with Bish Creek Forest Service Road;
- Post warning signs to discourage public access and use along the transmission line corridor;
- Post private property signage on fencing around the Project area;
- High disturbance project related construction activities will be limited to daytime hours and if nighttime construction is required, Cedar will seek the necessary permits;
- Implement standard measures to reduce dust and noise levels;
- Enforce no hunting and fishing policies for non-resident workforce personnel during off-time hours in the LAA;
- Prohibit recreational use of ATVs by employees on site, on access roads, trails and along rights of ways;
- Clearing will be kept to the minimum required and a buffer will be maintained around the site and along the transmission line right of way;
- Project lighting designs will be consistent with OGC's Light Control Best Practices Guideline (OGC, 2021) and will consider directional or shielded lighting to reduce vertical or horizontal distribution of light;
- Use adaptive control and variable lighting regimes (such as timers, dimmers, motion sensors).

### 5.8.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

During review of the Application by the Working Group, Haida Nation suggested that information from the air quality VC assessment should also be integrated into the assessment of land and resource use due to the inherent intersections. Cedar acknowledged the suggestion but noted that a linkage to the land and resource use VC was not identified in the AIR. The EAO notes that issues raised related to Indigenous land, including the impacts of air quality effects on land use are discussed in Part C of this Report.

### 5.8.4 THE EAO'S ANALYSIS AND CONCLUSIONS

This section presents the EAO's conclusions on the potential adverse residual effects from Cedar LNG from project activities to the land and resource use VC.

#### *5.8.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[35], the EAO proposes the following provincial conditions.

- Construction Environmental Management Plan (CEMP) (Condition 9), including air quality management measures;
- Community feedback process (Condition 11, as proposed in Section 5.1: Air Quality) to receive, address, and report on community concerns from the Project, which would include the following:
  - Establish and maintain communication methods where the public may submit comments or questions to Cedar, including a dedicated Project website and a telephone line;
  - Engage and notify private property owners and non-tenured land users of project activity timing and location; and
  - Report on comments received and Cedar's follow-up actions, mitigations or resolutions applied.
- A condition within the proposed SEMP (Condition 14) requiring Cedar to develop and implement a program to restrict non-Local contractor workforce personnel from engaging in recreational hunting, fishing or ATV or snowmobile use during off-work hours.

The EAO notes that if the Project receives an EAC and moves to provincial permitting, a detailed light control plan would be required by the LNG Facility Permit process based on the Light Control Best Practices Guideline. Lighting for the Project would need be designed in a manner consistent with the OGC's Light Control Best Practices Guideline. Noise due to the Project would also need to meet noise guidelines under the OGC LNG Facility Permit Application. Cedar would also be required to adhere to any cutting permits or authorized agreements for clearing activities. Permit holders must also submit a Security Management Plan outlining a systematic approach for maintaining the facility's fence line and marine safety zone around the LNG facility. The Security Management Plan should cover all areas under the control of the permit holder including onshore, foreshore property and water lots. The OGC further specified that in accordance with section 10 of the LNGFR, the permit holder must display signage at the facility. The purpose of this requirement is to provide basic facility information to the general public that may be of interest, or useful in the event of an emergency, or a complaint. Signs must include details such as the name of the LNG permit holder; emergency notification information, a legal description of the site, and if the facility handles flammable gas.

The EAO recommends the following Mitigation Measure under IAA for the land and resource

[35] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

use VC:

- Develop and implement a program to restrict non-local contractor workforce personnel from engaging in recreational hunting, fishing or ATV or snowmobile use during off-work hours in the LAA for land and resource use, as defined in section 7.9 of the Application.

#### *5.8.4.2 Residual Effects*

After considering the mitigation measures, the EAO predicts that Cedar LNG would result in residual effects to the land and resource use VC from the following residual effects:

- Change in private property and tenured land and resource use; and
- Change in non-tenured land and resource use.

Potential residual effects within federal jurisdiction related to land and resource use, including effects to the health, social or economic conditions of the indigenous peoples of Canada and current use of lands and resources for traditional purposes and cultural heritage are discussed in section 6.9 of this Report.

**Table 25: Characterization of residual effects for the land and resource use VC**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Moderate | The Facility Area and marine terminal LAA have been disturbed by forestry, mining, infrastructure, and LNG developments. This includes an existing access road (i.e., Bish Creek FSR) that has been upgraded and industrial resource development in Kitimat (i.e., Rio Tinto Alcan aluminum smelter and LNG Canada). Land and resource use has moderate resilience due to the availability of alternative land areas for hunting, outfitting, and trapping activities, resource use, and recreation. |
| Direction and Magnitude | Adverse and Low (private and tenured land use), and Moderate (visual/lighting) | For both private property and tenured land use and non-tenured land use, there will be low magnitude changes as a result of all Project activities. The Facility Area is located on private property and there are no current industrial, commercial, or residential uses in the area. Within the LAA, there are small overlaps with both private and tenured lands; however, Cedar would require approval to build on these lands. While there are various land uses in the RAA, the residual effect to private property and tenured land use during construction and operation is limited to the Project footprint and LAA. The Project footprint overlaps a small proportion of a guiding/outfitting area (0.7 percent) and a trapline area (0.8 percent) and Cedar would engage with these tenure holders to mitigate effects.<br><br>From a visual and lighting perspective, effects are predicted to be moderate due to the Project being visible from viewpoints at Kitamaat Village as well as from Kitimat Arm and Bish Creek FSR. However, effects are not predicted to be high because the Project will not be visually dominant due to distance and vegetative buffer (i.e., around the Facility Area perimeter and along the transmission line right-of- |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | way). The Project will increase the amount of industrialized landscape within the LAA but will not change the overall visual character in the LAA, which has already been altered by waterfront developments (such as LNG Canada). Acoustic effects are considered low, as described in Section 5.2: Acoustics of this Report. |
| Extent | Local | Residual effects are expected to be confined to the LAA which includes Kitamaat 1 and 2 Reserve Land, Private Property, Unsurveyed Crown Land, Provincial Crown Land, and Municipal Land. |
| Duration | Long-term | Construction residual effects such as access to and availability of recreational areas and limited increased demand for outdoor recreation within the LAA, will be long term and will continue in all Project phases. However, operational effects such as visual effects, lighting, and noise disturbance impacts on tenured and non-tenured land use are expected until decommissioning is complete. |
| Reversibility | Reversible | Effects on land and resource use are considered reversible upon decommissioning. |
| Frequency | Continuous | Residual effects associated with noise, light and disruption to resources are expected to be continuous as a result of changes to access and the continual use of equipment and installation of lighting infrastructure. |
| Risk (likelihood and consequences) | Low | Likelihood: high likelihood of effects based on the known impact of visual, lighting and noise disturbance and known project footprint spatial distribution of land uses.<br>Consequence: minor consequence based on the low to moderate magnitude within the LAA.<br>Risk: based on the high likelihood and minor consequence of residual effects to land and resource use it was determined that there would be a low level of risk. |
| Uncertainty | Low | Uncertainty is low based on a good understanding of effects on land and resource use of the Project. |
| Significance | In consideration of the above analysis, EAO concludes that the Project would not have significant adverse residual effects on the land and resource use VC. Residual effects would be localized, and upon the completion of all Project phases, the residual effects are reversible. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.8.4.3 Cumulative Effects Assessment*

Based on input provided by Indigenous nations, regulators, and community members, as well as current understanding of the conceptual project design, Cedar identified past, in progress, and reasonably foreseeable future projects and physical works that could have potential cumulative effects on land and resource use. These projects include:

- Former Eurocan Pulp and Paper Mill;
- Former Mon Bay Marina;

- Coastal GasLink Pipeline (TransCanada Corp);
- LNG Canada Export Terminal;
- LNG Canada Load Interconnection Project (BC Hydro);
- MK Bay Marina;
- Northwest Transmission Line;
- Pacific Northern Gas Pipeline;
- Rio Tinto Aluminum Smelter;
- Rio Tinto Terminal A Extension; and
- Various Forestry activities.

Project activity or physical works that will not interact spatially or temporally were not identified in the list above. As not all reasonably foreseeable projects and physical activities may proceed, the cumulative effects assessment is considered conservative.

The construction and operation of LNG projects and associated natural gas pipelines and transmission lines are expected to have the largest cumulative effect on land and resource use (including visual quality) within the RAA due to land clearing activities and implementation of access restrictions. In addition to the Project, there is one LNG project in the RAA in pre-development review: Skeena LNG. A second project, LNG Canada Export Terminal, by far the largest facility in the RAA, is currently under construction. No development details are available for the Skeena LNG proposed facility.

**Change in Private Property and Tenure Land Use**

Four private property parcels are overlapped by the Project Area and transmission line right-of-way, two of which are owned by Haisla Enterprises Ltd. and were purchased by Haisla Nation for the purpose of developing an energy export project. Cedar will continue to engage with the other private property owners within the LAA. The Project will otherwise not affect use or access to other private property within the RAA. Cumulative effects on forestry could occur from land clearing for the future projects. However, the Project will not affect TSA land and timber and will have no contribution to cumulative effects on forestry. Future projects may affect TSA land and resources and contribute to a cumulative effect. Mitigation measures proposed by proponents of other projects will the reduce the potential for cumulative effects on forestry within the RAA. With mitigation, the Project's contribution to cumulative effects on property and tenured land use will be negligible to low in magnitude, extend to the RAA, medium-term in duration, continuous in frequency, and reversible. The cumulative effects with the Project for change in property and tenured land use, including visual quality/light, is considered negligible to low magnitude (low to moderate for visual quality/light), medium-term in duration, continuous in frequency, and reversible.

**Change in Non-Tenured Land Use**

For non-tenured land use effects (such as recreation or fishing), outdoor recreational users (such as hiking or snowmobiling), hunters, and anglers (freshwater) are currently affected by changes in access and availability of lands (from which to conduct these uses) due to past and present physical activities and resource use. The construction and operation of reasonably foreseeable projects could further affect access to and availability of lands within the RAA from which these activities can occur. Land clearing and facility and infrastructure construction can contribute to changes in non-tenured land uses, including visual quality/light effects within the RAA. Project residual effects will contribute to cumulative changes in non-tenured land use within the LAA. The Project's contribution to cumulative effects within the RAA includes residual effects on recreational use, hunting, and fishing. The Project changes 48 ha of unsurveyed provincial Crown land within the RAA, representing less than 0.1% of the land base within the RAA. Other projects will affect the availability of lands for non-tenured land uses in a similar fashion, but only represent a small fraction of lands available for recreational use within the RAA. The cumulative effects case includes Rio Tinto Alcan, the development of multiple LNG projects, and associated pipeline and transmission lines. The Kitimat harbour waterfront, while already substantively industrialized, has the potential to support further development. The cumulative effects on visual quality would likely become more widespread in these specific areas. Proponents of other LNG projects are likely to use similar mitigation measures to address visual quality/light effects. Concentration of projects within certain areas could result in a higher likelihood of effects related to facility lighting, particularly with sky glow. With mitigation, the Project's contribution to cumulative effects on non-tenured land use will be low in magnitude (low to moderate for visual quality/light), extend to the RAA, medium-term in duration, continuous in frequency, and reversible.

#### *5.8.4.4 Interactions between Effects*

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including
    - iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the Act (2018)[36] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects on land and resources are described above in section 5.8.4.2.

The land and resource use VC assessment was linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

[36] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

- Acoustic - project-related activities may result in disturbance and nuisance effects to land and resource users;
- Vegetation resource - construction activities will remove or alter vegetation communities supporting vegetation-based resource activities (such as gathering of firewood);
- Wildlife - project-related activities may result in changes in use of wildlife resources (for example: hunting, guide outfitting, trapping on the land base);
- Infrastructure and Services - the Project will alter community infrastructure and services with the use of community recreational resources and therefore, infrastructure and services (section 7.11 of Application) considered information on outdoor recreation sites and trails provided in the Land and Resource Use section;
- Heritage resources - construction activities may alter heritage resources where archeological sites are identified where ground disturbance or clearing may occur;
- Land use plans - section 6.2 describes how the Project is consistent with relevant land-use plans of the government or an Indigenous nation; and
- The impact of the Project on Indigenous land and resource use is considered in Part C and Section 6.9: Requirements of the *Impact Assessment Act* of this Report.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

In addition, the EAO notes that the effects of all biophysical VCs including wildlife and vegetation resources is considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6). This assessment considers linkages within the biophysical realm and considers effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function.

#### *5.8.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of effects on land and resource use.

In the Application, Cedar described that Traditional knowledge and traditional use information was gathered from the assessment of project effects on Indigenous nations' interests, and it was informed by engagement with the Indigenous nations. A more detailed review of the Indigenous Interests with respect to the Project identified by Indigenous nations is provided in sections 11 and 19 of the Application. Some examples of Indigenous Interests were related to harvest and consumption of traditional foods, socio-economic conditions and the cultural well being of Indigenous peoples.

Indigenous nation engagement contributed to the understanding of existing land and resource uses in the area, informed baseline conditions, and supported the scope of issues assessed (for

example, increases in resource users and increased commercial fishing and logging in the area due to increases in population).

During the EA, Haida Nation provided comments on the assessment of Land Resources and Use. The information provided is summarized above in 5.8.3. Indigenous nations did not provide comments on residual effects ratings or proposed mitigation measures related to this VC.

#### *5.8.4.6 Conclusions*

The EAO is satisfied that Cedar LNG will not have significant adverse residual or significant cumulative effects on the land and resource use VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 9: CEMP, Condition 11: community feedback process, Condition 14: SEMP; and recommended Mitigation Measures under the IAA for acoustics (Appendix 1).

# 5.9 MARINE USE

## 5.9.1 BACKGROUND

This section assesses the potential effects Cedar LNG would have on the marine use VC, including the following potential effects:

- Changes in marine navigation;
- Changes in marine fisheries, including:
  - Commercial, recreational and Indigenous fisheries (CRI); and
  - Aquaculture;
- Effects to other uses, including:
  - Recreation and tourism; and
  - Aesthetic conditions.

Marine use effects within federal jurisdiction are discussed in section 6.9 of this Report, including: effects to the health, social or economic conditions of the Indigenous peoples of Canada; and the current use of lands and resources for traditional purposes and cultural heritage.

### *5.9.1.1 Regulatory Context*

The Application considered the following federal legislation and regulations to assess marine use:

- *Canadian Navigable Waters Act;*
- *Canada Shipping Act,* 2001;
- *Pilotage Act;* and
- *Fisheries Act.*

The following marine planning information, initiatives and plans were also used to inform the assessment on marine use:

- Marine Plan Partnership (MaPP) for the North Pacific Coast Marine Plans (such as Haida Gwaii Marine Plan, North Coast Marine Plan, Central Coast Marine Plan) and associated resources;
- Pacific North Coast Integrate Management Area Plan (PNCIMA)[37];
- Draft North Coast Waterway Management Guidelines; and

[37] The PCINMA area extends from the British Columbia-Alaska border south to Bute Inlet on the mainland, across to Campbell River on the east side of Vancouver Island and the Brooks Peninsula on the west side of Vancouver Island and along the edge of the continental shelf.

- Indigenous Nation Marine Plans: Haisla Community Marine Use Plan 2014, Gitga'at Marine Use Plan 2018, Kitsumkalum Marine Use Plan 2014 and Metlakatla Draft Marine Use Plan 2014.

Further details on land use plans, including these marine plans, are described in section 6.2 of this Report, and further details on the marine regulatory framework (including relevant international conventions, federal and provincial legislation) are provided in section 3.1 of this Report.

#### *5.9.1.2 Boundaries*

***SPATIAL AND TEMPORAL BOUNDARIES***

The LAA and RAA spatial boundaries for the marine use assessment are shown in Figure 18 and Figure 19 and are as follows:

- LAA: includes both water surrounding the marine terminal and confined channels along the Marine Shipping Route and waters extending 6 km on both sides of the Marine Shipping Route between Browning Entrance and the Triple Island Pilot Boarding Station. The LAA consists of the water area where Project marine activities have the greatest potential to adversely affect navigation, fisheries and other uses.
- RAA: includes the LAA and an additional 5 km buffer on either side (stopping where it reaches land).

The temporal boundaries of the assessment are the period over which effects on the marine use VC were evaluated. Cedar considered effects to marine resources during construction, operations, and decommissioning.

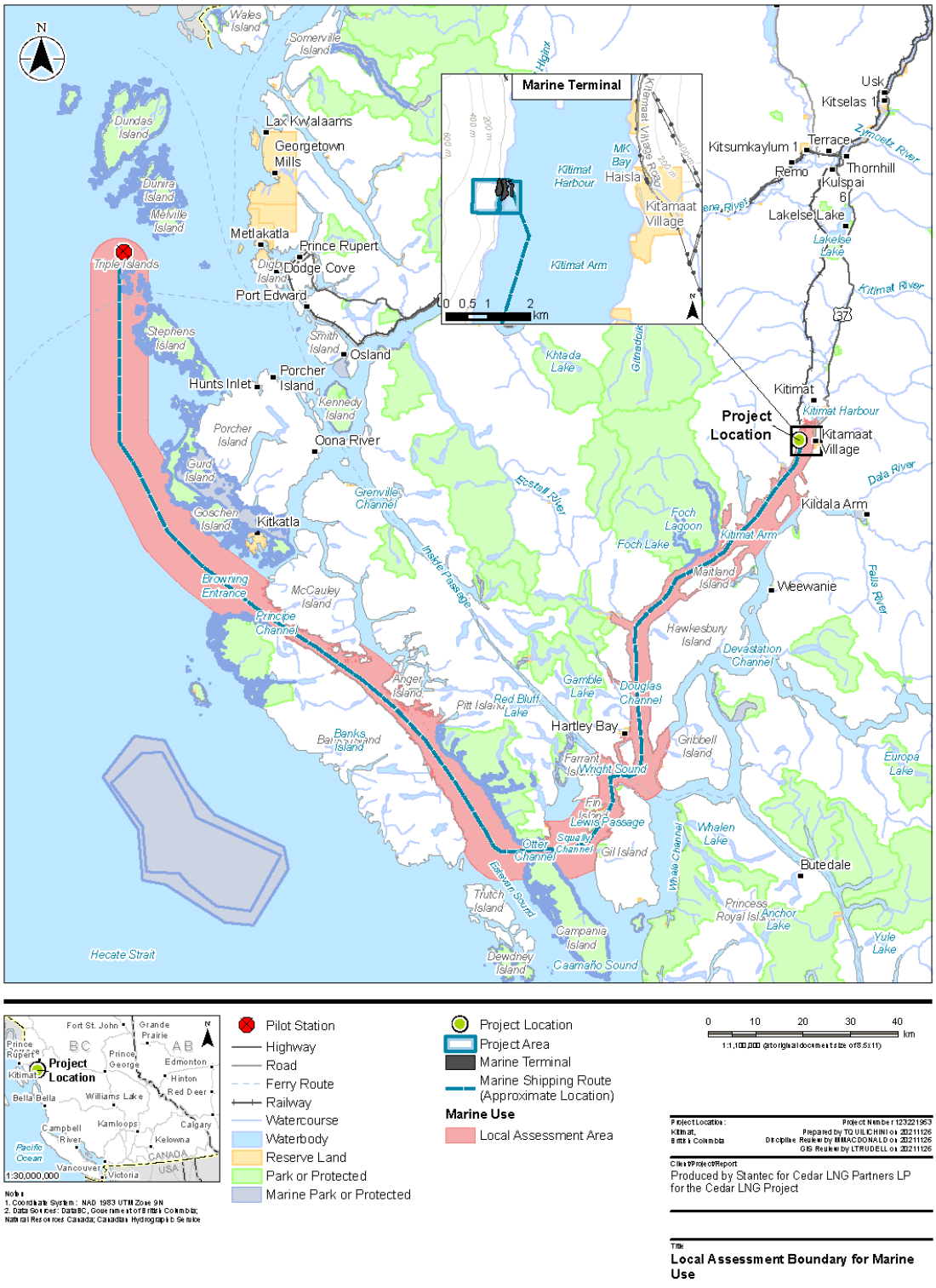


**Figure 18. Local Assessment Area (LAA) for the Marine Use VC.**

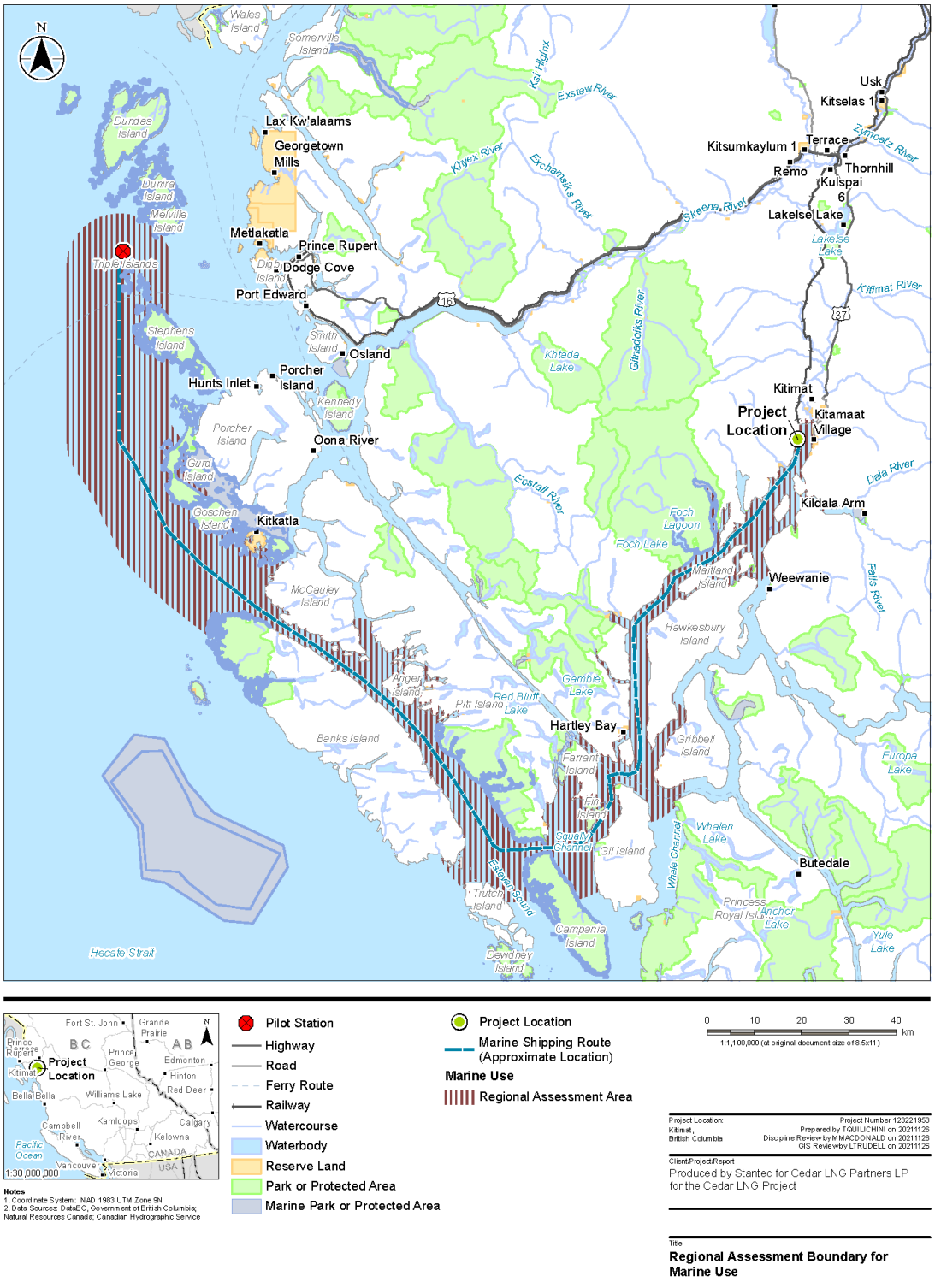


**Figure 19. RAA for the marine use VC.**

## 5.9.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.9.3.

### *5.9.2.1 Existing Conditions*

Cedar characterized existing marine use conditions from plans, reports, studies, applicable federal and provincial data (such as shipping, marine fisheries, spatial marine-based recreation and tourism data), assessments, both Indigenous Knowledge and traditional use in the area.

### *5.9.2.2 Marine Navigation*

The Cedar LNG marine terminal would be located within the port of Kitimat in the Douglas Channel. The port of Kitimat is a private industrial port that accommodates large vessel traffic intended for international markets. From 2016 to 2020, an average of 57 piloted vessels visited the port annually.

Cedar estimated peak small vessel[38](such as tugs, barges, commercial fishing vessels, pleasure craft, sailboats or government vessels) traffic levels in Kitimat Arm, using footage from a camera located at the Kitamaat Village Shore Station, from dawn to dusk, from July 15 to August 15 in both 2019 and 2020. The total number of vessel movements observed during these periods were 1,255 and 1,108 in 2019 and 2020, respectively, and included motorized boats (such as commercial shipping vessels, tugboats and barges, fishing, recreational, sailboats), non-motorized boats (such as canoes or kayaks), and government vessels operated by the military, DFO or Canadian Coast Guard.

Outside of the Douglas Channel, the Marine Shipping Route intersects with cruise ships and ferries. Cruise ships are infrequent in the RAA with a maximum of 60 ships expected in the RAA annually. BC Ferries and the Alaska Marine Highway System (AMHS) are the two ferry service providers which operate in the LAA and RAA areas. BC Ferries' Routes 10 and 11 intersect the Marine Shipping Route and are estimated to make the crossing approximately 284 times annually. One of the AMHS' mainline routes also traverses the Marine Shipping Route and performs the crossing around 119 times per year.

### *5.9.2.3 Marine Fisheries*

**Commercial and Recreational Fisheries**

The RAA overlaps with the following Pacific Fisheries Management Areas (PFMAs)[39]: 4, 5, 6, 104, and 105. The area where the RAA overlaps PFMA 104 is a large open water section of the

[38] Small vessels are defined as vessels that are not required to be fitted with AIS systems, though some may choose to be fitted with Class B AIS systems for safety reasons.

[39] PFMAs are managed by DFO utilizing spatially defined management areas

PFMA; Cedar reported that no known fishing activity occurs within, and therefore, Cedar did not evaluate fisheries data for PFMA 104.

Commercial fisheries generally take place year-round, with varying opening/closure times from year to year and are managed by DFO. Fisheries within the PNCIMA comprise roughly half of BC's total wild commercial fish harvest by value. Ten major commercial fisheries are found in PFMAs 4, 5, and 6 including those targeting various species of salmon, groundfish, small pelagics (such as herring), and invertebrates.

Recreational fisheries occur throughout the RAA, concentrated in Kitimat Arm and are regulated by DFO. The primary species associated with recreational fishers include salmon and groundfish. Recreational invertebrate fisheries include crab, prawn, and shrimp. Recreational fishing in PFMA 4, 5, and 6 peaks in July and August, with the highest number of catches reported in PFMA 4. Recreational fishing methods used include angling (from boat and from shore), beach digging or hand picking, diving, and shellfish trapping (from boat and from shore or dock).

**Indigenous Fisheries**

Cedar engaged with Indigenous nations and reviewed existing studies as well as publicly available sources to inform its understanding of the baseline conditions of Indigenous fisheries, their marine use and the scope of the assessment. Indigenous Nation Marine Plans and MaPP plans provided background and interpretation of marine use priorities for Indigenous nations along the shipping route. While plans largely outline frameworks related to ecosystem-based and marine resources management, they also highlight Indigenous values, needs, knowledge and use, as well as concerns. The plans additionally provide an overview of jurisdiction, resource management, economic development, and marine uses.

The Facility Area of Cedar LNG is located within Haisla Nation's traditional territory. In addition, the traditional territories of the following Indigenous nations are intersected by or in proximity to the Marine Shipping Route: Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, and Haida. Additionally, the Application notes that families from Métis Nation British Columbia hold specific harvesting areas that have been used by generations in the Cedar LNG area and actively harvest culturally important fish species (for example: salmon, herring, oolichan, rockfish, trout and char). For a complete list of species harvested and further details on Indigenous Fisheries, refer to the Indigenous Fisheries section of the Application. For further details on effects to marine use including Indigenous fisheries, refer to Part C and section 6.9 of this Report.

**Aquaculture**

The Application noted that currently no finfish aquaculture is located within the LAA. Instead, individuals and organizations with an aquaculture interest are expanding shellfish and marine plant aquaculture.

#### 5.9.2.4 Other Uses

**Recreation and Tourism**

Marine recreational activities and use that occur in the LAA and RAA take place year-round, with a concentration in summer months, include recreational boating, sea kayaking, coastal camping, diving, and wildlife viewing. Marine users may access recreational sites (marine-accessible parks and camping areas) by passing through Cedar LNG's Marine Shipping Route. Recreational routes for boating, pleasure craft cruising routes, and sea kayaking all overlap with the LAA and RAA where Wright Sound is identified as the location with the greatest potential for Cedar LNG traffic and recreational vessels interaction.

Key attractions of marine eco-tourism in the region are comprised of marine fishing, wildlife viewing tours, hot spring tours and experiencing the outdoors. Tourism peaks during July to September. While eco-tourism businesses primarily operate out of Kitimat, some are located in other geographic areas (such as Prince Rupert, Victoria, and Vancouver). Indigenous nations have also been combining aspects of eco-tourism with cultural tourism. For example, Gitga'at, Lax Kw'alaams, and Metlakatla have established a culturally based eco-tourism operation and there is potential for more growth for other communities.

**Aesthetic Conditions**

The North Coast Land and Resource Management Plan identifies Visual Management Areas along the North Coast where the overall emphasis of these areas is to maintain the quality of viewscapes to support recreation, tourism, cultural (Indigenous nations), and quality of life values. Three areas with scenic resource value were identified in the LAA: the Outside Passage, Gil Island, and Douglas Channel area.

A visual quality assessment was completed for the Marine Shipping Route for a previous project (LNG Canada) using 17 priority viewpoints along the route. Measurable parameters to assess the visual effect of transiting large marine vessels in priority viewpoints included vessel frequency, duration, and prominence. Existing conditions were characterized as having limited human disturbance and noted varied marine traffic. Further, Cedar expects that most of the shipping route will be intrinsically dark at night and in areas along the route where residential communities or industrial activities are present, ambient light levels are assumed to range from rural to urban (low to high brightness).

#### 5.9.2.5 Potential Project Effects

The Application predicted potential effects to changes in marine navigation and marine fisheries and other uses. Details of these potential effects are described below.

#### 5.9.2.6 Change in Marine Navigation

Marine navigation may be affected by the construction, presence, operation and decommissioning of the FLNG Facility (including the safety zone); as well as construction and LNG vessel traffic in the Marine Shipping Route.

Construction of the FLNG Facility including marine infrastructure and pile installation may affect marine activities in the LAA. Cedar anticipates effects to be minimal as the affected area is small

and near a pre-existing industrial port and users are expected to be able to continue activities at current levels; with the exception of the 500-m buffer or safety zone around marine infrastructure, which marine users would be discouraged from entering. The FLNG Facility would be new in-water infrastructure which would extend approximately 165 m into the channel and have the potential to impact marine navigation. The marine terminal will occupy approximately 5.5 percent of the channel width at the head of Kitimat Arm and 16.6 percent with the inclusion of the safety zone.

Regarding vessel traffic, the number of barge and Project-related vessel movements could be in the range of two movements per week (up to eight per month) during construction. During operations, the Application noted that up to 50 LNG carriers will travel along Cedar LNG's Marine Shipping Route annually from the Triple Island Pilot Boarding Station to the FLNG Facility resulting in an approximate 87.7 percent annual increase in piloted vessel visits to the head of Kitimat Arm, compared to the overall average from 2016 to 2020. These estimates do not include vessel traffic attributed to the LNG Canada project. At full build-out, up to 350 LNG Canada carrier transits could take place annually. Including LNG Canada, Cedar would contribute approximately 8% of projected vessels travelling to Kitimat annually (50/605 vessels).

The Application indicates that as Cedar LNG would result in new marine infrastructure and an increase in marine shipping traffic, a change in marine navigation will occur within the LAA but expects that marine navigation will safely continue at currently levels. As such, Cedar expects effects on marine navigation from marine shipping will affect a small proportion of navigable waters and not result in interference with the navigational passage of other vessels during all Project phases.

#### *5.9.2.7 Change in Marine Fisheries*

Due to an increase in vessel traffic and type along the shipping route, marine fisheries may be affected as a result of reduced fishing opportunities or access to fishing areas. The Application noted that Cedar LNG will require 50 LNG carrier trips a year in support of operation. As a result, there is potential that an increase in shipping traffic may interfere with fishing related vessels in or along the marine route which could result in lost fish time due to gear related issues (such as when gear needs to be pulled in/reset, becomes lost or entangled). Further, an increase in vessel traffic and type may affect the practicality of accessibility and effort to sites.

It is expected that Cedar LNG will increase large vessel movements within the LAA by 15.7 percent annually. Marine shipping vessels have the potential to interfere with fishing vessels that meet two conditions (overlap with the shipping route and when gear type/technique enables an interaction with marine shipping vessels); it is expected that marine shipping will overlap spatially and temporally with the commercial Indigenous and recreational salmon and groundfish fishing activities.

To quantify the potential impact to salmon and groundwater fisheries, Cedar assessed the disturbance to fisheries, which reflects the spatial and temporal overlap of fisheries areas with marine shipping impacts. The LAA and RAA were assessed together for salmon fishing and the potential average loss for commercial and Indigenous fisheries would be low; resulting in a disturbance of approximately 0.02 – 0.09 percent, based on area and the speed of the LNG carrier, but is not expected to affect the viability of salmon fishing operations. The potential average annual loss for commercial or Indigenous groundfish fisheries would be low, resulting in disturbance of approximately 0.02 – 0.06 percent dependent upon LNG carrier speed. Recreational fishing for both salmon and groundfish is not expected to interact with marine shipping traffic as small craft used in sportfishing are easily maneuverable.

Exposed shoreline harvesting sites may be affected by an increase in marine shipping traffic due to a potential increase in wave wakes. Interactions would mainly occur at low tide when harvestable shellfish are accessible. Cedar states it would follow the appropriate vessel speed and position parameters to minimize wash and wake effects when fishing, harvesting or recreational activities are occurring. The Application noted that as the Project's LNG carriers will be relatively infrequent (one return trip every 7 to 10 days) and because the wake waves will be within the range of naturally generated waves (due to the reduced speeds of the LNG carriers), there is a small probability that shoreline harvesters will be affected by project-related shipping traffic. As a result, Cedar does not anticipate that Project-related shipping traffic will introduce any new, previously unassessed wave effects.

#### *5.9.2.8 Other Uses*

An increase in vessel traffic and type, change in noise and light levels associated with construction activities, marine vessel traffic during operation and decommissioning activities (i.e., decommissioning infrastructure, marine transport of decommissioned infrastructure) may affect tourism, recreation and tourism activities.

**Recreation and Tourism**

Marine recreational and tourism sites are located throughout the LAA and RAA, but most activities do not occur along the Marine Shipping Route. An increase in vessel traffic and type may affect marine recreation and tourism activities if marine users choose not to access a recreation or tourism site due to frequent marine shipping traffic making access or effort impractical. With one large carrier in transit every 7 to 10 days and the expectation that recreational marine users and tourism operators will be accustomed to navigating around large vessel traffic, Cedar does not anticipate a reduction in visitor frequency or access to sites located along the Marine Shipping Route.

**Aesthetic Conditions**

With its low number of marine vessel transits (approximately eight times per month) and based on previous LNG carrier assessments conducted, Cedar anticipates a low impact to visual

quality as marine vessels pose low to moderate visual prominence and would be short-term as the LNG carrier passes.

Potential effects from light emissions (such as navigation and ship lighting) on the experience of recreational users are anticipated to be negligible/low. The marine terminal will be illuminated (as required for industrial sites to ensure safe construction and operation) and may affect aesthetic conditions for marine users, local recreational boaters and tourists in Kitimat Arm.

During operation, LNG carriers along the shipping route have potential to cause an increase in noise levels (that is, engine noise and use of air horns). Cedar identified that adverse effects from noise on marine users are considered negligible/low. Please refer to section 5.2 of this Report for acoustics effects.

#### *5.9.2.9 Mitigation Measures Proposed in the Application*

The Application proposed the following mitigation measures to avoid or minimize the potential adverse effects of Cedar LNG on Marine Use:

- Regular communication of Project activities (that may affect marine use) with marine users (including: commercial, recreational, and Indigenous fisheries; recreationalists; commercial tourism operators; Transport Canada; DFO; and relevant stakeholders) (all phases);
- Cedar LNG carriers will use the Canadian Coast Guard's Marine Communication Traffic Services (MCTS) to provide notice of planned vessel arrival time at the Triple Island Pilot Boarding Station (all phases);
- Establish LNG carrier shipping schedule notification processes for Indigenous nations with traditional territories overlapping the shipping route (all phases);
- Establish methods of initiating a safety zone (that is, an area where signage would be posted to inform mariners of potential FLNG facility safety hazards) around the marine terminal (operations);
- Utilize escort tugs between the Triple Island Pilot Boarding Station and Kitimat during LNG carrier transits and to assist with berthing and de-berthing/departure in accordance with Pacific Pilotage Authority (operations);
- LNG carriers will adhere to the proposed route and passing restrictions (operations);
- LNG carriers will maintain safe operating distance from other marine craft (operations); and
- LNG carriers will maintain safe speeds as described in rule 6 of the Collision Regulations. Upon implementation, Cedar will follow the draft North Coast Waterway Management Guidelines' recommendations regarding vessel speed and position (all phases).

During Application Review, Cedar also proposed a Follow-up Program under IAA for the marine use VC, which is described further below.

### 5.9.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issue related to the assessment of marine use for Cedar LNG were identified:

- Regional initiatives;
- Marine shipping communication protocols and plans;
- Safety zone;
- Wake effects;
- Marine fisheries; and
- Indigenous marine use.

#### *5.9.3.1 Regional Initiatives*

Transport Canada and Gitxaała noted that Cedar pointed to waterway management guidelines being developed for the North Coast through the Proactive Vessel Management (PVM) project as a source of information regarding current use of the shipping route by Indigenous communities, as well as a mitigation measures for impacts from project vessels to these uses. Haida commented that the Haida Gwaii PVM pilot was noteworthy because Dixon Entrance was identified as a target area after Transport Canada and the Haida co-chaired a multi-stakeholder committee that included the shipping sector. Haida noted that has led to a significant change in large vessel traffic movement along the west coast of Haida Gwaii. Haida stated that work within Dixon Entrance was highlighted due to the risk posed by vessel traffic using the current shipping route. Transport Canada noted that referring to these guidelines was premature as they have not yet been finalized by project participants but that Cedar's support in principle for the guidelines is viewed positively. The department suggested that Cedar seek membership in the project committee and participate in future meetings and discussions as they arise.

Transport Canada also requested that Cedar provide clarification regarding the degree to and means by which it has direct control or influence over the actions of Project vessels to adhere to the guidelines should they be implemented, and how this would be demonstrated or tracked.

In response to comments received, Cedar requested membership in the committee. Cedar noted that LNG carriers for the Project will be under the control of BC Coast Pilots.

The EAO notes that it has not considered the PVM or the proposed North Coast waterway management guidelines to be mitigation for the Project in its analysis. In consideration of the comments received during the EA and in acknowledgement of the importance of considering the wider regional context and cumulative effects of marine shipping, the EAO recommends a provincial condition (16) and a federal Mitigation Measure requiring Cedar to participate in relevant federal initiatives (in which industry is invited to participate) related to effects of

marine shipping in the region. With these mitigations, the EAO considers this issue adequately addressed for the purpose of the EA.

#### *5.9.3.2 Marine Shipping Communication Protocols and Plans*

Gitga'at, Lax Kw'alaams Band, and Transport Canada requested that Cedar provide further details on its proposed marine shipping notification process and associated communication protocols. Lax Kw'alaams Band and Gitxaała also stated that notification of Project activities where any Indigenous interest or activity must cede for their own safety should not be considered as acceptable mitigation since it required the impacted party to respond to the impact. Lax'Kw'alaams also requested that Cedar identify and characterize anticipated residual effects to marine users resulting from fear for safety and the inability to navigate through large marine traffic.

In response, Cedar committed to continuing consultation with communities to progress on these processes and protocols. Cedar noted that mitigation measures are well established (derived from existing legislation and regulations and other regional assessments) and have been successful at mitigating marine use effects. Cedar also stated that regularly communicating Project activities with marine users, providing Project-related shipping information to provincial and federal authorities, and additional communication with Indigenous nations (i.e., establishing LNG carrier notification processes) will help marine users be aware of Project-related shipping activities and reduce the possibilities of an interaction.

Cedar also proposed a Marine Transportation Management Plan which would include reporting mechanisms for Indigenous nations and marine users to report on and concerns related to LNG carrier interference with marine use, as well as a community feedback process (as described in Section 5.1: Air Quality). that would include a reporting mechanism for community concerns.

With respect to residual effects from fear for safety, Cedar noted that these are discussed in the community-specific Indigenous Interests chapters of the Application.

In response to concerns from Indigenous nations and Transport Canada, the EAO proposes a condition requiring Cedar to develop a marine transportation communication report (Condition 12) that would require Cedar to undertake the following actions:

- Regular communication of project activities that may affect marine use with marine users, including commercial, recreational, and Indigenous fisheries, recreationalists, commercial tourism operators, Transport Canada, DFO, and relevant stakeholders;
- Establish LNG carrier shipping schedule notification processes for Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, and Haida;
- Reporting mechanisms for Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, Haida and marine users to report to Cedar on any concerns related to LNG carrier interference with marine use;

- Location information, where concerns are location-specific and non-confidential, and identification of trends or locations of concerns; and
- Establish a grievance process for Indigenous marine users experiencing loss of fishing gear or other marine use effects.

The EAO also recommends a condition the EAO recommends a provincial condition (16) requiring Cedar to participate in relevant federal initiatives related to effects of marine shipping in the region, in which industry is invited to participate.

The EAO also recommends mitigation measures under the IAA for marine use, as described in section 5.1.4.1 below. These include a marine transportation plan and a Follow-up Program for marine use (focused on wake). The EAO also notes that the community feedback process proposed as both a provincial condition and federal Mitigation Measure in Section 5.1: Air Quality could be a venue for individual community members and marine users (that are not part of Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, and Haida) to raise concerns related to marine shipping.

The EAO also notes that effects to Indigenous marine use are addressed in Part C and section 6.9 of this Report. These sections reflect Indigenous nations views that while a condition on communication be a mitigation for safety, it is not a mitigation for effects on Indigenous users that they may experience as a result of having to adjust their activities because of LNG vessel traffic and concerns for their safety.

#### *5.9.3.3 Safety Zone*

Both Transport Canada and the OGC highlighted requirements and specifications related to a marine safety zone. Transport Canada noted that the Cedar had proposed a 500-m buffer safety zone around the terminal during operations, Transport Canada expressed that they do not have the authority to implement or monitor a safety exclusion zones given the powers and reach of its legislation and that a proponent may implement a safety zone (through signage or area monitoring) to inform the public of the risks or dangers of area and they can travel at their own peril. The OGC stated permit holders must implement a marine safety zone (defined as an area surrounding marine infrastructure where access would be limited during specified activities in the interest of public safety) and that a plan was required to be submitted for approval.

Cedar acknowledged Transport Canada's limitation and stated that a 500-m safety zone (that is, an area where signage would be posted to inform mariners of potential FLNG facility safety hazards) was still proposed and has been assumed to occur for the purposes of assessing Project-related effects to marine use spatially.

Transport Canada was satisfied with this response and noted that Cedar would have to work with Transport Canada's Navigation Protection Program to establish a safety zone, especially if some of the signage would use buoys, as an approval pursuant to the *Canadian Navigable*

*Waters Act* may be required for floating structures. While noting that it would be voluntary for marine users, the EAO recommends a mitigation measure under the IAA for a safety zone around the FLNG Facility to inform public marine users of the risks of the area and reduce the changes of safety incidents.

#### *5.9.3.4 Wake Effects*

Gitga'at, Gitxaała, Kitselas, Lax Kw'alaams, Metlakatla, and Haida expressed concerns about wake effects and requested further information regarding wake effects (that is, verification of real-world conditions vs a reliance on modelling, potential marine vegetation issues and shoreline harvesting, cultural and sacred sites, shipping and safety) related to Cedar LNG. It was also noted that because a wake verification study is a condition of the LNG Canada EAC, an assessment of that work was required. Metlakatla highlighted that marine traffic in its territorial waters may affect their governance system, and the ability to exercise stewardship obligations within the territory and that this impact is greater than the aesthetic effect suggested. Metlakatla suggested that the EAO recommend a Regional Impact Assessment of marine shipping, to better identify and understand the cumulative impact thresholds of marine shipping in the territory.

Cedar responded that it is aware that LNG Canada will be undertaking a wake verification study in response to EA conditions and that it will be using the same marine shipping route as Cedar. As such, the results of the study will be available before Cedar starts operation, and additional effects and mitigation identified by the LNG Canada study will be considered by Cedar as part of operation planning.

Further, Cedar provided a supplementary wake analysis memo that analyzed the effects of ship-generated waves on specific shoreline types to address potential wake-related effects on marine vegetation and shoreline harvesting areas, sacred sites, and sites of cultural importance along the shipping route. Per the expressed concerns, Cedar identified that shorelines of particular interest are harvesting areas including low lying sandy or soft sediment beaches and/or areas of marine vegetation. As sacred sites and sites of cultural importance are confidential to the Indigenous nations, additional representative shoreline types were selected for consideration in their analysis. Cedar used data to characterize existing wave conditions and the degree of wake generation that could be expected within Douglas Channel from a tug-escorted LNG carrier travelling at speeds between 10 to 14 knots. Estimated wake wave height and impacts to shoreline erosion and marine vegetation from LNG carriers were assessed for 25 shoreline sites that had potential to provide important shoreline harvesting areas for Indigenous nations.

From its analysis, Cedar reported that wake wave heights from the LNG carrier and escort tug scenario assumed in the model increased with the carrier operating speeds and decreased with increasing distance to the shoreline. With travel speeds between 10 to 14 knots, wave heights were within one standard deviation of the mean of maximum zero crossing wave heights year-round, however the following specifics were noted:

- Estimated wake heights were lower than ambient characteristic and maximum zero crossing wave heights (Browning Entrance and Hecate Strait);
- Some wake heights were within the range of ambient conditions (Kitimat Arm, Douglas Channel, Wright Sound, Otter Channel and Principe Channel) but were seasonally dependent; and
- Between March – November, when ambient wave heights were lower, wake heights were above one standard deviation of the mean of characteristic wave heights at sites closest to the shipping route.

Cedar noted vessel wake has the potential to intensify or accelerate shoreline erosion by increasing the frequency or magnitude of waves impacting the shoreline. This risk predominantly applies to the 4.2 percent of the shoreline along the shipping route characterized by silt or mud substrates. Cedar reported that, while some wake heights exceeded monthly characteristic wave heights, this occurred during the time of year with the lowest ambient wave heights, and wake heights were still within the range of maximum zero crossing wave heights. In addition, the majority of these wake heights occurred during the canopy-forming algae's growing season which can reduce Project-related wake shoreline erosion as it can attenuate wave energy prior to reaching the shoreline.

Cedar stated that, as the majority of wake generated by Project-related vessels is within the range of ambient conditions, it does not expect wake will cause marine vegetation to be dislodged from shorelines along the shipping route. In addition, turbidity effects at any one site will be low due to the depth and shape of the fjord channels and the short duration of exposed vegetation, infrequent vessel transits, and the small probability of those two events occurring simultaneously. Cedar further noted that Project-related vessel wake is not anticipated to cause light limitation to marine vegetation.

Cedar acknowledged the safety risk to elders or children from Indigenous nations that may be harvesting marine resources along the shoreline when large shipping vessels are passing (i.e., risk of being knocked over by a wake wave) but based on their tidal data, LNG carrier schedules, and vessel speed of 12 knots, it was reported that wake waves would occur at any one location of shoreline for just over one minute per LNG carrier transit.

As expressed in their application, Cedar reiterated that the exercise or practice of Indigenous rights and interests may be affected by Project-related LNG carrier traffic in the following interwoven ways:

- Avoidance of harvested shoreline resources resulting in reduced opportunities to access important cultural areas and practices;
- Decline in physical and/or mental health and well-being; and
- Decline in consumption of traditional foods.

Cedar also has proposed a Follow-Up Program for marine use, which would include a review to determine if new wake-related information (on wave characteristics on marine shipping activities) or mitigation measures (to reduce wake effects on Indigenous traditional harvesting activities) is available. Cedar would offer to meet with Haisla, Haida, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla to review results, discuss potential effects, and ways to mitigate them along the shipping route.

On review of the supplemental memo, Lax Kw'alaams and Haida noted they had outstanding concerns regarding cumulative effects of ship wake on shoreline erosion, shoreline vegetation or shoreline harvesting, and Cedar's assumption of 14-knot maximum ship speed used in the assessment. Lax Kw'alaams highlighted that some wake heights were predicted to exceed monthly characteristic wave heights, but that this occurred during the time of the year with the lowest ambient wave height. However, the time of the year with the lowest ambient wave heights coincides with the time of the year with the most shoreline harvesting, thereby increasing the risk to shoreline harvesters. Haida also noted its outstanding concern regarding effects on small vessels.

Gitxaała was pleased to see that, after bringing the issue of wake effects on harvesters to Proponent and Crown attention in the review of other projects as early as 2012, there was an acknowledgement that wake may affect the exercise of their rights. Gitxaała provided its perspective that the tidal data confirmed that preferred harvesting conditions for shoreline harvesting is a calm day with a low/zero tide, which is when the wake waves may result in unexpected waves (within the normal ambient range) that have the potential to knock over harvesters or damage boats on shore. Gitxaała noted that calm conditions on low tides are preferred conditions for shoreline harvesting and, in addition to the acknowledged real safety risk to elders or children from unexpected wake waves reaching the shore during shoreline harvesting activities, these waves could also damage small vessels used by harvesters to access the shoreline. Gitxaała expressed concerned there were no conditions proposed for the Project that would ensure LNG carriers do not operate at speeds higher than 12 knots.

Based on feedback received from Indigenous nations regarding their concerns regarding wake-related effects, Cedar committed to expanding the marine use follow-up program to include monitoring of changes to marine vegetation along the shipping route over a 4 to 5 year period using remote sensing data. Cedar stated it will work with Indigenous nations to identify five areas of interest along the Marine Shipping Route with eelgrass and/or kelp beds for the study. Cedar committed to acquiring satellite data (imagery and chlorophyll) at lower tide levels for the monitoring locations in two years before the start of operation and in two to three years after the start of operation. Data would be acquired during summer months when eelgrass and kelp are at peak distribution. This would be used to delineate the changes in the extents of marine vegetation. The results of this work would be provided in a technical memorandum and will be integrated into the follow-up program for marine use.

In consideration of the comments and concerns raised, the EAO recommends a Follow-Up Program for marine use (focused on wake) as a Mitigation Measure under the IAA, which would include monitoring of changes to marine vegetation. The EAO also notes that the proposed provincial condition for a community feedback process (condition 11) and a marine transportation communication report (condition 12) and recommended federal Mitigation Measure for a community feedback process and marine transportation plan, as described below in section 5.9.4.1, would also provide a means for Indigenous nations to report on concerns related to marine shipping, including wake effects. The proposed federal marine transportation plan also includes the recommendation that Cedar work with the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for LNG carriers visiting Cedar LNG facilities. Because vessel speed is a determining factor in wake heights, consideration of a safe vessel speed would also include consideration of wake effects on marine and shoreline users. Regarding the recommendation for a regional impact assessment of marine shipping, the EAO notes the number of initiatives underway address regional marine shipping effects, as described in section 3.1 of Part A. In addition, the EAO recommends a provincial condition (16) and a federal Mitigation Measure requiring Cedar to participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region, in which industry is invited to participate. The EAO notes that effects to Indigenous marine use from wake are further discussed in Part C and section 6.9 of this Report. The EAO was satisfied this issue was adequately addressed for the purpose of the EA.

#### *5.9.3.5 Marine Fisheries*

Gitga'at, Lax Kw'alaams, Gitxaała, and Haida raised issues related to potential impacts on marine fisheries, including the following:

- Gitga'at and Lax Kw'alaams both questioned Cedar's assumption that an LNG carrier would only disturb 30 minutes of fishing activities, when they were of the view that some marine users may elect to avoid areas when transit is scheduled for the whole day;
- Gitga'at questioned how construction activities could have a measurable effect on fisheries but would not result in an impact to fisheries;
- Gitga'at and Gitxaała both requested further analysis or data be provided from Cedar regarding shipping traffic;
- Gitga'at asked that the Douglas Channel be added to the specific shipping traffic analysis (current and future); and
- Gitxaała inquired about small vessel traffic in Hartley Bay.

In response, Cedar reiterated its view that a transiting LNG carrier would affect fishing for only 30 minutes, which was based on feedback provided by fishers through engagement conducted for LNG Canada. However, Cedar reported that if it was assumed that a full fishing day was lost

for each LNG transit, the total effect on commercial groundfish fisheries would increase from 0.02 – 0.06 percent to 1.42 – 2.24 percent, depending on the speed of the LNG carrier (8-14 knots).

Cedar noted that the cumulative effects assessment looked at all current and future projects that intersect the shipping route at any port and transiting along the shipping route into Kitimat Harbour. Cedar further stated that it has looked at cumulative effects of shipping in three representative "sections" of the shipping route: Douglas Channel, Principe Channel and the Triple Island Pilot Boarding Station and that vessel traffic varies with each. LNG carriers visiting the Project represent 8 percent of the cumulative vessel traffic that will transit the shipping route through Douglas Channel and into Kitimat Harbour (50 of 605 vessels). These carriers represent 6.3 percent of the cumulative vessel traffic that will transit the shipping route through Principe Channel (50 of 793 vessels). Lastly, Project-related vessel traffic represents 2.1 percent of the cumulative traffic passing the Triple Islands Pilot Boarding Station (50 of 2,358 vessels). This is inclusive of all vessels that will intersect the shipping route (that is, vessels that will transit to Prince Rupert). Cedar noted cumulative effects to marine fisheries have been characterized from low to moderate and that it is expected that marine use activities will be able to continue at current levels and not result in a change or disruption that widely restricts or degrades present marine uses to a point where the activities cannot continue at current levels.

Regarding Hartley Bay data, Cedar responded that it was not available and camera data required Gitga'at approval. Cedar acknowledged small vessel traffic concerns and their commitment to ongoing engagement with Gitga'at.

Gitga'at, Gitxaała and Lax Kw'alaams noted outstanding concerns on effects of Cedar LNG to marine use and Indigenous fisheries which are discussed further in the next section on marine use concerns. The EAO considered this issue adequately addressed for the purpose of the EA.

#### *5.9.3.6 Current Conditions*

Haida stated that, while Cedar reported PFMA 104 had no known fishing activity, harvesting does occur there and DFO would be able to provide harvest data. There is historical harvest data available publicly via MPA Network Seasketch interactive mapping tool, as well as through DFO Integrated Fisheries Management Plans for each fishery. Haida also noted that additional DFO data are available marine fisheries that Cedar did not summarize in the Application. Indigenous nations work with DFO on these fisheries, some of them collaboratively. DFO also collects data on "food, social and ceremonial fisheries" that could have been used.

The EAO notes the concerns with the data used in the assessment and has reflected this as a source of uncertainty in its ratings of residual effects in section 5.9.4.2 below. The EAO notes the mitigation measures proposed below, including the provincial marine transportation communication report and the federal marine transportation management plan, would be developed in consultation with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, and Haida; and would include measures targeting effects on Indigenous fisheries

and marine use. The EAO considers this issue to be adequately addressed for the purpose of the EA.

#### *5.9.3.7 Indigenous Marine Use*

Gitga'at, Lax Kw'alaams, Gitxaała, Kitselas and Haida raised concerns on the impact of Cedar LNG to Indigenous marine use. Gitxaała acknowledged that in comparison to LNG Canada, Cedar LNG is significantly smaller and will include less Project-related marine traffic. At full build out LNG Canada will produce up to 26 MTPA of LNG and predicts 700 LNG carrier transits annually versus Cedar's predicted output of 3 MTPA of LNG and 100 LNG carrier transits per year. However, they acknowledged that the LNG carriers and their escort tugs will follow the same marine shipping route to and from the project sites in Kitimat through Douglas Channel, Principe Channel and they will pass Dolphin Island enroute to the Triple Island Pilot Boarding Station. Gitxaała noted that while Cedar LNG and LNG Canada may be operational at the same time, it is also essential to understand and assess the unique contributions of Cedar LNG on its own.

Gitxaała expressed that the existing conditions in Principe Channel do not justify Cedar's characterization of Principe Channel as a well-established shipping route. Gitxaała noted that LNG Canada was predicted to result in an increase from 191 to 891 large vessel movements in Principe Channel. Gitxaała commented that this impending change would inarguably adversely affect the existing conditions of the Marine Shipping Route, which includes a significant portion of Gitxaała Nation's territorial waters, and Cedar's vessels would be in addition to those from LNG Canada. In this context it is extremely likely that changes to the acoustic, olfactory, and visual landscapes are likely, given the scale of the cumulative change brought by Cedar LNG and other projects that will add more marine traffic to the shipping route that passes through Gitxaała territory between Triple Island and Kitimat, in Gitxaała's view. Gitxaała noted that it had raised the need for a consideration of these sensory perceptive issues (that is, unwanted noise, smells, and visual impacts) at multiple points during this review process; however, the Application limits the discussion of these concerns to short qualitative acknowledgements in the Nation specific assessments. Gitxaała also stated Cedar LNG's potential impact on marine recreation and tourism will also result in a limit on Gitxaała's ability for future development of ecotourism-based business opportunities along Principe Channel, the heart of Gitxaała territorial waters. Regarding the PVM described above, Gitxaała notes these initiatives do have the potential to reduce interactions; however, the project-specific effects of the mere presence of LNG carriers and support tugs along the shipping route where previously there were none cannot be mitigated.

Haida commented that additional impacts from large vessel movements along the marine shipping route attributable to the Project may prevent or reduce Haida access to fishing or shoreline harvesting sites, which would disproportionately affect Haida citizens who heavily rely on the marine environment and its resources for food and for other purposes (e.g., ceremonial purposes, cultural, social, economic, spiritual, trade). If access to harvesting sites or the quality and quantity of resources available is diminished, Haida expressed that Haida citizens' physical

and mental health and well-being, culture, sense of identity, and governance systems may be impacted.

In response, Cedar noted that it will establish an LNG carrier shipping schedule notification process for Indigenous nations with traditional territories overlapping the shipping route. The marine shipping notification process would contribute to a reduction of adverse effects (such as avoidance, displacement or lost time) due to safety concerns (such as wake waves), inconvenience (such as pulling fishing gear), or reduced enjoyment (such as sensory disturbance). This mitigation measure is intended to reduce Project marine vessel traffic impacts to Indigenous nations' access to and use of their culturally important areas for consumption and harvesting purpose.

As described above, The EAO proposes a provincial condition requiring Cedar to develop marine transportation communication report (Condition 12) and recommends a federal Mitigation Measure for a marine transportation plan, including the establishment of communication protocols with Indigenous nations, but notes that communication is not mitigation for effects on Indigenous users as a result of having to adjust their activities because of LNG vessel traffic and concerns for their safety. Effects to Indigenous marine use are discussed further in Part C and section 6.9 of this Report. In acknowledgement of the importance of considering the wider regional context and cumulative effects of marine shipping, the EAO also recommends a provincial condition (16) and a federal Mitigation Measure requiring Cedar to participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region.

### 5.9.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated potential effects by considering construction, operations and decommissioning activities that could adversely affect marine use from a change in marine navigation and marine fisheries and other uses.

#### *5.9.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application and issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[40], the EAO proposes the following provincial conditions:

- Community Feedback Process to receive, address, and report on community concerns from the Project (Condition 11); and
- Marine transportation communication report, which would include reporting mechanisms for Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams,

[40] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

Metlakatla, Haida, and marine users to report on any concerns related to LNG carrier interference with marine use (Condition 12).

The EAO notes that marine shipping is a federally regulated activity and navigation, communication and safety are regulated and managed by Transport Canada, the Canadian Coast Guard, and the Pacific Pilotage Authority. This includes the following requirements:

- Use of escort tugs between the Triple Island Pilot Boarding Station and Kitimat during LNG carrier transits and to assist with berthing and de-berthing/departure in accordance to Pacific Pilotage Authority;
- Restrictions on the proposed route;
- Maintenance of safe operating distances from other marine craft (operation); and
- Maintenance of safe speeds as described in rule 6 of the Collision Regulations.

See Part A of this Report for further details on the Marine Regulatory Framework. The EAO is of the view that the existing federal regulation of marine shipping in combination with the proposed provincial conditions and federal key mitigation measures would address the effects to marine use identified during the EA.

The EAO recommends the following Mitigation Measures under IAA for marine use VC:

- Develop and implement a marine transportation plan in consultation with Gitga'at, Gitxaała, Haida, Haisla, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla that includes :
  - LNG carrier shipping schedule notification processes for Gitga'at, Gitxaała, Haida, Haisla, Kitselas, Kitsumkalum, Lax Kw'alaams and Metlakatla a;
  - Reporting mechanisms for Gitga'at, Gitxaała, Haida, Haisla, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla and marine users to report on any concerns related to LNG carrier interference with marine use;
  - Methods for regular communication on operation activities with marine users, including recreational users, commercial tourism operators, fishers, Transport Canada, and other relevant stakeholders during all phases of the Project;
  - Use by Cedar LNG carriers of the Canadian Coast Guard's Marine Communications and Traffic Services to provide notice of planned vessel arrival time at the Triple Island Pilot Boarding Station (all phases);
  - Establish a safety zone around the marine terminal during operation ;
  - Cedar must participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region and industry is invited to participate;
  - Cedar must work with the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for LNG carriers visiting Cedar LNG facilities.

- Community Feedback Process as described in Section 5.1: Air Quality.

In addition, the EAO also proposes a Follow-up Program for marine use under the IAA related to wake effects on traditional marine use activities. This would include the following:

- Prior to operations, Cedar will determine if new publicly available information on characteristics of wake from marine shipping activities, or new mitigation measures to reduce wake effects on Indigenous traditional harvesting activities is available.
- Cedar will then offer to meet with Haisla, Haida, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla to review these results and discuss potential effects and ways to mitigate them along the shipping route (that is a communication plan) prior to the arrival of the first LNG carrier to the Project's terminal.
- Cedar will integrate feedback from the review into the follow-up program.
- The results of the review and meeting(s) will be reported to the Agency and to each of Haisla, Haida, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla prior to the first LNG carrier visiting the marine terminal.
- The report will also describe new or modified mitigation measures to be implemented, as applicable.
- The follow-up program (that is, literature review and meetings) will be repeated five years after the start of LNG shipping.

Cedar will monitor changes to marine vegetation along the shipping route using remote sensing data. The monitoring will include data collection once in summer months in each of two years before the start of LNG shipping and once in summer months in each of three years after start of LNG shipping. Areas of interest will be selected in consultation with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla nations.

#### *5.9.4.2 Residual Effects*

After considering the relevant mitigation measures, the EAO concludes that Cedar LNG would result in the following residual adverse effects to the marine use VC:

- Change in marine navigation; and
- Change in marine fisheries and other uses.

Potential residual effects within federal jurisdiction related to marine use, including effects to the health, social or economic conditions of the indigenous peoples of Canada and current use of lands and resources for traditional purposes and cultural heritage are discussed in section 6.9 of this Report.

**Table 26: Characterization of residual effects for marine use**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Medium | The region is currently subject to a variety of large marine vessel traffic (including ferries, cruise ships, fishing boats and commercial shipping vessels); however, current vessel traffic levels are low compared to other parts of B.C. Thus, the Marine Shipping Route has the capacity to accommodate increases in marine shipping traffic from a navigational perspective; however, the Marine Shipping Route is also considered highly sensitive to any changes to marine use due to the potential for Cedar LNG vessel traffic to disrupt cultural, harvesting, and other traditional practices of Indigenous nations. Context is rated from medium as a result. |
| Direction and Magnitude | **Marine Navigation:** Adverse and low<br><br>**Marine Fisheries and Other Uses:** Adverse and moderate | **Marine Navigation:** Construction, operation, and decommissioning will result in an increase in new in-water infrastructure in Kitimat Arm and an increase in Project-related vessel traffic along the Marine Shipping Route. Effects from marine shipping are anticipated to impact a small proportion of navigable waters. An interference with the navigational passage of other vessels during all Project phases is not anticipated. During peak construction, barge and Project-related vessel movements could be two movements per week. During operation, 50 LNG vessels or 100 LNG vessel movements are expected annually (approximately two LNG vessel movement per week). This frequency is similar to marine shipping frequency during construction.<br><br>**Marine Fisheries and Other Uses:** Cedar LNG would result in an increase in vessel traffic, which may affect marine fisheries and other uses as a result of reduced fishing and other marine use opportunities, interference with access to fishing or marine use areas, and a reduced quality of experience due to noise, light and aesthetic effects of LNG vessels. However, these effects are not anticipated to create a change or disruption that widely restricts or degrades present marine uses to a point where they cannot continue at current levels. |
| Extent | Regional | Residual effects to marine use are applicable throughout the RAA although effects are expected to impact a small proportion of navigable waters within the RAA and only during the transit time of the vessel in the Marine Shipping Route s. |
| Duration | Long-term | The residual effects will last the duration of the Project and in all project phases: construction, operation, and decommissioning. |
| Reversibility | Reversible | The residual effects on Marine Use will cease upon completion of all Project phases. |
| Frequency | Regular/Frequent to Continuous | During operation and construction, 50 LNG vessels or 100 LNG vessel movements are anticipated annually (approximately two LNG vessel movement per week). Residual effects to marine use are not anticipated to occur at a specified schedule during construction and decommissioning phases however activities throughout operation are expected to occur continuously and at regular intervals. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Affected Populations | Disproportionate | The increase in large vessel movements may prevent/reduce access to fishing, marine use or shoreline harvesting sites causing Indigenous communities to experience disproportionate effects. |
| Risk (likelihood and consequences) | Likelihood – high likelihood of residual effects to marine use during all Project phases impacting marine navigation and marine fisheries and other uses.<br>Consequence – moderate consequence based on the magnitude of effects to marine use and through application of mitigation measures.<br>Risk – based on the likelihood and consequence of residual effects to marine use it was determined that there would be a moderate level of risk. | |
| Uncertainty | Uncertainty of effects to marine navigation is considered to be low based on a good understanding of the scope and extent of effects. Uncertainty on effects to marine fisheries and other uses is considered moderate based on concerns raised regarding data sources, assessment methods, wake effects and efficacy of mitigation measures. | |
| Significance | In consideration of the above analysis, mitigation measures that will be implemented, and the extent and reversability of effects, the EAO concludes that Cedar LNG would not have significant residual effects on the marine use VC. | |

*Note: Criteria and assessment ratings are defined in Appendix4: Residual Effects Characterization Definitions.*

#### *5.9.4.3 Cumulative Effects Assessment*

Past and present physical activities with the potential to cumulatively interact with Cedar LNG include:

- Fairview Container Terminal;
- LNG Canada Export Terminal;
- MK Bay Marina;
- Northland Cruise Terminal (Prince Rupert Port Authority);
- Prince Rupert Ferry Terminal;
- Prince Rupert Grain Terminal (Prince Rupert Grain Ltd.);
- Prince Rupert LPG Export Terminal (Pembina Pipeline Corp.);
- Prince Rupert Fuels Project (Wolverine Terminals ULC);
- Ridley Terminals (Ridley Terminals Inc.);
- Rio Tinto Aluminum Smelter;
- Rio Tinto Terminal A Extension;
- Various forestry activities;
- Various fishing and aquaculture activities;
- Westview Wood Pellet Terminal (Pinnacle Renewable Energy Inc.);
- Fairview Container Terminal Expansion – Phase 2 B(DP World/Prince Rupert Port Authority);

- Kitimat LPG Export Project (Pacific Traverse Energy);
- Ksi Lisims LNG Project;
- Port Edward Small Scale LNG (Port Edward LNG);
- Skeena LNG (Top Speed Energy);
- Vopak Pacific Canada Storage and Export Facility (Vopak Development Canada Inc.); and
- Westcoast Connector Gas Transmission Project (Enbridge Inc.).

If all the projects listed above proceed to construction and operation, approximately 2,313 vessels could intersect the northern portion of the Marine Shipping Route annually, with 560 of those vessels (or 24.2 percent) visiting the port of Kitimat directly. However, the increase in large vessel traffic is not expected to increase all at once given available information on schedules for present/future projects, also taking into account that all activities may not be approved.

Cedar LNG will contribute up to 50 LNG carriers (approximately 2.1 percent to the total large vessel traffic predicted for the region if all past, present, and future projects and physical activities proceed). Cedar LNG and its associated safety zone will occupy approximately 16.6 percent of the channel width at the head of Kitimat Arm.

**Change in Marine Navigation**

Potential cumulative effects on marine navigation could occur both along the shipping route, with vessel interactions whose routes overlap Cedar LNG's Marine Shipping Route and from current and future projects with marine works in Kitimat Harbour.

The Rio Tinto Terminal A Extension Project, LNG Canada Export Terminal, and the MK Bay Marina could contribute to cumulative effects on navigation. As proposed projects with marine terminals in Kitimat Arm will include additional vessels traveling along the shipping route, there is also the potential for the increase in traffic to impede navigation.

The likelihood of cumulative residual effects on marine navigation is considered to be high. The assessment is based on the large number of current and potential projects with marine shipping components in the area. These effects will be long-term and likely irreversible given that it is unlikely that all projects would be completed at the same time. Given the experience of the port of Kitimat (that is, a history of industrial development and large industrial traffic management) and other government agencies involved in maintaining navigable waters, existing conditions, the overall potential shipping volumes, and proposed mitigation measures; the magnitude of cumulative effects is considered to be low for marine navigation. The cumulative effects on marine navigation from construction of the LNG Facility infrastructure are expected to be long-term but reversible upon decommissioning.

**Change in Marine Fisheries and Other Uses**

Cumulative effects on marine fisheries and other uses are possible as present and future marine shipping traffic may interfere with fishing, shoreline harvesting, or recreational uses if the volume of marine shipping traffic interferes with their access to sites or activities.

Large commercial vessels travelling to Prince Rupert will only pass through the northern portion of the RAA when travelling to and from the Triple Island Pilot Boarding Station. Potential interactions between project shipping activities and Prince Rupert bound vessels is expected to be limited to the area offshore of the Triple Island Pilot Boarding Station in the northern portion of the RAA (where limited fishing activity has been identified).

The additional increase in large vessel movements withing the Marine Shipping RAA attributable to the Project may prevent or reduce access to fishing or shoreline harvesting sites, which would disproportionately affect Indigenous nation members who heavily rely on the marine environment and its resources for FSC, economic, subsistence, and trade purposes. As the Facility Area is located within Haisla Nation's traditional territory and the traditional territories of Gitga'at First Nation, Gitxaała Nation, Kitselas First Nation, Kitsumkalum First Nation, Lax Kw'alaams Band and Metlakatla First Nation and Haida Nation are intersected by or in proximity to the Marine Shipping Route, these Indigenous communities may experience disproportionate effects.

The likelihood of cumulative residual effects on marine fisheries and other uses is considered to be high. The assessment is based on the large number of current and potential projects with marine shipping components in the area. These effects will be long-term and likely irreversible. However, the EAO believes that it is unlikely that all projects would be completed at the same time. The magnitude of cumulative effects is considered to be moderate. The cumulative effects to Indigenous marine use including Indigenous governance are assessed further in Part C and section 6.9 of this Report.

#### *5.9.4.4 Interactions Between Effects*

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

- the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including
    - the result of any interaction between those effects.

The EAO also notes that Section 25(2) of the Act (2018)41 states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the

[41] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

results of any interaction between effects. Risks and uncertainties of the effects are described above in section 5.9.4.2.

The marine use VC assessment is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Acoustics – the assessment considers Project-related noise;
- Wildlife – information on industrial vessel traffic was used to inform the assessment on marine bird movement;
- Marine Resources – the assessment of potential effects on marine use includes consideration of Project-related effects on marine resources;
- The impact of marine use effects on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and section 6.9 of this Report, respectively.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

The EAO notes that the effects of all biophysical VCs (including acoustics, wildlife, and marine resources) are considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6). This assessment considers linkages within the biophysical realm and considers effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function.

#### *5.9.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of effects on marine use.

In the Application, Cedar stated that traditional knowledge was sourced from existing studies and publicly available sources to inform Cedar's understanding of Indigenous fisheries and marine use. Understanding existing land and resources uses in the area, informed baseline conditions, and scope of issues assessed was also provided through Indigenous nations engagement. Indigenous nations identified Indigenous Knowledge related to: species harvested; marine use, fishing and harvesting areas; timing of fishing; current fishing practices and gear utilized; marine use and planning initiatives; and cultural importance associated with marine species and use.

Cedar used the following sources of traditional knowledge in assessing the marine use VC:

- Gitxaała Nation Use Study for the Project (Gitxaała Nation 2021);
- Kitselas First Nation Traditional Use and Occupancy Study for the Vopak Project, Ridley Island, Prince Rupert Harbour Region (Kitselas First Nation 2020);

- Kitsumkalum First Nation Indigenous Land Study Regarding the Vopak Pacific Canada Project (Kitsumkalum First Nation 2020b);
- The LNG Proposed Terminal Site and Tanker Route within Haisla traditional territory: Haisla TLUS and Socio-Economic Profile (Powell 2013);
- Marine Plan Partnership for the North Pacific Coast (MaPP 2017); and
- Draft North Coast Waterway Management Guidelines (Waterways Management Guidelines 2021).

These reports provided information on areas of importance to Indigenous nations related to: species harvested; location of fishing, harvesting, and marine use areas; timing of fishing, harvesting, and marine activities; current fishing practices and gear used; proposed mitigation measures; and marine use and planning initiatives.

During the EA, Metlakatla, Lax Kw'alaams, Gitga'at, Gitxaala, Kitselas, and Haida provided comments on the assessment of effects to marine use, related to proposed mitigation measures, and characterization of residual and cumulative effects. The information provided is summarized above in section 5.9.3, as well as being discussed in the nation-specific sections in Part C of this Report. Gitxaala expressed they had a high level of uncertainty around the effectiveness of the marine transportation communication report condition meant to address concerns related to marine traffic management. Gitxaała expressed its deep concerned that the marine transportation plan was not proposed as a federal or provincial condition. Gitxaała noted there were several commitments included in the proposed MTMP that were related to communications, for example, adherence to safe operating distances, passing restrictions, and maintaining safe speeds. Haida also noted that notification requirements in the proposed marine transportation communication report do not address potential residual effects from marine vessel traffic, sensory disturbance, wake and air emissions, which may affect Haida Interests.

In addition, Gitxaala noted their reduced confidence regarding residual and cumulative effects from Cedar's marine operations on Part B VCs. They further noted that the absence of enforceable conditions related to participation in and/or support of Gitxaala's participation in federally run co-management initiatives under the Oceans Protection Plan exacerbates GTMA's lack of confidence in the shipping related mitigations for the Project.

Key ways in which the EAO took these comments into account in the marine use assessment included:

- In the residual effects characterizations:
    - Identifying marine use within the Marine Shipping Route as sensitive, based on the potential for any decreases in marine use quality to result in a deterioration of experience of cultural, harvesting, and other traditional practises of Indigenous nations;

  - Identifying the potential for disproportionate effects to Indigenous nations along the Marine Shipping Route; and
  - Rating the uncertainty of the residual effects to marine fisheries and other uses as moderate;
- Recommending a Follow-up Program for marine use under the IAA; and
- Recommending as a federal Mitigation Measure under the IAA a marine transportation plan that would incorporate:
  - Marine communication protocols;
  - A requirement that Cedar must participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region (where industry is invited to participate); and
  - A requirement that Cedar must work with the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for LNG carriers visiting Cedar LNG facilities.

#### *5.9.4.6 Conclusions*

The EAO is satisfied that Cedar LNG will not have significant adverse residual or significant cumulative effects on the marine use VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 11: community feedback process and Condition 12: marine transportation communication report, Condition 16: regional cumulative effects initiatives; and recommended Mitigation Measures and Follow-up Program under the IAA for marine use (Appendix 1).

# 5.10 INFRASTRUCTURE AND SERVICES

## 5.10.1 BACKGROUND

This chapter assesses the potential effects Cedar LNG would have on the infrastructure and services VC including consideration of the following potential effects:

- Changes in infrastructure and services including:
  - Municipal services and infrastructure and utilities;
  - Policing and emergency services;
  - Health services;
  - Education;
- Change in accommodation availability; and
- Change in transportation infrastructure.

Infrastructure and services was selected as a VC due to the concerns of Indigenous nations, Northern Health, and local governments that Cedar LNG could increase local population size and affect local and regional housing, infrastructure and services. A GBA Plus approach was used to consider the differential infrastructure and services impacts on diverse subgroups, including gender, sex, age, and Indigeneity, as well as how these factors may intersect.

### *5.10.1.1 Regulatory Context*

The infrastructure and services VC is governed at the federal, provincial, regional, and municipal government levels, as well as by Indigenous nations. Two regional districts are located in the RAA: the Regional District of Kitimat-Stikine (RDKS) and the North Coast Regional District (NCRD). Two municipal governments operate in the LAA: the District of Kitimat and City of Terrace. Three Indigenous nations have communities on reserve lands in the LAA: Haisla Nation (Kitamaat Village), Kitselas First Nation (Gitaus and Kelspai), and Kitsumkalum First Nation (Kalum). Relevant legislation and responsibilities are described below.

The *Local Government Act* provides the framework for regional districts regarding planning and land use. The *Community Charter* provides municipalities jurisdiction over water, wastewater, solid waste management systems and other utilities. RDKS and NRCD provide a variety of local government services, including rural land use planning, community water systems, fire protection, library services, transportation and engineering. The RDKS provides solid waste services to most communities in the LAA except for Kitimat, which provides their own services. A mayor and council are elected as representatives for the District of Kitimat and the City of Terrace and are accountable for filling the responsibilities outlined by the *Community Charter*, including: administration, community development and planning, economic development, public works and engineering, finance, emergency response, fire rescue, and leisure services. Water distribution and treatment (where available), as well as sewage and treatment, is

provided by a variety of sources including regional districts, municipalities, Indigenous nations and individuals.

Police services are governed by the *Police Act*; ambulatory services are governed by the *Emergency Health Services Act*; and fire services are the responsibility of local government authorities as directed under the *Fire Services Act*. The District of Kitimat Fire and Ambulance Services and the Terrace Fire and Rescue Department provide and support fire protection and emergency response services. The remaining communities in the area rely on RDKS and the Thornhill Volunteer Fire Department. Police services throughout the LAA include two RCMP detachments. Indigenous policing is administered by Public Safety Canada through the First Nations Policing Program.

Healthcare is provided by the provincial government through the Northern Health Authority (Northern Health). Indigenous healthcare is funded and administered by the Government of Canada through the *Canada Health Act*.

The chief and council of each nation are responsible for providing municipal services, such as social, education, and community-development programs. Additional information on governance for the Indigenous nations is provided in the Application.

While Cedar LNG does not include a camp as part of the scope of the Project, Cedar LNG workers would be housed within open camps in Kitimat. The operation of an industrial camp is prescribed as a regulated activity under B.C.'s *Public Health Act*. An industrial camp operator must comply with requirements of the Industrial Camps Regulation. The regulation outlines the requirements for a number of public-health-related factors, including:

- Camp siting and size;
- Arrangement of camp facilities (including sleeping accommodations)
- Provision of safe drinking water; and
- Location and construction of sewage facilities.

Relevant guidance from Northern Health regarding industrial camps also includes:

- Northern Health's recommendations for industrial camps;
- Communicable disease control plan - Best Management Guide for Industrial Camps (June 2017);
- Standard working group comments for environmental assessments;
- Northern Health emergency roles and responsibilities; and
- Health and medical services plan best management guide for industrial camps.

#### *5.10.1.2 Boundaries*

Spatial boundaries for the LAA includes communities with the greatest potential to experience positive or adverse effects on infrastructure and services as a result of Cedar LNG, including

changes in population, demographics, employment and income. The LAA, as shown in Figure 20, below, is comprised of Kitamaat 2, Kitamaat Village, District of Kitimat, Terrace CA[42] (including City of Terrace, Kitimat-Stikine E regional district electoral area and Kulpsai 6), Kitselas 1 and Kitsumkalum 1. The RRA includes the LAA in addition to Kitimat Stikine Electoral Areas C and E and North Coast Regional District Electoral Areas A and C (Figure 21).

Cedar assessed impacts to the infrastructure and service VC during Cedar LNG construction (approximately four years), operation (40 years), and decommissioning phases (approximately 12 months).



[42] Statistics Canada census subdivisions and census agglomerations 30.

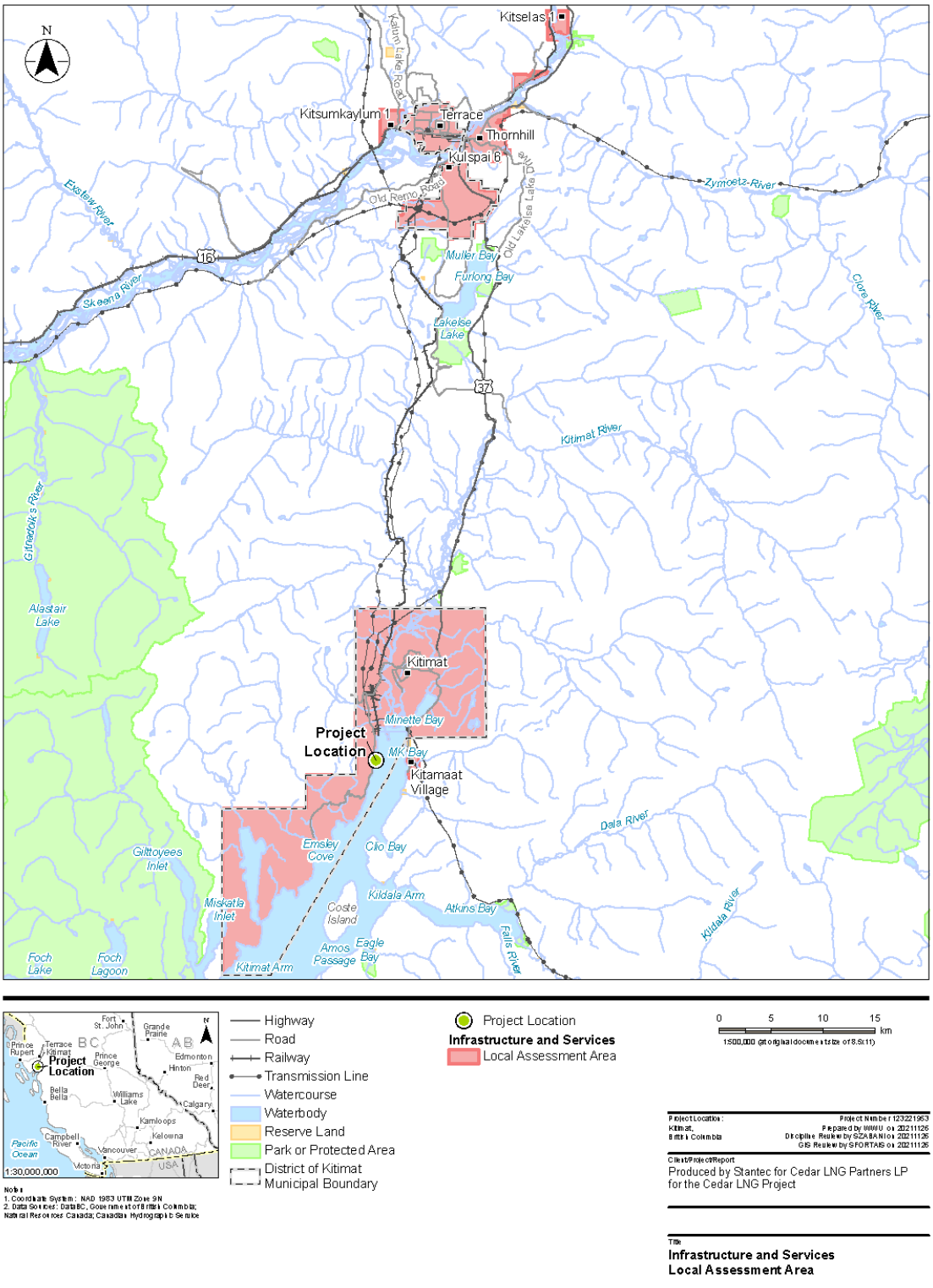


**Figure 20: Infrastructure and services LAA, Cedar LNG**


**Figure 21: Infrastructure and service RAA, Cedar LNG**

## 5.10.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE

## APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.10.3.

### *5.10.2.1 Existing Conditions*

Cedar characterized the existing conditions of the infrastructure and services VC through consideration of the existing socio-economic conditions of the LAA and RAA. The main sources of information used in the Application for the socio-economic assessment were the Cedar LNG project description, socio-economic studies prepared for Cedar LNG, regulatory applications filed for other major development projects (for example, Kitimat LNG, CGL, LNG Canada), review of annual and quarterly reports for LNG Canada Community Level Infrastructure Social Management Plan, secondary studies/plans and documentation, statistical information from the census, information from discussions with government agencies and local media. Information on the existing conditions related to potential effects assessed in the Application is included in this section.

#### *INFRASTRUCTURE AND SERVICES*

**Municipal Services and Infrastructure and Utilities**

In 2018 and 2019, the District of Kitimat's water infrastructure used 43 percent capacity during average daily demand and 80 percent capacity at peak demand. In 2016, the District of Kitimat sewage infrastructure had reached full capacity, during peak demands and 21 percent capacity during average daily demands, respectively. An increase of approximately 18 percent in the annual waste disposal rate in the RDKS occurred between 2017 and 2019, which was attributed to industrial waste in the region outside of the Terrace area.

Community centres are available for use by Indigenous community members and residents of Kitimat and Terrace for recreational, community and social activities. Previous increases in transient industrial workers created concern regarding capacity of recreational facilities, a 2013 study found that this had not occurred. Through the increase in industrial activity in the region, an increase in support occurred for development of recreational assets (such as sports organizations) and increase in revenues for recreational facilities. Kitselas notes that members which use recreational facilities have noticed capacity impacts in recent years.

**Policing and Emergency Services**

The Kitimat Fire and Ambulance Service responds to approximately 1,500 calls for service each year, including medical emergencies, fires, motor vehicle collisions, specialized rescue operation, and carbon monoxide calls. Kitimat Fire and Ambulance Service experienced an increase in service call volume of 35 percent in the first half of 2021 compared to the same period in 2020; fire-related calls increased by 6 percent and medical-related calls increased 16 percent. The Terrace Fire and Rescue Department experienced an increase in service call

volume of 32 percent in 2021 compared to 2020; fire-related calls increased by 74 percent and medical-related calls increased by 133 percent.

Changes in crime rates and caseloads indicate that police services in the LAA are experiencing increased pressure. Between 2015 and 2019, overall crime rates (the number of criminal code offences or crimes, excluding drugs and traffic, reported for every 1,000 permanent residents) increased in Kitimat and Terrace between 18.5 percent and 34.5 percent. Recently Kitimat's RCMP detachment added four officers in response to projected increased economic activity.

**Health Services**

Two hospitals are located in the LAA (Kitimat and Terrace). Kitimat General Hospital and Health Centre in Kitimat is a Level 4 trauma centre providing medical services to the community. It has a 24/7 emergency department with 22 acute care beds. Mills Memorial Hospital in Terrace provides healthcare to Terrace and surrounding communities in addition to communities such as Haida Gwaii, Stuart Lake and Dease Lake. Mills Memorial Hospital has 44 acute care beds. A new hospital, originally scheduled to open in 2024, will replace the Mills Memorial Hospital. It will have 78 beds and is expected to be more than twice the size of the current facility.

There are three health centres in the Indigenous communities located in the LAA. The Kitamaat Village health centre provides telehealth rooms, space for physiotherapists and dentists, nursing staff, mental health counsellors, alcohol/addiction workers, community health representatives and home care providers. The Kitselas Health Services administers a variety of health clinics and community groups based on the needs of Kitselas members. Their two locations are the Health Centre and Health Satellite office. The Kitsumkalum health centre provides health care services to their community and is managed by the First Nations Health Authority. A report on the well-being experiences of women in Kitimat and Kitamaat Village found women experience many barriers to healthcare, including access to obstetricians and gynecologists, long wait times, and few female doctors. The Kitselas First Nation 2021 Annual Determinants of Health Survey found that 72 percent of participants stated that local health services met the needs of their household and that 55 percent of participants indicated that all household members currently have a family doctor. Gitga'at First Nation 2021 Community Wellness Report states that healthcare services in northern British Columbia are overburdened and understaffed and members have experienced long wait times, a lack of specialized and culturally appropriate services, and systematic racism in the healthcare system.

**Education**

The Coast Mountains School District 82 provides education services to the LAA communities of Kitimat and Terrace, and the First Nations Schools Association supports Haisla, Kitselas and Kitsumkalum in providing educational services to community members. Post-secondary education is available at three locations in the RAA, the Coast Mountain College, University of Northern British Columbia and Kitamaat Valley Education Society.

Preschool and childcare are available in Kitimat, Terrace, Kitamaat Village and Thornhill. In 2020, there were 33 licenced childcare facilities providing 894 total spaces. Between 2014 and 2020, 18 new licenced daycare facilities were added in Kitimat and Terrace (LNG Canada 2020). Childcare shortages have been identified in Terrace and Kitimat and reported by members of the Haisla First Nation. Common issues include the high cost of childcare, unmet demand for group childcare, and a shortage of facilities with under three-years-old licences.

### *ACCOMMODATIONS*

Kitimat's 2019 assessment of population growth projections concluded that there would be a sufficient number of houses to accommodate the projected population in 2026. Terrace's 2020 assessment regarding population growth between 2020 to 2030 concluded there would be a significant shortage between 2020 and 2025. The Greater Terrace Housing Needs Assessment (2020) found that demand for workers in the area has added strain to the supply and affordability of housing.

Haisla noted that there is a lack of affordable housing based on housing shortages and low-income in the Kitamaat Village. Kitsumkalum has experienced finding land suitable for housing an ongoing issue with 20 families on a waitlist in 2016 and a projected increase to between 40 to 65 families by 2031. Gitga'at members living off-reserve reported that housing is unaffordable in northern BC and that safe and affordable housing is a critical issue for families and individuals.

There are several emergency shelter and transition houses in the LAA. Kitimat has Douglas Place, a cold weather shelter, and Dunmore Place, which is operated by the Tamitik Status of Women and provides emergency shelter for women who are escaping violence. In Terrace, there are several transitional and emergency shelters with a total of 66 emergency beds. Recently, demand for transitional housing has increased and shelters report they are operating at or beyond capacity; the number of women turned away between 2019 and 2021 has increased dramatically and clients are staying for longer periods due to lack of affordable housing.

The average housing price in Kitimat and Terrace has shown significant fluctuation between 2011 and 2019, correlating with actual or anticipated demand associated with industrial development. Terrace and Kitimat have seen an increase in rental demand and increase in rental cost since 2010 with significant influence of construction workers.

Hotels and motels, lodges and cabins, RV and camp sites and bed and breakfasts, are available for temporary housing in the Kitimat and Terrace areas. There are an estimated 391 temporary accommodation rooms in Kitimat and 1,188 in Terrace. In addition, there are three work camps in Kitimat that provide accommodations for workers the region, Sitka Lodge (an open camp with a capacity of 1,186), Crossroads Lodge (an open camp with a capacity of 700), and Cedar Valley Lodge (only houses LNG Canada workers with a capacity of 4,500).

### *TRANSPORTATION INFRASTRUCTURE*

Cedar considered the existing condition of both the road network and airports as part of the transportation infrastructure. The roadway infrastructure in the LAA consists of roads within Kitimat and Terrace, and Highway 37 between Terrace and Kitimat. There is limited long term traffic count monitoring in Kitimat and Terrace. Available monitoring data shows increases in traffic between 2014 and 2020 in both the Terrace and Kitimat areas. In Kitimat, increases were between 10 percent and 20 percent and on the Kitimat River Bridge, south of Terrace, traffic increased by 34 percent. Highway 16, west of Highway 37 near Terrace, which sees the most traffic in the area, experienced a decrease in traffic of just over 2 percent between 2014 and 2017. Car accident statistics have remained relatively stable from 2016 to 2019 for communities in the LAA. In 2020, decreases in car accidents and injuries were seen in 2020, with the exception of Kitimat, which continued to remain statistically stable. Passenger air traffic at the Northwest Regional Airport increased approximately 30 percent between 2013 and 2019; however, traffic did decrease in 2020 and 2021 as a result of COVID-19. Commercial air traffic increased 21 percent between 2018 and 2019. The municipal, provincial, and federal governments have supported the development of road infrastructure improvement projects in Kitimat and the surrounding areas in order to support the current and anticipated increase in road traffic volumes.

Access to the Project from Kitimat will occur via Haisla Boulevard, Alcan Way, and the Bish Creek Forest Service Road. Bish Creek Forest Service Road is primarily used for industrial purposes, such as accessing the Kitimat LNG site and some intermittent logging. The Bish Creek Forest Service Road was recently upgraded as part of the Kitimat LNG project and further modification is not expected as part of the Project.

#### *5.10.2.2 Potential Project Effects*

Construction will last approximately four years with an average of 230 to 315 persons over this period and an estimate peak workforce of 350 to 500 from April to October during each year of construction (starting in second year). Operation of Cedar LNG is expected to require approximately 100 full time staff with the majority from the local population, utilizing existing housing in Kitimat and surrounding area. During operations every three to five years an additional 100 persons will also be required to perform scheduled shutdown and maintenance. The workforce in all phases will be recruited locally as much as possible. However, construction and operation will require some specialized trades and qualifications/experience that will likely be sourced from elsewhere in BC, Canada or internationally. This non-local workforce will utilize the existing third-party work camps available in Kitimat. While the availability of existing labour force required to respond to Cedar LNG labour demands is unknown, an estimated labour force of 870 to 1,119 persons may be available to respond to Cedar LNG's demand for direct labour.

A variety of infrastructure and services have the potential to be affected. The Cedar LNG-related population increase will place additional demands on existing infrastructure and

services. The effect of population increases on the infrastructure and services VC is assessed by effect below.

### *CHANGES IN INFRASTRUCTURE AND SERVICES*

**Municipal Services and Infrastructure and Utilities**

Solid waste and wastewater from Cedar LNG have the potential to result in adverse effects to infrastructure and services. Wastewater is expected to be stored, pumped and disposed of at a licenced facility, although Cedar will consider treatment and discharge of wastewater under an *Environmental Management Act* permit. A waste management plan will be developed as part of the CEMP. Non-hazardous solid wastes will be recycled, reused or collected in a central secure area onsite and then disposed of at a local receiver facility. Hazardous liquid and solid waste will also be collected at a secure onsite location and then transported to a licenced hazardous waste facility.

Cedar LNG would not be connected to the municipal water systems and therefore, would not place additional demands on existing supply or infrastructure during any stage of the Project. During construction, Cedar would apply for permits to withdraw water from surface creeks. During operations, water would be supplied to the FLNG through desalination. Trucking water to the site is also a possibility in both stages. The Project workforce may use recreational facilities in local communities resulting in higher demand. The District of Kitimat and the City of Terrace have several recreation facilities that are used by local residents and transient workers. Although, workforce camps in Kitimat are equipped with recreation facilities, workers make use of other recreational amenities in Kitimat and Terrace.

**Policing and Emergency Services**

The presence of the Project workforce and Project activities could result in higher demand for services such as police, fire protection, and ambulance. Policing services may be affected by interactions between workers and residents, and by increased disposable income.

**Health Services**

Project workers will require health care as a result of illness or workplace injuries, adding demand to healthcare services. Cedar expected that for conditions that require routine health care, non-local workers will continue to use the services of family physicians or specialists located in their home communities. Medical facilities will be provided and will include first-aid stations, medical room(s) with beds and certified first-aid staff, dedicated communications devices for requesting outside emergency aid, first-aid staff, first-aid kits and space for equipment storage. Any medical emergencies that cannot be handled by the Project's onsite medical station will most likely be referred to Kitimat General Hospital.

**Education**

Increased demand for education services is only likely to occur during the operation phase as the non-resident construction workforce will reside in open camps/lodges in Kitimat and are unlikely to relocate families for work during construction, in Cedar's view. In the first years of operation, some non-local workers may re-locate to the LAA. However, considering the small size of the operation workforce and that not all of these workers will bring school-aged children to the LAA, the Project-related demand on the education system will likely be very small. Because total enrolment within the CMSD has been declining since 2010/2011 (as of 2021) and CMSD projected a decrease of 64 students over the next 10 years, it is predicted that there will be adequate capacity to accommodate any new Project-related students in the LAA. There are preschool and childcare shortages in the LAA, which would be sensitive to additional demand. The Project-related demand on preschool and childcare would likely be very small as few non-local workers are expected to permanently reside in the LAA and fewer would bring young children.

### *CHANGES IN ACCOMMODATIONS AVAILABILITY*

Accommodation availability may be temporarily affected by Cedar LNG as the short-term increase of population in the LAA has the potential to place additional demands on housing and temporary accommodations. It is possible that effects to housing could be felt disproportionately by vulnerable members of the population. During construction, non-local workers will be required to stay at one of the two existing work camps in Kitimat or in hotels and other temporary facilities. During operations, non-resident workers may relocate to the LAA. Cedar indicated that the workforce would likely primarily be accommodated at one of two open camps in Kitimat, Civeo Sitka Lodge and Crossroads Lodge, which have a total of 1,886 beds. Civeo Sitka Lodge currently operates a 24/7 medical clinic with nurse practitioner and advance care paramedic on staff. Crossroads Lodge does not currently provide medical services. Cedar Valley Lodge is a private lodge that houses the workforce for LNG Canada. It has a capacity for 4,500 workers and reduces demand on existing open workforce lodges in Kitimat. While it is likely that other projects in the region will also be using these camps for workers, Cedar anticipates that there would be space for the Project's non-local construction workforce. This was based on the fact that construction for Cedar LNG is planned to start in the second half of 2023 and would have the highest level of activity from spring 2024 through 2025. This is anticipated to coincide with completion of Coastal GasLink construction in 2023 and ramping down of the main construction phase for LNG Canada in 2024.

Given the use of open accommodations and Cedar's intent to hire local workers first, Cedar predicted that increased demand for housing and other forms of accommodation from in-migrating construction and operation phase workers is not expected to measurably increase demand such that upward pressure on costs occur.

### *CHANGE IN TRANSPORTATION INFRASTRUCTURE*

Multiple Cedar LNG-related activities have the potential to affect transportation infrastructure through the transportation of Project goods, services and workers. The increase in traffic will affect local infrastructure and require management procedures (Cedar plans to develop a Traffic Management Plan if required). Buses or vans will be used to transport workers from work camp to Cedar LNG and as much of the workforce as possible will be recruited locally. Road access throughout construction will be the primary means for delivery of materials and consumables, earthmoving equipment and transportation of construction workers from work camp, as well as the Northwest Regional Airport. An estimated 70 to 310 vehicle movements per day are estimated to occur throughout construction and operation, resulting in an increase in traffic between 26.7 percent and 118.3 percent along Bish Creek Forest Service Road during Project construction.

#### *POSITIVE EFFECTS*

Positive effects may be seen through economic contribution to the LAA (property and income taxes) representing a potential expansion of municipal tax bases, thereby helping to pay for additional service providers needed for the increase in population.

#### *5.10.2.3 Mitigation Measures Proposed in the Application*

Cedar proposed the following mitigation measures to avoid or minimize the potential adverse effects of Cedar LNG on the infrastructure and services VC:

- Implement a code of ethics, respectful workplace policies and provide cultural awareness training for all workers to reduce demand on local police and emergency services during operation;
- Provide onsite first-aid station, medical room(s) with beds and certified first-aid staff and dedicated communications devices for requesting outside emergency aid to limit demand on local health services during construction and operation;
- Implement onsite security services and security gate at the Cedar LNG site to increase safety by reducing unauthorized access and crime, thereby reducing demand on Kitimat police services during construction and operation;
- Prepare and implement an emergency management program for operation to assist in avoidance / management of emergencies at the Cedar LNG site, thereby limiting demand on emergencies in the LAA;
- Implement a local hire/procurement policy during construction and operation to reduce need for non-local workers, thereby reducing demand on local infrastructure and services;
- Develop and implement a waste management plan as part of the CEMP to reduce usage of landfills in the LAA through recycle/reuse/etc. of non-hazardous solid wastes and transportation of hazardous waste to an offsite facility;

- Use local workforce accommodation centres during construction to house non-local workers to limit demand on local housing and services; and
- Develop and implement a community feedback tool to allow Cedar to respond to community concerns and adapt mitigation measures if applicable to limit demand on local infrastructure and services.

During Application Review, Cedar also proposed a Follow-up Program under the IAA for infrastructure and services, which is described further below. Cedar also proposed a Follow-up Program on GBA Plus, which is described in Section 6.8: Human and Community Well-Being.

### 5.10.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group and Indigenous nations, the following key issues related to the assessment of the infrastructure and services VC for Cedar LNG were identified:

- Data sufficiency;
- Demands on infrastructure; and
- Cumulative effects on transportation infrastructure.

Issues raised by reviewers relating to GBA Plus and under-represented groups are discussed in Section 6.8: Human and Community Well-Being.

#### *5.10.3.1 Data Sufficiency*

Issues with the sufficiency of data presented in the Application were raised by Northern Health, Lax Kw'alaams, Gitxaała and Gitga'at.

Northern Health was not satisfied with the Application's information and assessment of impact to health services. The reliance on secondary sources was criticized. Northern Health noted that the baseline information provided for existing conditions did not contain important information and context. This included:

- Accommodations - rising housing costs, vacancy rates, and history of renovictions;
- Health Services - staff shortages, funding based on permanent residents, and Covid-related reduced capacity, primary care needs of non-local workforce; and
- Transportation Infrastructure - high industrial road traffic, winter driving conditions.

Lax Kw'alaams criticized the exclusive use of secondary data sources and requested rationale on why only secondary sources were used. Lax Kw'alaams requested explanation of how key informants were identified and which informants were consulted. Gitga'at raised concerns that the Application does not accurately characterize the infrastructure and services VC as it relates

to communities associated with Cedar LNG, especially regarding health service delivery, and that mitigations proposed are unclear and potentially insufficient.

Cedar stated that the baseline data on infrastructure and services presented in the Application reflect the requirements of the AIR. Cedar is of the view that these baseline data allow for a fulsome assessment of potential effects that are appropriate to the size of the Project (i.e., a peak construction workforce of 500 and an operations workforce of 100 FTEs) and the magnitude of potential effects. There are many current sources of information that describe in detail the socio-economic environment of the Project LAA and RAA. Baseline data were primarily drawn from current secondary data sources including LNG Canada Community Level Infrastructure and Services Management Plan (CLISMP) reports which provide detailed data on infrastructure and services in Kitimat and Terrace. The District of Kitimat Housing and Action Plan and Needs Assessment, the Greater Terrace Housing Needs Report, and the 2020 Community Childcare Needs Assessment and Space Creation Action Plan provided recent information on housing and childcare in the region, as well as insight into issues and concerns. Government databases and reports published by local municipalities and authorities also informed the baseline. Results of consultation influenced the scope of assessment and informed existing conditions. In addition, information was gathered from reports describing experiences of those groups expected to be disproportionately affected by the Project.

In addition to the information sources described above, Cedar engaged with local community groups to understand and work to address concerns related to the Project. Information regarding engagement is presented in the Public Consultation Reports, and engagement will continue as Project development advances.

The EAO considered the available data adequate for the purpose of the EA. In the absence of more detailed data, the EAO notes that it has considered the concerns raised by Northern Health and Indigenous nations regarding the current stressed state of the health care system, accommodations availability, transportation infrastructure and other types of infrastructure in its assessment of context in the residual effects characterization below.

#### *5.10.3.2 Demands on Infrastructure and Services*

Northern Health, Kitsumkalum, Gitxaała, Kitselas and ESDC raised concerns about the impact of population increases on infrastructure and services. These Working Group members expressed concerns that the region has already experienced large population increases due to existing projects and the cumulative effects of multiple projects are a strain on regional infrastructure.

Gitxaała commented on the demand on accommodation availability and the impacts on their members. Gitxaała's Socio-Economic Risk Report states "There are multiple members on the waitlist to access housing in the village and a large proportion of those individuals currently reside in Prince Rupert, Port Edward and Terrace. Due to the rapid rise of housing prices in these areas, Gitxaała members are choosing to relocate to Lach Klan". Additionally, Gitxaała noted the District of Kitimat study: Household Survey Population, Income, and Housing

Estimates was published in Feb. 2022 and includes updated information that is relevant to accommodation availability.

Northern Health requested information on how many workers would be expected to relocate and live in permanent housing (not work camps). Northern Health recommended a condition requiring Cedar to mitigate socio-economic effects and implement additional monitoring and management of socio-economic effects of the Project on both Indigenous and non-Indigenous communities and stakeholders, if monitoring indicated this was warranted. Kitsumkalum and Gitxaała also requested a condition regarding socio-economic effects and recommended Cedar be required to contribute to regional or other ongoing processes to mitigate cumulative effects.

Northern Health noted that recent information from 2022 shows that a significant portion of the local population in the Terrace area is without access to primary care and this is placing unprecedented demand on the local emergency department as people are presenting for primary care issues. Given this context, Northern Health raised concerns about the potential impacts of the Cedar LNG workforce on local health services and emergency health services. Northern Health stated that this is an impact which needs to be managed in the EA process. Northern Health noted that projects are able to support the resiliency of the local health care system by innovative/collaborative approaches in managing local health care challenges. Northern Health recommended that Cedar be required to develop a Health and Medical Services Plan (HMSP) as per Northern Health's Best Management Guide as a condition to this Project. Gitxaała also expressed concerns that assessment of impacts to infrastructure and services, in particular access to healthcare (including mental health care) and accommodation availability, were not addressed for Gitxaała members living off-reserve, such as in Terrace and Kitimat. Additionally, the assessment does not include any consideration of cumulative effects on infrastructure across the region that will increase pressure on Gitxaała's infrastructure on reserve.

Cedar stated that based on the current stage of Project development, they are not able to predict how many workers will relocate to the LAA and therefore have considered it may be as much as the maximum workforce of 500 people. Cedar proposes to implement a local hiring policy to reduce the in-migration of workers and their families. Cedar stated that the baseline data presented for infrastructure and services allow for the assessment of potential effects in a level of detail appropriate to the size of Cedar LNG, potential Project interactions with infrastructure and services and the magnitude of potential adverse effects. Available quantitative and qualitative information on health services and infrastructure in the LAA have been provided as well as a description of the challenges experienced by members of Indigenous groups with respect to access to health care and wait times. Cedar believes that the mitigations presented for infrastructure and services are appropriate for the size of Project, workforce, and magnitude of potential adverse effects.

Cedar responded that it would implement a number of mitigation and management measures to reduce adverse effects on the RAA's health infrastructure and services, including preparation

of a HMSP, which would include providing onsite first-aid stations, medical room(s) with beds and certified first-aid staff, an employee and family assistance program. Cedar is committed to communicating project information and predicted demands on infrastructure and services to responsible authorities, including Northern Health, to assist with their planning. In addition, as Project development and health and safety planning advances, Cedar stated that it would engage with Northern Health on the development of the HMSP and communicable disease management, noting that there is no Project-specific camp. Cedar also proposed a Follow-up Program for infrastructure and services to verify effects predictions presented in the Application, and to address specific areas of uncertainty that Cedar received comments on during Application review. Of particular concern was increased pressure on health care services provided by Northern Health and changes in housing availability.

Gitxaała noted that people, including non-local Cedar LNG workers, have the right to seek healthcare if they are in need. Gitxaała was of the view, that for some non-local workers, accessing healthcare while onsite is a better option compared to their home communities which may not have the same health care services available.

In consideration of the concerns raised the EAO proposes the following EAC conditions:

- CEMP, including a waste management plan to reduce usage of landfills in the LAA (Condition 9);
- Community Feedback Process (Condition 11) to receive and address community concerns and complaints, as introduced in Section 5.1: Air Quality, which would include the requirements to:
  - Establish and maintain a dedicated Project website and telephone line where the public may submit comments or questions to Cedar; and
  - Report out comments received and Cedar's follow-up actions, mitigations or resolutions applied.
- Health and Medical Services Plan (Condition 13), developed in consultation with Northern Health, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, that would address: communicable disease, require the provision of on-site first aid, emergency management at the work site, measures to minimize impacts to local non-urgent care services, including by encouraging workers to seek medical care in their home communities or in camps, where medical services are provided in camps, and communication between Cedar and health service providers;
- Socioeconomic Management Plan (Condition 14) that would require Cedar to prioritize local hiring and procurement to reduce the increase in population associated with the Project workforce and an accommodation policy that includes measures to ensure that accommodation for non-local contractor construction personnel is exclusively within

existing work camps or other temporary accommodations and does not include rental of local housing(and therefore contribute to housing shortages or price increases); and

- Regional cumulative effects initiatives (Condition 16) requiring Cedar to participate in a regional social and economic management and monitoring committee, if such a committee (or its equivalent) is created by the provincial or local government, to address regional socioeconomic issues (and includes participation from industry).

The EAO notes that these proposed conditions would target potential issues around effects on waste infrastructure, health services, housing infrastructure, and social effects as well as provide a mechanism for Cedar to engage with the community to address other concerns that may arise. The EAO also recommends mitigation measures under the IAA, including a Follow-up Program for infrastructure and services to monitor address effects on infrastructure as described in Section 5.10.4.1 below.

At the conclusion of the EA, Kitselas expressed concern that the proposed conditions would not effectively address issues regarding effects on health services, housing infrastructure and social effects. Kitselas noted that LNG Canada was required to implement similar conditions and most affected communities have indicated that they have not been successful.

Northern Health also expressed several outstanding concerns regarding increased demand to infrastructure and services. Northern Health commented on the insufficient capacity to accommodate the health service requirements of non-local temporary workers in the region. Northern Health cited experiences with comparable project in the region has resulted in increased demand for primary care services, such as non-emergency visits to the emergency department for prescription renewals. Northern Health indicated that this increased demand should be expected for Cedar LNG. Northern Health stated that the HMSP is inadequate to address their concerns and, as proposed, only meets the minimum requirements for the WSBC First Aid regulation. Northern Health was of the view that impacts to health services would be significant without additional mitigation. Additionally, Northern Health recommended that Cedar consider a worker accommodation strategy which requires the employer to have direct accountability for the non-local workforce beyond work hours.

The EAO acknowledges these outstanding concerns, the strains experienced on infrastructure and services, and the challenges in mitigating effects of this nature. The EAO has considered these factors in its ratings of residual effects below. The EAO concurs that effects on infrastructure and services from Cedar LNG are likely, but is of the view that the proposed mitigation measures are appropriate for the scope of potential effects of the Project, given the maximum number of workers for Cedar LNG. The EAO has captured these maximum worker numbers in the Project Description (Schedule A to the EAC), which would be legally binding, if issued. Additionally, the EAO notes that the Socioeconomic Management Plan would include adaptive management, which would allow the implementation of additional mitigations, if

necessary. The EAO is satisfied that this issue was adequately addressed for the purpose of the EA.

#### *5.10.3.3 Cumulative effects on Transportation infrastructure*

Kitsumakalum raised concerns about cumulative effects on the region and transportation infrastructure including both road and rail. Kitsumkalum was concerned that transportation of Cedar LNG construction materials and other supplies by land would contribute to these cumulative effects.

Cedar noted that the number of predicted vehicle trips per day between Kitimat and Terrace associated with construction activities would be 5-20 vehicles per day. This number will vary based on the construction activities and how many local contractors Cedar is able to engage and would be expected to be greatest in the summer months. Further, Cedar described that the construction workforce would peak at 500 people. This would occur after construction on the western end of Coastal GasLink is complete (i.e., the current pipeline workforce has been disbanded) and when LNG Canada is in commissioning and its workforce is substantially reduced. As a result, Cedar predicted there would be a substantially lower demand on regional transportation infrastructure and services providers when construction of the Project is underway.

In consideration of the comments received during the EA and in acknowledgement of the importance of considering the wider regional context and cumulative effects for socioeconomic effects, the EAO recommends a provincial condition (16) requiring Cedar to participate in a regional social and economic management and monitoring committee, if such a committee (or its equivalent) is created by the provincial or local government, to address regional socioeconomic issues (and includes participation from industry). The EAO notes that concerns regarding cumulative effects, as they relate to Kitsumkalum's interests are discussed further in Part C of this Report. The EAO considered this issue adequately addressed for the purpose of the EA.

### 5.10.4 THE EAO'S ANALYSIS AND CONCLUSIONS

This section presents the EAO's conclusions on the potential adverse residual effects from Cedar LNG on the infrastructure and services VC.

#### *5.10.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the analysis and information contained in the Joint Permitting /

Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[43], the EAO proposes the following provincial conditions:

- CEMP, including a waste management plan to reduce usage of landfills in the LAA (Condition 9);
- Community Feedback Process (Condition 11);
- Health and Medical Services Plan (Condition 13);
- Socioeconomic Management Plan (Condition 14); and
- Regional cumulative effects initiatives (Condition 16).

The EAO notes that if Cedar LNG receives an EAC, it would need to obtain provincial permits, including a water discharge permit under the *Environmental Management Act* for any discharges of water from the FLNG facility, including from wastewater. The EAO also notes that existing camps that may house workers are regulated under B.C.'s *Public Health Act* and must comply with the requirements of the Industrial Camps Regulation.

The EAO also recommends the following Mitigation Measures and Follow-up Programs under the IAA:

- Develop and implement a Worker Code of Conduct and provide cultural awareness training for all workers that includes local and cross-cultural awareness;
- Provide onsite first-aid station, medical room(s) with beds and certified first-aid staff and dedicated communications devices for requesting outside emergency aid to limit demand on local health services during construction;
- Implement onsite security services and security gate at the Cedar LNG site to increase safety by reducing unauthorized access and crime, thereby reducing demand on Kitimat police services during construction and operation;
- Prepare and implement an emergency management program for operation to assist in avoidance / management of emergencies at the Cedar LNG site, thereby limiting demand on emergency services in the LAA for infrastructure and services as defined in Section 7.11 of the Application;
- Develop and implement a waste management plan to reduce usage of landfills in the LAA for infrastructure and services as defined in Section 7.11 of the Application through recycle/reuse/etc. of non-hazardous solid wastes transportation of hazardous waste to an offsite facility; and
- Develop an accommodation policy that includes measures to ensure that accommodation for contractor construction personnel residing outside the

[43] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

Infrastructure and Services LAA is exclusively within existing work camps or other temporary accommodations and does not include rental of local housing.

In addition, the EAO also proposes a Follow-up Program for infrastructure and services under the IAA, which would include:

- The follow-up program will provide annual employment and health reporting during construction and for the first five years of operation. These reports will include information, including any disaggregated data that is voluntarily disclosed to Cedar or its contractors to:
  - The labour force, specifically the number of people working on the Project, where the people are from, and their accommodation (if non-local)
  - Workplace hospital visits in Terrace and Kitimat including:
    - Number of total unscheduled emergency room visits
    - Number of emergency room visits that have an associated Workers Compensation Board claim (i.e., are related to a work injury)
    - Number of in-patient admissions
    - Number of in-patient admissions that are related to a Workers Compensation Board claim
    - The "home" health services location for emergency room visits (i.e., are they from northwest British Columbia, from another area within the Northern Health Authority, or from an area outside of the Northern Health Authority)
- A copy of the annual reports will be provided to Northern Health and Schedule B Indigenous nations, and Cedar will be available to meet regarding the reports

#### *5.10.4.2 Residual Effects*

After considering all relevant proposed mitigation measures, the EAO concludes that Cedar LNG would result in the following residual adverse effects to the infrastructure and services VC:

- Changes in infrastructure and services (including health services);
- Change in accommodation availability; and
- Change in transportation infrastructure.

The EAO's characterization of the expected residual effects of Cedar LNG on the infrastructure and services VC is summarized below. The EAO's conclusion on significance reflects the EAO's assessment of the risk of the effects and uncertainty in the assessment, in addition to the other criteria.

**Table 27: Summary of residual effects to infrastructure and services resources from Cedar LNG**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low | The LAA has a long history with industrial development. Infrastructure and services in the region have been subject to several recent large industrial projects, as these projects ramp down spare capacity is anticipated. Accommodation availability will be less impacted due to the use of existing worker accommodation centres for temporary workers. There is existing capacity for increased use of transportation infrastructure. The region may have some resiliency for potential impacts to infrastructure and services. At the same time, Indigenous nations and Northern Health have expressed concerns that the region is already stressed by existing projects and cumulative effects. Northern Health has indicated health care capacity is particularly strained in the region. The context is rated low as a result. |
| Direction and Magnitude | Adverse and Low-Moderate | The influx of workers is expected to place additional adverse demand on infrastructure and services in the RAA. The magnitude is moderate (for the peak estimated workforce of 500 workers during construction) and low (for the estimated workforce of 100 workers during operations). |
| Extent | Regional | The predicted residual effects of Cedar LNG would be greatest in the Kitimat area but are expected to extend throughout the RAA. |
| Duration | Long-term | The residual effects are predicted to be present for the project life of Cedar LNG, although they will be greatest during construction. |
| Reversibility | Reversible | The residual effects are reversible in the long-term as the increased demand on infrastructure and services will subside when the Project is complete and the workforce is no longer required. |
| Frequency | Continuous | The residual effect would occur continuously; however, greater impacts are expected during Project phases requiring larger non-local workforces (i.e., construction). |
| Affected Populations | Disproportionate | The residual effect may be experienced more acutely by certain sub-populations (including groups of populations such as women, racialized persons, Indigenous Peoples, LGBTQ2+, (dis)abled people). |
| Risk (likelihood and consequences) | Moderate | The likelihood of Cedar LNG placing increased adverse demand on infrastructure and services is medium to high. The consequence of the increased adverse demand is moderate as non-local workforce required is expected to be small. Therefore, the risk is considered moderate. |
| Uncertainty | Moderate | The EAO's confidence in this assessment is moderate as there are a number of unknown variables that may influence the degree to which Cedar LNG will impose adverse effects to infrastructure and service. For example, uncertainty about the size of the non-local workforce required, the timing of the phases of other large projects in the |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | region and the effectiveness of the mitigation measures. However, the maximum number of workers is known with certainty. |
| Significance | EAO concludes that Cedar LNG would not have significant adverse residual effects on infrastructure and services, in consideration of the moderate nature of effects that would be greatest during construction (4 years), and the proposed provincial conditions and federal Mitigation Measures, which would allow effects to be monitored and adaptively managed. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions*

#### *5.10.4.3 Cumulative Effects*

An assessment of cumulative effects on infrastructure and services was undertaken because the Project is assessed as having residual effects on infrastructure and services and residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities. The past and present projects that were considered in the cumulative effects assessment are:

- Coastal GasLink Pipeline;
- LNG Canada Export Terminal;
- LNG Canada Load Interconnection Project (BC Hydro);
- Pacific Northern Gas Pipeline;
- Rio Tinto Aluminum Smelter;
- Rio Tinto Terminal A Extension; and
- Various forestry activities.

**Change in Infrastructure and Services**

The projects that are most likely to act cumulatively with infrastructure and services are projects for which the labour forces will be in the RAA at the same time as the Cedar LNG labour force. These projects will increase the population of the area and may result in additional demands on infrastructure and services in the RAA. Several current projects are likely to be completed by the time Cedar begins construction, reducing potential effects on infrastructure and services in the LAA. Based on available information, the Project's construction will likely overlap temporally with operation of the LNG Canada Export Terminal, which will require an operation workforce of between 400 and 700. Cedar LNG's contribution to this would be a maximum of 500 workers during the construction phase (approximately four years).

The likelihood of cumulative residual effects occurring is assessed as medium. The assessment is based on the capacity of infrastructure and services, Cedar's mitigation measures, Cedar's efforts to hire locally, the likelihood that future projects and physical activities will be required

to apply standard mitigation and other management measures, and cumulative demand for infrastructure and services during construction and operation.

**Change in Accommodation Availability**

The projects and physical activities most likely to act cumulatively with Cedar LNG to affect housing availability are those that may occur at the same time as Cedar LNG and require the presence of a workforce in the RAA. Workers from other projects may place additional demands on housing and temporary accommodations. This may result in displacing local residents and visitors and preventing them from using temporary accommodations. It may also lead to an increase in the cost of housing and rental accommodations and create barriers to accessing rental opportunities or homeownership, particularly for members of those groups already facing such challenges.

As reported in the Terrace Housing Needs Assessment, in a medium to high economic scenario, demand will exceed supply for housing between 2020 and 2030. This has been determined using a conservative approach and considering that the Project could potentially overlap temporally with other large projects in Kitimat, which could lead to an increase in the RAA population of up to 1,900 people during the Project construction phase. In consideration that this would include the LNG Canada operation workforce (peak of 700), this would not exceed capacity of local open lodges, as non-local workers for LNG Canada will stay at the LNG Canada Cedar Lodge. Project contribution to this effect would be moderate, in consideration of the construction workforce (maximum 500).

The likelihood of cumulative residual effects occurring as assessed is low during operation and decommissioning phases, when labour forces are relatively small. The likelihood has been assessed as high during construction as adverse effects on housing availability are likely to occur during construction if the planned projects in the RAA proceed as scheduled. The assessment is based on the capacity of housing in the RAA, Cedar's mitigation and enhancement measures, Cedar's efforts to hire locally, and cumulative demand for housing during construction and operation.

**Change in Transportation Infrastructure**

Projects and activities associated with future development may act cumulatively with Cedar LNG to affect transportation infrastructure if they overlap temporally. However, projects which result in upgrades to transportation infrastructure in the RAA, such as improvements to airports and roadways, will most likely have positive effects on transportation services and infrastructure, because they would increase their capacity. In addition, local spending as a result of the presence of project workforces may lead to an expansion of municipal tax bases and potential improvements to local roads and other transportation infrastructure.

Other project labour forces may travel on local roads periodically during their time off. However, because the existing work camps used for housing Cedar LNG construction workers

will have services available, including catering and opportunities for recreation, Project workers are unlikely to travel into communities within the LAA. Cedar would also provide carpooling services (bus or van) for Project workers between the worker accommodation centers and the Cedar site during construction. These measures will reduce Cedar LNG contributions to cumulative effects on transportation infrastructure (such as traffic congestion). Non-local Project workers may travel to and from the RAA via airplane through the Northwest Regional Airport. Other Project activities including construction traffic and the transport of waste would likely involve the movement of vehicles and equipment on local roadways and this would act cumulatively with the Project to affect traffic and road conditions.

Adverse residual cumulative effects on transportation infrastructure are not expected to result in an exceedance of available capacity, or a substantial decrease in the quality of a service provided, on a persistent and ongoing basis, which cannot be mitigated with current or anticipated programs, policies, or mitigation measures. The likelihood of cumulative residual effects occurring is assessed as low to medium. The assessment is based on the capacity of transportation infrastructure in the RAA, Cedar's mitigation and enhancement measures, and cumulative demand for transportation infrastructure during construction and operation.

#### *5.10.4.4 Interactions between Effects*

Under Section 22(1) of IAA (2019), the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including

iii. the result of any interaction between those effects.

The EAO also notes that Section 25(2) of the Act (2018)[44] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects to infrastructure and services are described above in Section 5.10.4.2.

The infrastructure and services VC assessment informed the assessment of Cedar LNG effects on other VCs and factors as follows:

- Employment and Economy VC: the labour analysis, and assessment of potential effects on housing affordability, cost of living, and regional economy;
- Land and Resource VC: considered information on outdoor recreation sites and trails; and

[44] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

- The impact of changes to infrastructure and services on Indigenous Interests is considered in Part C of this Report.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

The EAO notes that the effects of all human VCs, including infrastructure and services and employment and considered in the assessment of Human and Community Well-Being (Section 6.8). This assessment considers linkages within the human realm and considers effects in a holistic manner. In this assessment, the EAO concluded that there would be a moderate (both positive and adverse) magnitude effect on human and community well-being.

#### *5.10.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of infrastructure and services effects.

In the Application, Cedar noted that it incorporated information related to on-reserve infrastructure and services in its assessment but did not receive any associated traditional knowledge or traditional use information for the description of existing conditions.

During the EA, Gitga'at, Gitxaała, Kitselas and Lax Kw'alaams provided comments on the assessment of health and infrastructure effects, including related to proposed mitigation measures and characterization of residual and cumulative effects. The information provided is summarized above in section 5.10.3 , as well as being discussed in the nation-specific sections in Part C of this Report. Key ways in which the EAO took these comments into account in the acoustics assessment included:

- In the residual effects characterizations
  - Identifying that the context for infrastructure and services is low (or sensitive) based on information from Indigenous nations (as well as Northern Health) on the stressed state of the current housing availability and health care system;
  - Identifying the potential for disproportionate effects to Indigenous nations from infrastructure and services effects; and
  - Rating the uncertainty as moderate in acknowledgement of the uncertainties regarding the project workforce that will end up being hired locally and the effectiveness of mitigation measures, based on the experience with management plans for other projects in the region.
- Recommending a Follow-Up Program for infrastructure and services under the IAA;
- Recommending a community feedback process, which would provide a mechanism for Indigenous nations to raise concerns regarding community impacts, as a federal Mitigation Measure and provincial conditions; and

- Recommending provincial conditions requiring Cedar to prepare a HMSP and SEMP during all project phases and to participate in regional cumulative effects initiatives around socioeconomic effects (if created by government).

#### *5.10.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or significant cumulative effects on the infrastructure and services VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, the CEMP (Condition 9), community feedback process (Condition 11), health and medical services plan (Condition 13), and SEMP (Condition 14); and recommended Mitigation Measures and Follow-up Program under the IAA for infrastructure and services (Appendix 1).

# 5.11 HERITAGE

## 5.11.1 BACKGROUND

This chapter assesses the potential effects Cedar LNG would have on the heritage VC, including consideration of physical and cultural heritage and archeological, paleontological, or architectural sites or structures, as defined under Sections 2(c)(i) and (iii) of the IAA. The heritage VC includes consideration of impacts to archaeological sites, historical heritage sites and paleontological sites. Heritage was selected as a VC to meet regulatory requirements under the Act (2002), the IAA, and the *Heritage Conservation Act* (HCA), and due to the importance of heritage resources, including archaeological sites, to Indigenous nations, the public and other stakeholders, as well as its sensitivity to physical disturbance. Cedar LNG has the potential to result in the alteration, disturbance, or destruction of heritage resources through tree clearing and ground disturbance activities.

The heritage VC assessment draws on the information presented for the land and resource use VC regarding traditional knowledge and traditional use. Potential effects to cultural heritage (a component of the IAA 2(c)(i) and effects to the health, social or economic conditions of the Indigenous peoples of Canada (IAA 2(d)), are assessed in section 6.9 (Requirements of the IAA) of this Report.

### *5.11.1.1 Regulatory Context*

Heritage resources are regulated by both provincial and federal Acts. In addition to heritage requirements under the Act and IAA, the legislation and policies that apply to the heritage VC are described below.

Heritage sites are land (included land covered by water) and heritage objects are personal property, that have heritage value to BC, a community or an Indigenous nation. In BC, all heritage sites that pre-date 1846 and heritage wrecks (vessel or aircraft) abandoned for two years, or more are protected by the HCA, whether on provincial Crown or private lands. Heritage resources including burials and rock art sites are protected under the HCA which is under the mandate of the Archaeology Branch of the Ministry of Forests. The Heritage Branch, Ministry of Land, Water and Resource Stewardship is the province's primary body responsible for the conservation of historic places, fossil management and geographical names.

Both the HCA and the *Land Act* are the provincial legislation that governs the management of fossils.

### *5.11.1.2 Boundaries*

The RAA and LAA for the heritage VC were the same: the area where clearing and/or ground disturbance (including terrestrial, intertidal and subtidal areas) may occur for Cedar LNG, including the Facility Area (approximately 125ha) and the proposed transmission line corridor (approximately 32.5 ha). Cedar did not assess impacts to the heritage VC within the Marine

Shipping LAA because marine shipping is not anticipated to result in effects to coastal archaeological and heritage sites.

Cedar noted that heritage effects would only occur during the construction phase of Cedar LNG because this is the period when clearing and ground disturbance would occur.

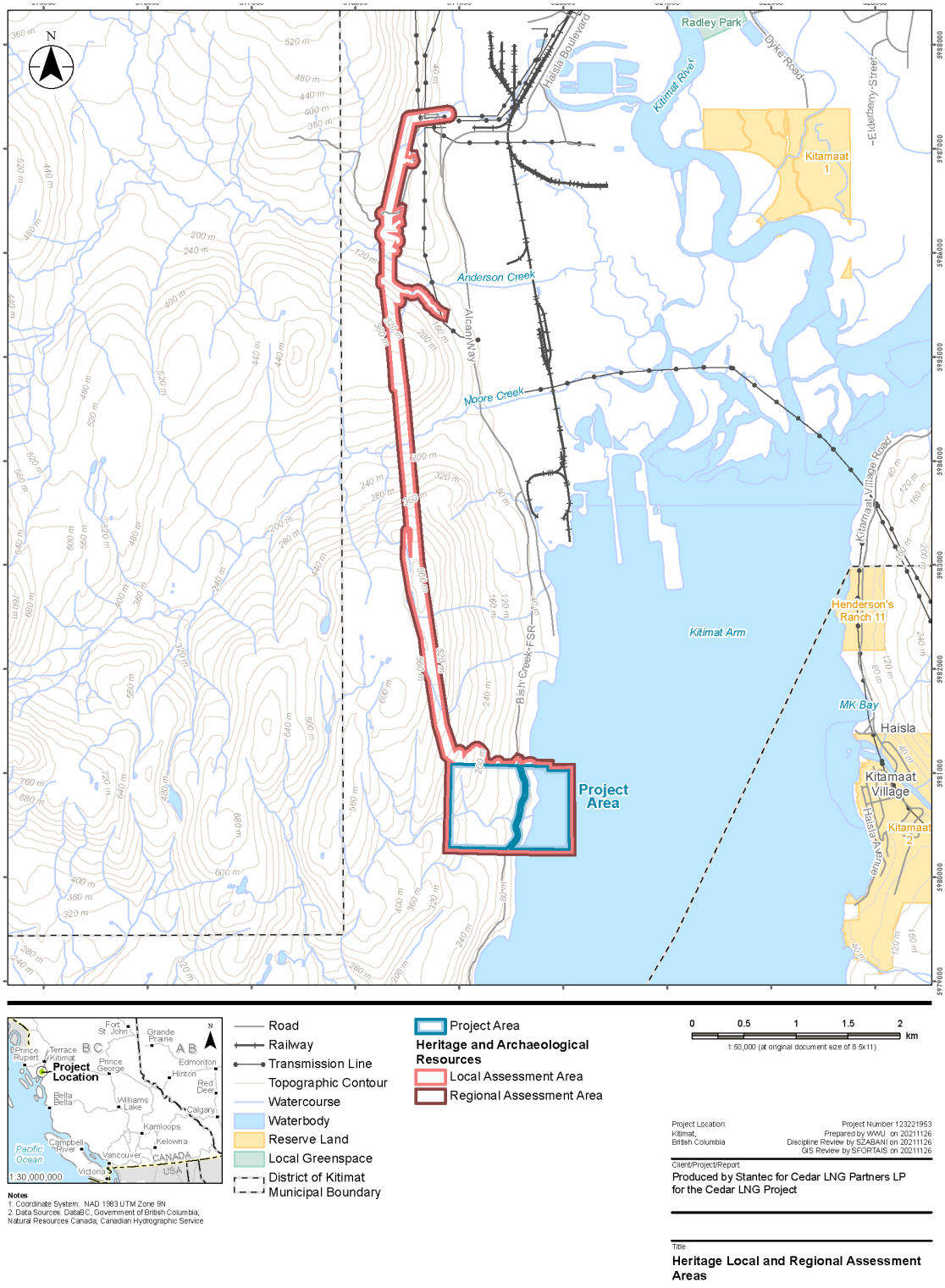


**Figure 22. Heritage VC Local Assessment Area (LAA), Regional Assessment Area (RAA) and Facility Area (Project Area).**

## 5.11.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.11.3.

### *5.11.2.1 Existing Conditions*

Cedar conducted baseline studies for heritage resources, which included a desktop review of recorded historic places, desktop paleontological review, desktop review of previous archaeological studies and a field Archaeological Impact Assessment (AIA) of the LAA/RAA to determine existing conditions.

The Regional District of Kitimat-Stikine's community heritage registry was reviewed to identify historic places recorded in the LAA/RAA. No historic places were registered in the LAA/RAA.

The paleontological review included examination of the online data sources administered by the Province to describe baseline paleontological resource conditions for the LAA/RAA and identify areas with high paleontological resource potential. No fossil sites were recorded in the LAA/RAA, with the closest recorded fossil occurrence approximately 5.5 km northeast of the proposed transmission line corridor. The potential for Project-related effects to paleontological resources was determined to be low as the bedrock in the LAA/RAA consists of igneous rock (generally fossils are found only in sedimentary rock).

From the desktop review of the previous AIA fieldwork completed in portions of the LAA/RAA, Cedar noted that one archaeological site had been recorded in the area, consisting of one pre-1846 culturally modified tree (CMT) which had fallen dead and showed heavy degradation. No additional CMTs or exposed archaeologic resources were identified during the AIA fieldwork. Three areas were identified as having moderate to high potential for the presence of buried archaeological resources in the LAA/RAA. However, none of these were found to have archaeological remains from the 27 subsurface tests that were completed over the three sites. Further details on the AIA are available in Appendix 7.13A of the Application.

### *5.11.2.2 Potential Project Effects*

Cedar identified a potential effect to the heritage VC that could occur during the construction phase that consisted of loss of information about or alteration to the site or context from:

- site preparation and clearing;
- construction of land-based infrastructure; and
- construction of marine-based infrastructure.

Cedar noted that the CMT identified in the LAA/RAA would be avoided or mitigated following all applicable regulatory requirements (under the HCA) and procedures as outlined in the Construction Environmental Management Plan (CEMP).

The potential exists for a chance find of heritage resources during construction. Should a chance find occur, the chance find procedure in Cedar's CEMP will be implemented. In addition, a chance find of archaeological materials would require a permit under the HCA and would also be initiated. This would include contacting the Archaeology Branch of the Ministry of Forests. Therefore, any effects on heritage resources as a result of a chance find are expected to be addressed and properly mitigated.

Cedar concluded that, based on these considerations, they did not anticipate residual impacts to the heritage VC during from Cedar LNG.

#### 5.11.2.2.1 PHYSICAL HERITAGE AND STRUCTURES– IAA, 2(C)I AND III

The IAA requires that effects within federal jurisdiction be considered. These include the following effects addressed in the heritage VC:

- 2(c) with respect to the Indigenous peoples of Canada, an impact — occurring in Canada and resulting from any change to the environment — on
  (i) physical and cultural heritage; and
  (iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Cedar assessed potential effects to physical heritage, including CMTs, archaeological resources, and materials or other physical evidence of human habitation or use.

As described above, one CMT was identified but it would be avoided during construction. Cedar did not identify any site-specific concerns from Indigenous nations related to heritage based on engagement and Indigenous knowledge information and TUS shared with Cedar by Indigenous nations.

#### 5.11.2.2.2 Positive Effects

Cedar did not identify any positive effects of the project on the heritage VC.

### *5.11.2.3 Mitigation Measures Proposed in the Application*

Cedar proposed the following mitigation measures for heritage resources:

- Where feasible, Cedar will avoid known heritage sites;
- If avoidance of heritage sites is not feasible, Cedar will consult with Haisla, and any mitigation determined through consultation with Haisla will be implemented;
- Having a chance find procedure for heritage resources as part of a CEMP; and
- If avoidance of heritage is not feasible or a chance find site requires alteration or disturbance Cedar will obtain the appropriate alteration permit under the HCA.

In addition, Cedar has integrated certain key design decisions into the project to help reduce the effects on the heritage VC, including:

- Locate natural gas pre-treatment and liquefaction equipment and LNG storage on the floating LNG facility, which reduces the size of the project footprint and limits impacts to archaeological features; and
- Clear span transmission towers across Moore and Anderson creeks, which avoids impacts to archaeological features.

## 5.11.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

### *5.11.3.1 Effects Along Shipping Route*

Gitga'at and Gitxaała requested that the potential effects to heritage along shipping route be assessed. Haida expressed concerns that were no conditions for the protection, monitoring, or follow-up measures for areas of cultural importance to Haida. Gitxaała noted that shipping wake effects and shipping accidents were not adequately considered with respect to potential effects to heritage sites.

Cedar noted that the heritage assessment focuses on areas where interactions are anticipated. Marine shipping is not anticipated to result in effects to the heritage VC. Results from publicly available wake effects studies prepared for other EAs in BC indicate that wake generated by Cedar LNG shipping traffic would be less severe than wind and current generated waves created naturally during storm events. Intertidal beaches are constantly interacting with rising and lowering tides and related wave action. Based on the previous studies, Cedar LNG shipping traffic is not anticipated to introduce any new wave-induced erosion effects on heritage and archaeological resources along the Marine Shipping Route.

In addition, Cedar completed an additional study on wake during Application Review, which is described in Section 5.9: Marine Use. Cedar noted that this analysis corroborated the information that Cedar has shared with the EAO and Indigenous nations through the EA process, which is that tug-escorted LNG carriers would have minimal potential effects on shoreline erosion (and therefore, also heritage resources). Cedar also has proposed a Follow-Up Program for marine use, as described in section 5.9, which would include a review to determine if new wake-related information (on wave characteristics on marine shipping activities) or mitigation measures (to reduce wake effects on Indigenous traditional harvesting activities) is available. Cedar would offer to meet with Haisla, Haida, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla to review results, discuss potential effects, and ways to mitigate them along the shipping route.

The EAO recommends this Follow-Up Program for marine use as a Mitigation Measure under the IAA, as described below. The EAO also notes that the proposed provincial condition for marine transportation communication procedures and federal Mitigation Measure for a marine transportation plan, as described in section 5.9, would also provide a means for Indigenous

nations to report on concerns related to marine shipping, including wake effects. The EAO was satisfied that this issue was adequately addressed for the purpose of the EA.

### 5.11.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO evaluated the potential effects of Cedar LNG that could affect heritage or archaeological sites, including consideration of physical heritage and archeological, paleontological or architectural sites or structures, under Sections 2(c)(i) and (iii) of the IAA.

#### *5.11.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[45], the EAO proposes the following provincial conditions.

- Construction Environmental Management Plan, which includes the requirement for a chance find procedure for heritage resources including fossils (Condition 9).

Heritage resources are protected under the HCA whether on Provincial Crown or private land. Under the HCA Section 12.1(2), sites and objects protected include those that predate AD 1846, burial sites and rock art sites. A permit is required for any subsurface investigation, excavation or alteration of an archaeological site or investigation with the intent to locate such sites. Mitigations for any potentially affected sites identified during construction would be determined in consultation with the appropriate permitting agency[46] and subject to receiving these permits.

A chance find procedure for all heritage resources (archaeological sites of all ages, historical heritage sites and paleontological sites) is included as part of the proposed CEMP, which would be developed in consultation with Haisla. This procedure would outline the process for ensuring the preservation and proper management of heritage resources, should any be unexpectedly encountered during project activities.

The EAO also recommends the following Mitigation Measures under the IAA for heritage:

- Develop and implement a chance find procedure for heritage resources for the construction phase.

[45] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

[46] If required for Cedar LNG, permitting under the *Heritage Conservation Act* will be administered by the OGC or the Ministry of Forests' Archaeology Branch (https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/archaeology/permits).

In addition, as described in Section 5.9: Marine Use, the EAO also proposes marine communication procedures and a Follow-up Program for marine use under the IAA related to wake effects on traditional marine use activities.

#### *5.11.4.2 Residual Effects*

After considering the mitigation measures proposed in the TOC and the protections under the HCA, the EAO concludes that Cedar LNG would not result in residual adverse effects to the heritage VC, including physical heritage and archeological, paleontological, or architectural sites or structures, as defined under Sections 2(c)(i) and (iii) of the IAA. Potential effects to cultural heritage and effects to the health, social or economic conditions of the Indigenous peoples of Canada are assessed in section 6.9 (Requirements of the IAA) of this Report.

#### *5.11.4.3 Cumulative Effects Assessment*

Cumulative effects to the heritage VC are not applicable for Cedar LNG as no residual effects were identified.

#### *5.11.4.4 Interactions between Effects*

Under Section 2(d) of the IAA, the effects within federal jurisdiction include:

d) any occurring in Canada to the health, social or economic conditions of the Indigenous peoples of Canada.

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including
   iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the Act (2018)[47] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects are described above in section 5.11.4.2.

The heritage VC assessment is linked to the assessment of other VCs and factors as follows:

- The impact of effects to the heritage VC on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and Section 6.9: Requirements of the IAA of this Report.

[47] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.

#### *5.11.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of heritage effects.

In the Application, Cedar noted that traditional knowledge and traditional use information was included in its assessment based on input gathered from the Haisla through consultation, and voluntary information sharing. The traditional knowledge provided by Haisla to Cedar through project-specific consultation and Haisla's traditional use study did not identify site-specific issues or concerns.

During the EA, Gitga'at, Gitxaała, and Haida provided comments on the assessment of heritage effects. The information provided is summarized above in section 5.11.3, as well as being discussed in the nation-specific sections in Part C of this Report. As described above, these comments provided by Indigenous nations influenced the EAO's assessment. In particular, the EAO took these comments into account in recommending mitigation measures including the provincial condition for marine transportation communication procedures and the federal Mitigation measure for a marine transportation plan, which would provide a mechanism for Indigenous nations to raise concerns regarding marine shipping and be engaged in discussions regarding vessel speeds. The proposed Follow-up Program for marine use (focused on wake) was also recommended in consideration of Indigenous nations concerns raised during the EA.

#### *5.11.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or cumulative effects on the heritage VC, including components related to Sections 2(c)(i) and (ii) of the IAA. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; and the proposed mitigation measures identified in the draft provincial TOC including, Condition 9: CEMP and the recommended Mitigation Measures under the IAA for heritage (Appendix 1).

# 5.12 HUMAN HEALTH

## 5.12.1 BACKGROUND

This chapter assesses the potential effects Cedar LNG would have on the human health VC. Human health was selected as a VC due to the importance to Indigenous nations, government agencies, the public and other stakeholders. In this chapter, effects to human health from exposure to chemicals of potential concern (COPC), noise and electromagnetic fields were considered. Effects to the human health VC from exposure to COPCs were evaluated using a Human Health Risk Assessment (HHRA).

Effects to social determinants of health and community well-being, considering impacts beyond COPCs, noise and electromagnetic fields are considered in Section 6.8: Human and Community Well-Being of this Report. Effects to infrastructure including medical services are evaluated in Section 5.10: Infrastructure and Services. Human health effects within federal jurisdiction including effects to the health, social or economic conditions of the Indigenous peoples are discussed in section 6.9 of this Report.

### *5.12.1.1 Regulatory Context*

Relevant federal and provincial statues, policies, and frameworks, as applicable, were used in Cedar's assessment of the potential effects to human health from Cedar LNG. The provincial and federal guidance considered are:

- *Public Health Act*, which included provisions to address environment health hazards from pollutants;
- Guidance on Human Health Risk Assessment (Northern Health);
- Guidance for Prospective Human Health Risk Assessment (BC HHRA Guidance);
- Guidance for Evaluating Human Health Impacts in Environmental Assessments: Human Health Risk Assessment (Health Canada);
- Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada); and
- Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality (Health Canada).

### *5.12.1.2 Boundaries*

The human health spatial boundaries are based on the other VCs which may affect human health (i.e., air quality and acoustic VCs). The air quality VC has a 40 km by 40 km boundary centered on Facility Area and a 1.5 km zone on each side of the Marine Shipping Route for the LAA/RAA (see Figure 6 in Section 5.1: Air Quality of this Report). The acoustics VC has an area spanning 3 km in all directions from the Facility Area, proposed transmission line corridor and 1.5 km from the center of the approximately 265 km shipping route for the LAA/RAA (see Figure 8 in Section 5.2: Acoustics of this Report).

Cedar assessed effects to human health during construction, operations, and decommissioning.

## 5.12.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section summarizes the information, methods and conclusions presented by Cedar in the Application, while input from reviewers is summarized in section 5.12.3.

### *5.12.2.1 Existing Conditions*

Cedar sourced baseline data for the human health analysis from the air quality and acoustic VC. Further information on Cedar's analysis is available in section 7.12.5 of the Application.

To determine the potential health effects of Cedar LNG, a HHRA was conducted to evaluate potential risks at receptor locations where people are known to be present in proximity of Cedar LNG. This was done by identifying the COPCs anticipated to be present in the emissions from Cedar LNG, predicting the Cedar LNG-related changes to environmental media (such as, soil, water, country foods, air), which people could be exposed to and estimating and assessing the risk these predicted changes could have on human health. Individual COPCs were selected based on their anticipated presence in the emissions from Cedar LNG and presence of human receptors. Cedar determined that the operable Cedar LNG-related exposure pathway was inhalation of COPCs in the air. In addition, the HHRA considered the human health effects of exposure to noise and from Cedar LNG-related activities from physical activities and physical works and electromagnetic fields (along the transmission line right-of-way). Exposure pathways from soil, sediment, surface water, groundwater and country foods were considered inoperable as they did not have Cedar LNG-related COPCs, and in some cases there was not the presence of human receptors. As such, Cedar did not assess these exposure pathways in the HHRA.

Air quality in Kitimat is influenced by existing industrial activity with exceedances of health thresholds for concentrations of one-hour and annual $SO_2$ and 24-hour $PM_{2.5}$. The existing acoustic environment in the LAA/RAA is dominated primarily by nature sounds and sometimes the sounds of marine vessel traffic. In Kitamaat Village, Lach Klan (Kitkatla), Metlakatla Village, and Kitimat, the existing acoustic environment also includes anthropogenic sounds such as rail, marine, air, and vehicular traffic, as well as industrial activities. Both the daytime baseline sound levels and the baseline nighttime sound levels do not exceed the OGC Permissible Sound Level (PSL) at any of the receptor locations. Existing conditions for the air quality and acoustics VCs are described in further detail in sections 5.1 and 5.2 of this Report, respectively.

### *5.12.2.2 Potential Project Effects*

Two exposure pathways for potential effects on human health were identified, these being the inhalation of COPCs in the air and noise exposure from project activities and physical works. Cedar LNG was not predicted to have a measurable impact on chemical concentrations in soil,

sediment, surface water, groundwater, and country foods; therefore, these potential pathways were identified as inoperable and not identified as sources of exposure to COPCs. Cedar also determined electromagnetic fields were an inoperable pathway because the extremely low frequency electromagnetic fields produced by the transmission line for Cedar are not hazardous to human health.[48]

Inhalation exposures to COPC in ambient air and exposure to noise during the construction, operations and decommissioning phases of Cedar LNG could contribute to potential changes in human health risk. The change to human health from these pathways is generally a function of the person's proximity to Cedar LNG (air emission and noise dissipate with distance from the source) and the duration of exposure.

### *AIR QUALITY*

During all phases of Cedar LNG, vehicle and equipment exhaust would be produced from fuel combustion and released into the area. The operation of the FLNG facility would produce COPC emissions from flaring. Cedar considered ten air contaminants and determined three should be considered COPCs. The three COPCs identified by Cedar were sulphur dioxide ($SO_2$), nitrogen dioxide ($NO_2$) and particulate matter 2.5 micrometres or smaller in diameter ($PM_{2.5}$). The remaining seven air contaminants that were considered by Cedar included polycyclic aromatic hydrocarbons (PAH), particulate matter 10 micrometres or smaller in diameter ($PM_{10}$), diesel particulate matter (DPM), hydrogen sulfide, volatile organic compounds (VOC) and ozone. However, following Cedar's assessment of each of these seven air contaminants, none were classified as a COPC and no further assessment was required (Appendix 7-12A: Technical Data Report – Human Health Risk Assessment). With respect to $PM_{10}$, it was determined that during construction, this air contaminant would result primarily from wind erosion and road dust/soil raised from vehicle motion. However, as $PM_{10}$ (due to its particle size) generally only disperses in the immediate vicinity and redeposits on the ground, and as the soil piles would be sprayed with water, it was not identified as a COPC in the construction phase. During the operations phase, the vast majority (greater than 99 percent) of the $PM_{10}$ was actually $PM_{2.5}$, and therefore, $PM_{10}$ was not identified as a COPC in operations. The human receptors exposed to COPCs include all people in the air quality LAA/RAA, including people within residential areas, hospitals, schools, daycares or using the land for traditional, recreational, or other activities.

Cedar evaluated the existing and predicted future air quality conditions with Cedar LNG, as described in Section 5.1: Air Quality of this Report.

A total of 29 receptor locations were used to assess the Cedar LNG Facility Area. It was determined that there were existing areas where the one-hour $SO_2$ and one-hour $NO_2$ concentrations were already above air quality benchmarks.

[48] Based on the publication from Health Canada, Power lines and Electrical Products: Extremely Low Frequency Electric and Magnetic Fields.

Three receptor locations were assessed for the Marine Shipping Route. Among them, Hartley Bay represents the worst-case conditions for people along the Marine Shipping Route based on its proximity (approximately 3 km from the shipping route). The other two receptor location, Lach Klan (Kitkatla) and Metlakatla Village, are located approximately 15 km and 30 km from the shipping route, respectively.

Additional information regarding air quality is available in Section 5.1: Air Quality of this Report.

### *ACOUSTICS*

During construction and operation, noise from Cedar LNG vehicles, equipment, LNG carriers and project infrastructure all have the potential to adversely affect the quality of life of nearby residents or land users. These noise levels dissipate with distance and barriers between noise source and human receptors. The human receptors exposed to COPCs include all people in the Acoustic LAA/RAA. This includes Kitamaat Village, people living within 3 km of the shipping route, recreational or temporary land user (such as campers or hikers) and Indigenous land users engaged in traditional use practices (such as harvesting country foods).

Cedar evaluated effects of noise through consideration of annoyance rates and sleep disturbance. Health Canada considers a "quiet rural area" to be an area with a *day-night equivalent sound level* ($L_{dn}$) of 45 decibels (dBA) or less due to human-made sounds. The assessment of human health from noise effects is based on incremental increase from the existence scenario to the Cedar LNG scenario. Health Canada's noise guidance uses the percent highly annoyed (%HA) to quantify annoyance due to noise effects for activities with a duration of 12 months or more. The %HA is calculated from the base case (existing noise conditions), construction case and operation case. Health Canada's recommended maximum increase in %HA (for more than a year) is 6.5 percent. As recreation land users are not present for more than a year this metric is not applicable. From the World Health Organization guidelines, Health Canada recommends sleep disturbance being a maximum indoor sound level of 45 dBA 10 to 15 times per night. Health Canada considers the outdoor-to-indoor transmission loss with windows at least partially open to be 15 dBA, making the maximum outdoor levels 60 dBA (i.e., emergency marine horn). Health Canada uses 45 dBA for the continuous outdoor noise threshold (i.e., facility operation).

A total of 28 receptor locations were used to assess sleep disturbance for Cedar LNG. During construction these ranged from an increase of 0 to 5.8 %HA and operations showed a range from 0 to 2.9 %HA, all less than the recommended maximum. The maximum %HA in both phases were located at the Half Moon Bay Traditional Use Area. It was determined that sleep disturbance did not apply to the construction phase as most construction activities are planned to occur during the day. The potential sleep disturbance during operations was estimated at five receptor locations with the sound levels ranging from 51.3 to 59.1 dBA from the marine horn, less than the 60 dBA threshold for maximum outdoor noise, and negligible to 34.5 from the facility operation, all less than the 45 dBA threshold for continuous outdoor noise.

Additional information regarding acoustics is available in Section 5.2: Acoustics of this Report.

#### *POSITIVE EFFECTS*

Cedar did not identify any positive effects of Cedar LNG on the human health VC.

##### *5.12.2.3 Mitigation Measures Proposed in the Application*

Cedar did not provide mitigation measures specific to human health because Cedar's concluded that Cedar LNG did not have unacceptable effects to human health. However, mitigation measures that address air quality and acoustic are discussed in section 5.1 and 5.2, respectively, and would also mitigate potential effects to human health, including Follow-Up Programs under the IAA for air quality and acoustics.

### 5.12.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, Indigenous nations, and the public, the following key issues related to the assessment of human health for Cedar LNG were identified:

- Human health effects from air emissions;
- Baseline information on COPCs;
- Human health effects along Marine Shipping Route;
- Human health effects experienced by workers at worker accommodation location;
- Reliance on LNG Canada information; and
- Use of Health Canada human health risk assessment guidance.

##### *5.12.3.1 Human Health Effects from Air Emissions*

Health Canada, Northern Health and Kitimat Terrace Clean Air Coalition (KTCAC) (via the public comment period on the Application) raised concerns on the potential health effects from air quality emissions, monitoring and follow-up.

Health Canada was of the view that although there is currently inadequate evidence to infer a causal relationship between long term exposures to $SO_2$ and health effects, it is still important to collect continuous monitoring data for multiple time scales, including annual averages for all project phases in order to provide an overall picture of the $SO_2$ concentrations in the project area. Health Canada requested $SO_2$ be included in follow-up monitoring to ensure Cedar has the ability to reduce residual and cumulative effects, as well as keep concentrations as low as possible. Health Canada also commented, since $NO_2$ and $PM_{2.5}$ are both non-threshold pollutants[49], further measures should be considered in order to reduce the burden of air

[49] As per HC Air Quality guidance: non-threshold substance means that health effects may occur at any level of exposure. Health Canada. 2016. Guidance for Evaluating Human Health Impacts in Environmental Assessment: AIR Quality. Available at https://publications.gc.ca/site/eng/9.802343/publication.html

pollution on the population.

Health Canada disagreed with the Cedar's use of Canadian Ambient Air Quality Standards (CAAQS) to calculate HQs. Health Canada stated that the CAAQS are most effectively used as a tool for improving air quality, not as a benchmark for assessing the acceptability of risk. Therefore, Health Canada did not support the assumption that exposures that are below the CAAQS would represent a negligible risk to human health. In addition, Health Canada indicated that if the predicted concentration of an air COPC exceeds a CAAQS, even if it is the base case, further discussion should be provided. Northern Health also raised a concern regarding the approach that Cedar took in assessing air quality health impacts for non-threshold pollutants.

Cedar referenced the four $SO_2$ monitoring stations that are currently present in the Kitimat area, stating that monitoring of baseline conditions and the incremental increase could be completed using these stations. Cedar stated that Cedar LNG will not be a significant source of $SO_2$ and, noted that, compared to the existing Rio Tinto aluminum smelter, the incremental increase resulting from Cedar LNG is not likely to be measurable or distinguishable. Any applicable permits, approvals or authorizations required will be applied for by Cedar.

In consideration of the concerns raised during the EA, the EAO has considered the residual and cumulative effect of $SO_2$, $NO_2$ and $PM_{2.5}$ in its analysis and conclusions below. The EAO notes that if Cedar LNG receives an EAC, it would need to obtain provincial permits, including waste discharge permit for air emissions under the *Environmental Management Act*. This permitting process would be administered by the OGC. As part of this process, the OGC would require detailed project design with updated air quality modeling. An air quality management plan and monitoring program would be expected to be conditions of a permit. The EAO also recommends Mitigation Measures and a Follow-up Program under the IAA for air quality, as described in Section 5.1: Air Quality of this Report. The EAO considers that, the proposed federal measures, in combination with the proposed CEMP (which will include air quality management), the detailed permitting process and expected permitting conditions would adequately address the potential effects to human health via changes in air quality identified during the EA.

Northern Health requested that further information be provided regarding the locations of the areas with the highest existing concentration of COPCs, the likelihood of people visiting these areas or being in the general vicinity, and how Cedar LNG will change these risks/impacts.

Cedar stated that the locations of highest concentrations of one-hour and annual $NO_2$, one-hour $SO_2$ and 24-hour and annual $PM_{2.5}$ are predicted to occur in the same location for the base case and application case. For the project alone case, the highest concentrations are predicted to occur within the project footprint. This limited contribution demonstrations that, should receptors be present at these locations, the potential human health risk would be as a result of the base case conditions.

KTCAC raised concerns regarding the potential impacts of Cedar LNG on human health. The concerns included: inadequacies associated with relying on ambient concentrations, assessment of non-threshold COPC, and inadequacies in cumulative effects assessment. KTCAC

also felt that Cedar's Application Information Requirements lacked sufficient consideration of the effects of air quality on human health.

Cedar explained that Cedar LNG would have negligible emissions further than 1.5 km from Cedar LNG and these would not overlap Rio Tinto (4 km) or Kitimat (6 km). As there are no residences or living quarters within 1.5 km of Cedar LNG, the incidence of asthma, COPC, and/or premature mortality in Kitimat, Terrace or other communities would remain unchanged from current levels. While Cedar acknowledged there may be existing health concerns related to inhalation exposure of COPCs, Cedar LNG is a negligible contributor. The cumulative effects of Cedar LNG would be localized (within 1 km of the Facility Area) and have little influence at further distances.

The EAO notes that the cumulative effects of air emissions on human health are considered below and that permitting and federal conditions described in Section 5.1 and in section 5.12.4.1 below, would target air quality emissions that could have effects on human health. The EAO notes that the proposed Follow-up Program for air quality would include consideration of health effects and results would be provided to Health Canada, Northern Health, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla. The EAO recommends that proposed air quality Follow-up Program include $SO_2$, $NO_2$ and $PM_{2.5}$. The EAO is of the view that these issues have been adequately resolved for the purposes of the EA.

#### *5.12.3.2 Baseline Information on COPCs*

Northern Health commented that although Cedar LNG is not expected to contribute COPC concentrations to terrestrial environments, baseline sampling of soil, groundwater, sediment, and surface water at the site is needed to ensure that Cedar LNG does not disturb and mobilize any potential existing contamination that may be present. Given current and former industrial processes in the region, Northern Health understands that regional contamination (such as metals or PAHs) from the deposition of air emissions and other historical industrial process may exist in the area. Baseline information is also needed in case of accidental and unexpected releases of contamination and can serve to protect Cedar's and province's liability in the event of concerns or incidences.

Cedar responded that Cedar LNG is located on a site that has no prior history of industrial activity or development (apart from a log sort). Although deposition of particle-bound non-volatile (metals and heavier molecular weight PAH) and semi-volatile (lower molecular weight PAH) compounds may have occurred on the site, the site is located 2 to 3 km south of Kitimat Harbour, and thus, both deposition and the subsequent accumulation of contaminants in surface soil on the site can reasonably be expected to be minimal. Based on this is reasonable to conclude that construction activities onsite would not be expected to alter the quality of soil on the site. Cedar further noted that accidental releases of contaminants would be addressed at the time of release and would be remediated at the time of the release. However, Cedar agreed to conduct baseline soil sampling to confirm that concentrations are below regulatory standards.

In consideration of the concerns raised by Northern Health, the EAO proposed a condition (Condition 15) requiring Cedar to conduct baseline soil sampling for metals and PAHs prior to starting construction. Results must be compared to appropriate regulatory standards and if exceedances are observed and if there are operable pathways, Cedar must complete a Human Health and Ecological Risk Assessment (HHERA), the results of which will then inform additional sampling, mitigation and/or monitoring measures where needed. With this condition, the EAO considered this issue adequately addressed for the purpose of the EA.

#### *5.12.3.3 Human Health Effects Along Marine Shipping Route*

Health Canada noted that the assessment of the health effects from emissions of an LNG carrier passing a community along the Marine Shipping Route focused on acute exposure. While the emissions from vessels associated with Cedar LNG would be intermittent, exposures are expected to be repeated, occurring on a regular basis for several years, and chronic effects should be considered. In addition, the effects of vessels from a number of projects should be considered.

Cedar stated that with up to 50 LNG carrier loads per year, and accounting for incoming and outgoing trips, an LNG carrier would pass along the Marine Shipping Route 100 times per year (approximately 1.9 carriers every week). Exposure at Hartley Bay would only occur when the wind blowing west towards the community of Hartley Bay. As the air quality model predicted $NO_2$ levels to rise and return to normal within a 40-minute period after an LNG carrier passes, the intermittent but recurring exposure would theoretically be a 40-minute exposure up to 1.9 times per week. Cedar did not believe that this is an appropriate exposure scenario to assess chronic inhalation health risk, given the low exposure and high amount of uncertainty.

Health Canada was satisfied with the level of detail provided in the assessment but noted that the EAO should be aware that the chronic and cumulative human health effects of vessel emissions are an uncertainty in the assessment.

Gitxaała was of the view that the Application did not adequately consider the potential effects of shipping on marine country foods, with specific concern regarding ingestion of seafood being harvested from marine areas which may be affected by COPCs. Gitxaała was of the opinion that Cedar's determination of this being an inoperable pathway was incurred due to the risk of accidents and malfunctions affecting water and sediment quality.

In Cedar's supplemental note on the effects of Cedar LNG on Gitxaała Nation's Indigenous Interests, dated April 20, 2022, Cedar stated that changes to quality of country foods (such as traditional foods) were identified as an effect pathway in the assessment of project interactions conducted in the Application). However, Cedar indicated that Cedar LNG would not contribute COPCs to the marine environment. The HHRA that Cedar completed included review of LNG Canada's HHRA for seafood consumption. Cedar concluded in the HHRA that marine country foods were not an effect pathway. As such, the effect pathway of changes to quality of country foods (including marine) was not carried further in the Application.

Gitxaała found this response to be satisfactory for the purposes of the EA, but maintain that accidental releases of COPCs from shipping accidents or malfunctions would be likely to affect marine country foods and should be prioritized in any human health related assessments or monitoring that would be carried out in the event of a shipping accident or malfunction. This issue is discussed further in section 6.1 of this Report.

The EAO has considered Working Group views in its ratings of uncertainty for residual health effects from air emissions along the Marine Shipping Route.

#### *5.12.3.4 Human Health Effects Experienced by Workers at Worker Accommodation Locations*

Health Canada raised concerns regarding the HHRA where it is stated that there is no worker camp proposed for Cedar LNG. During Working Group meetings, Cedar stated that workers would reside in existing “open camps” and Cedar committed that “the assessment of human health will include a review of locations with permanent (for example, residential homes, permanent worker camps) and temporary human receptors (such as camp sites or recreational sites)". Health Canada also referenced LNG Canada where information regarding off-duty workers, who do not fall under WorkSafeBC jurisdiction, is considered. Health Canada stated that inclusion of work camps in the HHRA is necessary to include as a human receptor location.

Cedar stated that the "open camps" in Kitimat include the Civeo Sitka Lodge and the Horizon North Crossroads Lodge. These two camps are approximately 8.4 km and 10.4 km from Cedar LNG, respectively. These workers are treated as residents of Kitimat because the camps are located within the town.

The Civeo Sitka Lodge and Horizon North Crossroads Lodge correspond to the approximate location of Receptor #10 (Kitimat General Hospital) and Receptor #4 (St. Anthony's Elementary School), respectively. This means that off-duty workers living at the two camps would have a human health risk comparable to that of Receptors #4 and #10.

Predicted base case and application case concentrations were below the CAAQS for Receptor #4 – $PM_{2.5}$ (24-hour and annual) and $NO_2$ (1-hour and annual), and Receptor #10 – $PM_{2.5}$ (24-hour and annual) and $NO_2$ (annual). Although the predicted values are below the CAAQS, these non-threshold, non-carcinogenic contaminants have been further considered in mitigation measures and an air quality follow-up program. Predicted base case and application case concentrations were above the CAAQS for Receptor #4 – $SO_2$ (1-hour), and Receptor #10 – $SO_2$ (1-hour) and $NO_2$ (1-hour). However, Cedar concluded the change in concentration between base case and application case represented a negligible increase to health risk.
Inhalation health risk for off-duty workers was described in LNG Canada because the LNG Canada worker camp is immediately adjacent to the construction site. This would result in LNG Canada workers being exposed to high levels of air emissions when on-duty at the construction site, and off-duty remaining exposed when living beside the construction site. A comparable exposure scenario is not applicable to Cedar workers, who will travel more than eight kilometres from Cedar LNG after their work shift is over.

The EAO is of the view that this issue has been adequately addressed for the purposes of the

EA. The EAO notes that the permitting conditions, provincial conditions and federal mitigation measures described further in in section 5.12.4.1 below, which would address air quality emissions would also reduce any potential health effects of receptors at all locations.

#### *5.12.3.5 Reliance on LNG Canada Information*

Northern Health raised concerns regarding the sufficiency and appropriateness of Cedar relying on LNG Canada's human health-related data, rather than directly conducting project-specific assessments and collecting project-specific data.

Cedar responded that the Ministry of Health had recommended the respective information from LNG Canada's HHRA be applied to the Cedar LNG human health VC and Cedar LNG's HHRA. Cedar ensured this was part of the Application to the appropriate extent to ensure the information that was utilized was applicable to Cedar LNG. Real-time air quality data was collected from air quality monitoring stations and compared to the LNG Canada air quality modelling data, from which Cedar concluded that the LNG Canada modelling results over-predict the actual air quality conditions. As such, Cedar was of the view that the air quality conditions during construction and operations would be lower than predicted in the Application. Cedar noted that LNG Canada had negligible human health risk conclusions at substantially higher emissions concentrations with closer human receptor residents than Cedar LNG, and their results were used as support for the professional opinion on the scope of the assessment.

The EAO is of the view that this issue has been adequately addressed for the purposes of the EA. This conclusion is supported by Cedar's participating in the Kitimat Airshed Group or successor airshed monitoring programs established by the Province (Condition 16) and the recommended Follow-up Program for air quality, which requires the comparison of air quality monitoring results and residual effects characterization criteria in the Application to data collected from monitoring stations over the first three years of operations.

#### *5.12.3.6 Use of Health Canada Human Health Risk Assessment Guidance*

Northern Health did not agree with Cedar following Health Canada's HHRA guidance rather than the BC HHRA guidance. This provincial guidance provides a standardized approach to assessing the potential human health risks from exposure to environmental contaminants related to proposed projects in BC.

Cedar noted that a draft of the BC HHRA Guidance was only published in April 2021, at which point Cedar was close to completion of Cedar LNG's HHRA. The version 2.0 (final) of the BC HHRA Guidance was published in April 2022, post-completion of Cedar LNG's HHRA and after the Application had been submitted. Cedar stated that both the Health Canada and BC HHRA Guidance were based on the same overall methodology in assessing human health risk (same principles of toxicology and human health risk quantification), and the completion of a federal HHRA was representative for Cedar LNG; therefore, the conclusions of the HHRA are not

affected. In addition, Cedar indicated that the requirements of the BC HHRA Guidance are broader than the federal Guidance.

The EAO is of the view that these issues have been adequately resolved for the purposes of the EA. This conclusion is supported by the air quality management measures required as part of the CEMP (Condition 9), Cedar's participation in the Kitimat Airshed Group or successor airshed monitoring programs established by the Province (Condition 16), provision of a soil sampling report (Condition 15) and the federal Mitigation Measures. These are described further in section 5.12.4.1 below.

## 5.12.4 THE EAO'S ANALYSIS AND CONCLUSIONS

This section presents the EAO's conclusions on the potential adverse residual effects from Cedar LNG from construction, operations and decommissioning activities to the human health VC.

### *5.12.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[50], the EAO proposes two provincial conditions directly applicable to human health:

- CEMP, including human health effects, as well as noise and air quality management measures (Condition 9);
- Soil sampling report, including baseline soil sampling for metals and PAHs (Condition 15).

The EAO also notes that following conditions would also assist to mitigate effects to human health:

- Community feedback process (as described below) to receive, address, and report on community concerns from the Project, including concerns related to noise and air quality (Condition 11);
- Marine transportation communication report (Condition 12); and
- Cedar will be required to join the Kitimat Airshed Group or other successor airshed monitoring programs established by the Province (Condition 16).

As noted in Section 5.1: Air Quality and Section 5.2: Acoustics, if Cedar LNG receives an EAC, it would need to obtain provincial permits, including an air discharge permit under the *Environmental Management Act*. This permitting process would be administered by the OGC.

[50] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

As part of this process, the OGC would include assessment and monitoring conditions related to air quality and noise. The OGC would engage Northern Health in this process.

In addition, the federal Mitigation Measures and Follow-up Programs identified in Section 5.1: Air Quality and Section 5.2: Acoustics related to human health would also apply.

#### *5.12.4.2 Residual Effects*

After considering the mitigation measures and the views of Working Group members, the EAO concludes that the changes to air quality and noise along the Facility Area (Table 29) and Marine (Table 30) would result in residual adverse effects to the human health VC.

Residual human health effects to specific federal topics (for example, health, social or economic conditions of the Indigenous peoples of Canada are discussed in section 6.9 of this Report.

**Table 28: Characterization of residual effects for the human health VC in the Facility Area**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | **Noise**: Moderate<br>**COPCs**: Low | Existing noise levels are not above OGC and Health Canada Guidelines. However, ambient sound levels in the Kitamaat Village, combined with present projects, make this area sensitive to noise additions.<br>The modelled base case COPCs are above acceptable levels for human health; therefore, the EAO considers air quality in the Kitimat area to have low resiliency or ability to accommodate additional increases in COPCs. |
| Direction and Magnitude | **Noise:**<br>Adverse and Low<br>**COPCs:** Adverse and Moderate | The maximum increase in %HA and sleep disturbance sound level were both less than Health Canada's guidelines.<br>The maximum effects to human health from increase in COPCs were minor but in many cases the modelled base case concentration were already greater than acceptable levels. |
| Extent | **Noise**: Local/Regional<br>**COPCs:** Local | Predicted effects to human health from noise is applicable throughout the LAA/RAA. However, the %HA and sleep disturbance are less than Health Canada guidelines.<br>Predicted effects to human health from increase in COPCs are applicable throughout the LAA. |
| Duration | Long-term | The residual effects on human health from the Facility Area occur throughout all Cedar LNG phases. |
| Reversibility | Reversible / Irreversible | The residual effects on noise and air quality from the activities at the Facility Area would cease following the end of decommissioning of Cedar LNG.<br>Human health effects from exposures to high levels of COPCs to individuals may be irreversible. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Frequency | **Noise:** Continuous<br>**COPCs:** Continuous | Effects of noise from the Facility Area would occur continuously throughout all Cedar LNG phases.<br>The increase in COPCs from the Facility Area would be expected throughout all Cedar LNG phases. |
| Affected Populations | Disproportionate | The effects of the Facility Area would be more acutely experienced by local residents and Haisla members who are located in closer proximity (such as employment or residence) and frequency (such as permanency of residence or length of employment/shifts). In addition, the residents of the Haisla Recovery Centre/hospital, which is located near the shoreline along the Marine Shipping Route, may be more disproportionately affected by changes to VCs affecting human health. |
| Risk (likelihood and consequences) | Likelihood: high likelihood of effects due to noise and COPCs during construction and operations.<br>Consequence: moderate consequence based on the low to moderate magnitude extending throughout the RAA.<br>Risk: based on the high likelihood and moderate consequence of residual effects to the acoustic environment, it was determined that there would be a moderate level of risk. | |
| Uncertainty | Uncertainty is low to moderate. The EAO has a high level of confidence that effects have not been underestimated based on the conservatism applied in the HHRA, and the conservative approach and assumptions applied in the air dispersion and acoustic modelling | |
| Significance | In consideration of the above analysis and low magnitude of the modelling of effects, and the conditions identified in the TOC and Mitigation Measures, the EAO concludes that the Facility Area would not have significant adverse residual effects on the human health VC. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

**Table 29: Characterization of residual effects for the human health VC in the Marine Shipping Route.**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Noise: Low<br>COPCs: Moderate | While the existing sound levels on the Marine Shipping Route are all within PSL, Indigenous users along the Marine Shipping Route are considered highly sensitive to increases in noise due to the potential for increases in noise to result in a deterioration of experience of cultural, harvesting, and other traditional practices.<br>The Marine Shipping Route is not currently exposed to high levels of COPCs for extended periods of time and the presence of wind increases the rate of dispersion; therefore, the resilience of air quality in the Marine Shipping Route is considered to be high. However, Indigenous users along the Marine Shipping Route are also considered highly sensitive to any change in air quality due to the potential for decreases in air quality to lead to a deterioration in experience of cultural, harvesting, and other traditional practices. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| | | |
| Direction and Magnitude | **Noise:** Adverse and Low<br>**COPCs:** Adverse and Moderate | The maximum increase in %HA and sleep disturbance sound level were both less than Health Canada's guidelines and would be expected to be within baseline conditions (which includes occasional marine traffic including ships, ferries, recreational and other types of vessels). Application noise levels are also less than PSL.<br>Potential human health effects to individuals from exposures to increased levels of COPCs from vessels in transit may be irreversible. . However, due to the transient nature of ships, any increases would dissipate quickly. |
| Extent | Local | Predicted effects to human health from air quality and noise are applicable throughout the marine LAA. However, the emissions would disperse quickly due to prevailing winds and the noise would be infrequent as it would result primarily only from the sounding of the marine horn. |
| Duration | Long-term | The residual effects on human health from marine shipping occur throughout operations. |
| Reversibility | Reversible/<br>Irreversible | For noise, the residual effects of increased shipping noise would cease following the end of operations. Residual effects increased COPCs to air quality would also cease following operations.<br>While health effects from exposures to high levels of COPCs to individuals may be irreversible, these are not predicted to occur as a result of Cedar LNG because for modelled project-related emissions exceedances of thresholds are predicted to be infrequent (short-term) dissipate quickly at any individual receptor location. |
| Frequency | **Noise:** Frequent/<br>Regular<br>**COPCs:** Infrequent | Noise effects from marine shipping would be expected to be experienced by people or communities when vessels pass for a duration of up to 24 hours approximately 100 times a year.<br>Increases in COPCs from marine shipping would be expected with passing ships but only under certain unfavorable weather conditions, which are predicted to occur rarely and short-term, as noted above. |
| Affected Populations | Disproportionate | The effects along the Marine Shipping Route would be more acutely experienced by local residents along the shipping route and Indigenous nation members who are present within the local extent (such as recreational boating or marine harvesting). Some individuals are more susceptible to COPC exposure due to physiology (for example, newborns, children, pregnant or breastfeeding women and elderly people), health status (for example, immune-compromised persons, persons suffering from heart disease, respiratory conditions or allergies), behaviour (such as amount of time spent outdoors), and lifestyle (for example, smoking, Body Mass Index (BMI) and exercise status). |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Risk (likelihood and consequences) | Likelihood: high likelihood of effects to air quality and acoustics during operations.<br>Consequence: minor consequence based on the moderate but infrequent magnitude of effects that are spatially limited to the marine LAA.<br>Risk: based on the likelihood and consequence of residual effects to air quality and acoustics it was determined that there would be a low level of risk. | |
| Uncertainty | Uncertainty is moderate. While the effects are unlikely to be underestimated based on the screening level dispersion modelling approach and the conservative approach to establishing baseline conditions, the cause-effect relationship between Cedar LNG and the human health VC are not fully understood (including uncertainty in the chronic and cumulative human health effects of vessel emissions). | |
| Significance | In consideration of the low magnitude of the predicted effects, as well as the proposed provincial condition and federal Mitigation Measures, the EAO concludes that Cedar LNG would not have significant adverse effects on the human health VC. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *5.12.4.3 Cumulative Effects Assessment*

**Facility Area**

Three past, present, and reasonably foreseeable future projects and activities were considered in the cumulative effects assessment for the human health VC. Those with potential to interact cumulatively with COPC and/or noise effects from the Facility Area include:

- Rio Tinto;
- LNG Canada; and
- Rio Tinto Terminal A Extension.

These projects have already been integrated into the assessment of potential effects to the human health VC. For example, Rio Tinto, LNG Canada and Rio Tinto Terminal A Extension were all considered in the base case for air quality. No reasonably foreseeable future projects within the air quality LAA/RAA were identified that could have overlapping residual effects with the human health VC. The EAO recognizes that Cedar LNG would have a small incremental increase to COPCs that are already above CAAQSs ($SO_2$ and $NO_2$) or are non-threshold pollutants ($NO_2$ and $PM_{2.5}$); therefore, the EAO predicts that Cedar LNG would have a cumulative effect on health that was expected to be low in magnitude.

For cumulative effects related to noise, four reasonably foreseeable projects have infrastructure within the acoustic LAA/RAA.

- Cedar Feed Gas Connector Pipeline;
- Pacific Northern Gas Project;
- Pacific Trails Pipeline; and
- Westcoast Connector Gas Transmission.

However, the components of these pipelines within the acoustic LAA/RAA do not have the potential to produce noise.

**Marine Shipping Route**

As previously noted, Cedar LNG would result in an increase of two vessels travelling through the Marine Shipping Route every 7 to 10 days (one vessel travelling to and from the FLNG facility). The increase in COPCs would be short-term and under infrequent weather conditions. The increase in noise would be short-term and infrequent. The EAO concludes that Cedar LNG would not have significant adverse residual cumulative effects on the human health VC from either the FLNG facility or marine shipping.

#### *5.12.4.4 Interactions between Effects*

Under Section 22(1) of the IAA, the impact assessment of a designated project must take into account:

a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including
    - iii. the result of any interaction between those effects.

The EAO also notes that Section 25 of the Act (2018)[51] states that every assessment must consider risks and uncertainties associated with effects of the reviewable project, including the results of any interaction between effects. Risks and uncertainties of the effects to human health are described above in section 5.12.4.2.

The human health VC is linked to the assessment of Cedar LNG effects on other VCs and factors as follows:

- Air quality - Air quality modelling results were incorporated into the HHRA to characterize the health risk from air contaminants.
- Acoustic - Acoustic modelling results were assessed to characterize the health effects to people from project-related noise.
- Wildlife - Species of wildlife in the region that are harvested as country foods by Indigenous nations were described in the HHRA TDR (Appendix 7.12A of the Application); however, country foods were not identified as an operable pathway.
- Freshwater Fish - Species of freshwater fish in the region that are harvested as country foods by Indigenous nations were described in the HHRA TDR (Appendix 7.12A of the Application); however, country foods were not identified as an operable pathway.

[51] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

- Marine Resources - Species of marine animals and fish in the region that are harvested 24 as country foods by Indigenous nations are described in the HHRA TDR (Appendix 7.12A of the Application); however, country foods were not identified as an operable pathway.
- Infrastructure and Services – Increase in pressure on health services was assessed to characterize the effects of increased project-related needs;
- Indigenous Interests - The impact of human health effects on Indigenous Interests and the current use of lands and resources for traditional purposes is considered in Part C and Section 6.9 of this Report, respectively.

The EAO did not identify any additional effects or interactions that have not been assessed within the above sections.
The effects of all biophysical VCs including air quality, wildlife, freshwater fish, and marine resources are considered in the assessment of the effects on biophysical factors that support ecosystem function (section 6.6). The effects of all human VCs including Employment and Economy, Infrastructure and Services and human health, are considered in the assessment of human and community well-being (section 6.8). These assessments consider linkages within each of the biophysical and human realms and consider effects in a holistic manner. The EAO concluded that there would be a low magnitude of effects on biophysical factors that support ecosystem function and a moderate magnitude effect on human and community well-being.

#### *5.12.4.5 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of human health effects.

In the Application, Cedar noted that it did not receive traditional knowledge or traditional use information related to human health during its consultation and information sharing activities.

During the EA, Gitga'at, Gitxaała, Kitselas and Metlakatla provided comments on the assessment of human health effects, including related to proposed mitigation measures and conclusions. The information provided is summarized above in section 5.2.3, as well as being discussed in the nation-specific sections in Part C of this Report. Key ways in which the EAO took these comments into account in the human health assessment included:

- In the residual effects characterizations
  - Identifying that that the acoustic environment of the Marine Shipping Route as sensitive, based on the potential for increases in noise to result in a deterioration of experience of cultural, harvesting, and other traditional practices of Indigenous nations;
  - Identifying the potential for disproportionate effects to Indigenous nations along the Marine Shipping Route; and
- Recommending Follow-Up Programs for air quality and noise under the IAA.

#### *5.12.4.6 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse residual or significant cumulative effects on the human health VC. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group, Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 9: CEMP; and recommended Mitigation Measures and Follow-up Programs under the IAA for air quality and acoustics (Appendix 1).

# 6.0 ASSESSMENT OF OTHER MATTERS

## 6.1 MALFUNCTIONS AND ACCIDENTS

### 6.1.1 BACKGROUND

During construction, operations and decommissioning of Cedar LNG, unplanned events associated with Cedar LNG activities or processes could arise resulting in potential effects to environmental, economic, social, heritage or health values.

This chapter considers potential malfunctions and accidents, identifies the mechanisms that would be implemented during design and operation to mitigate the impacts of these potential events throughout the life of Cedar LNG, and assesses the potential effects of these events throughout the life of the project.

In the context of Cedar's assessment and this Report, malfunctions are defined as unplanned events resulting from equipment or infrastructure failure. Accidents are defined as unplanned events that result from human error. These are both distinct from effects caused by the Project arising from planned physical works and activities that are predictable and are assessed in Chapter 5 (Valued Components Effects Assessment) and Section 6.4: Greenhouse Gas Emissions. They are also distinct from unplanned events resulting from external stressors in the environment such as weather, seismic and tsunami events that may impact Cedar LNG (see Section 6.3: Potential Changes to the Project that may be caused by the Environment).

Malfunctions and accidents were assessed due to their importance to Indigenous nations and stakeholders, to meet requirements under Section 22(1)(a)(i) of the IAA, and in consideration of the assessment matters in Section 25 of the Act (2018)[52].

Cedar LNG considered the scenarios below in the Application as potential malfunctions or accidents that could occur during construction, operations, and decommissioning:

- Loss of containment of LNG from the FLNG Facility;
- Spills of hazardous materials;
- Emergency FLNG shutdown;
- Loss of LNG containment;
- Fire or explosion;
- LNG carrier grounding, collisions, and allisions; and
- FLNG allision.

[52] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

#### 6.1.1.1 Assessment Methods

Cedar used a project risk matrix to assess effects to VCs which provide definitions of likelihood and consequence; and location specific individual risk (LSIR) to estimate risk to public safety using an approach that predicts individual risk.

Because safety aspects of the facility design, construction and operation are strictly regulated by processes outside of the EA, in its Application Cedar used information prepared for the LNG facility permit process, including the hazards identified in the Hazard Identification study (HAZID) (Risktec 2021a[53]), the potential extent of hazards identified in the Quantitative Risk Assessment (QRA) (Risktec 2021b[54]), and the project risk assessment methodology for categorizing the potential residual (mitigated) risk to public and environment.

The HAZID assesses and categorizes the various risks with a focus on risks associated with potential high consequence events. In addition, the HAZID assesses the relevant measures to mitigate the risks to tolerable levels using an as low as reasonably practicable process. The preliminary QRA was conducted using pre-FEED level information and focuses on location specific individual risk (risk to people outside the fenced Project Area) to support project siting and layout. Risk to workers is assessed in future phases of the Project, managed through the Project's health, safety, security and environment (HSSE) management program, and regulated by WorkSafeBC.

Cedar's Application aligned the risk scoring system for each of the malfunctions with the risk assessment system used to evaluate Cedar LNG from an engineering safety perspective. The ranking system assigns risk based on a risk matrix (see Table 30). The matrix considers prescribed likelihood on the vertical axis and consequence on the horizontal axis to assign a final risk score. The rankings consider the risk of the event with mitigation measures in place

and demonstrate how the likelihood and consequence ratings combine to provide an overall risk score to indicate priority for risk management options. Risk scores include low, moderate, high, and extreme.

- Low risk is acceptable and additional mitigation measures are not required to manage the risk;
- Moderate risk is tolerable with mitigation measures in place. The risk should be monitored closely;
- High risk requires ongoing analysis and may require additional mitigation; and

[53] Risktec (Risktec Solutions Canada Limited). 2021a. Cedar LNG Project Hazard Identification (HAZID). Document number 21-PTRAV-02-1, Issue 2. 24 Risktec. 2021b. Cedar LNG Project Preliminary QRA, 1.1

[54] Risktec. 2021b. Cedar LNG Project Preliminary QRA, 1.1.

- Extreme risk is not acceptable and additional mitigation measures must be assigned to the risk. A re-examination of the risk with additional mitigation measures in place is recommended.

Risk scoring is based on standard definitions of likelihood and consequence that can be assigned to each malfunction and/or accident for this section.

**Table 30: Risk Matrix**

| | | Consequence | | | | |
|---|---|---|---|---|---|---|
| | | 1 – Insignificant | 2 – Minor | 3 – Moderate | 4 – Major | 5 – Catastrophic |
| Likelihood | A – Almost Certain | High | High | Extreme | Extreme | Extreme |
| | B – Likely | Moderate | High | High | Extreme | Extreme |
| | C – Moderate | Low | Moderate | High | Extreme | Extreme |
| | D – Unlikely | Low | Low | Moderate | High | Extreme |
| | E – Rare | Low | Low | Moderate | High | High |

**Table 31: Likelihood Ratings for Malfunctions and Accidents**

| Rank | Title | Definition |
|---|---|---|
| A | Almost Certain | Incident is very likely to occur on this project, possibly several times |
| B | Likely | Incident is likely to occur on this project |
| C | Moderate | Incident has occurred on a similar project |
| D | Unlikely | Given current practices and procedures, this incident is unlikely to occur on this project |
| E | Rare | Incident is highly unlikely to occur on this project |

**Table 32: Consequence Ratings for Malfunctions and Accidents**

| Rank | Title | Definition |
|---|---|---|
| 1 | Insignificant | No measurable impact. Localized to point source. No recovery required. |
| 2 | Minor | Localized within incident area. Recovery within six months of impact. |
| 3 | Moderate | Adverse effect within the incident area with possible wider effect. Recovery within two years. |
| 4 | Major | Major adverse effect within incident area with possible wider effect. Recovery within five years. |
| 5 | Catastrophic | Major regional adverse effect. Recovery longer than five years. Limited prospect of full recovery. |

## 6.1.2 POTENTIAL MALFUNCTIONS AND ACCIDENTS AND PROPOSED MITIGATIONS ASSESSED IN THE APPLICATION

### *6.1.2.1 Mitigation by project design*

Project design is a factor in mitigating the effects of malfunctions and accidents. Cedar LNG would be designed in accordance with applicable legal requirements, CSA Z276 (LNG — Production, storage, and handling), and CSA EXP276.2 (design requirements for near-shoreline floating liquefied natural gas facilities). Key mitigation measures integrated to design include:

- Process safety system for detection of fire and gas;
- Backup power supply;
- Emergency shutdown systems; and
- Secondary containment systems.

The following sections describe the individual malfunctions and accidents considered and further details on mitigations specific to each one.

#### *6.1.2.2 Loss of Containment of LNG from the FLNG Facility*

Potential loss of LNG containment in storage tanks within Cedar LNG's double hulled FLNG facility without ignition is considered in this section. During normal operations, LNG would be stored in the LNG Facility prior to transfer to a vessel for shipment.

As LNG is an extremely cold liquid that is much lighter than water, any liquid loss from the sealed and pressurized system would likely spread on the surface of water or land and rapidly or immediately change physical state and vapourize. Cedar LNG would include mitigation measures to limit ignition sources. Ignition and associated mitigation measures are considered below. A potential LNG release to the water is not expected to result in toxic effects as LNG does not persist in the environment and is non-toxic to marine life. As such, no cleanup actions are anticipated to be necessary due to an LNG spill.

##### 6.1.2.2.1 Mitigation Measures

Cedar identified mitigation measures in the Application for the project, including mitigation by design to reduce the likelihood and consequence severity if a loss of containment occurs, including the following:

- Implementing a spill protection system including emergency shutdown systems, containment, drainage and spill control systems, and safe dispersion for all credible accidental events.
- Implementing an emergency management program consistent with CSA Z246.2 (Emergency preparedness and response for petroleum and natural gas industry systems) and the requirements of the Emergency Management Regulation under the Oil and Gas Activity Act.
- Implementing a maintenance program for operation that includes regular inspections of its equipment and infrastructure to ensure the facility is maintained in a state of good repair, following the guidance of equipment manufacturers.
- Implementing an HSSE management program ensuring that all staff onsite are trained to ensure safety and appropriate response to incidents throughout construction and operation.

In the Application, Cedar stated that it would refine the 2021 QRA in accordance with the

Liquefied Natural Gas Facility Regulation for key activities to support design and preparation of the emergency management program during the permitting phase of the Project. As more detailed design information is incorporated into the QRA, analysis would be undertaken to identify key plausible scenarios in which an LNG release could occur. Additional mitigation measures may be brought forward following the QRA and incorporated into design and construction. Cedar expects this to include the delineation of a safety zone during loading of LNG carriers.

#### 6.1.2.2.2 Potential Effects

With the implementation of mitigation measures, including a spill protection system and an emergency response program, Cedar was of the view that the likelihood of LNG containment loss, assuming no ignition, would be rare and the consequence of impacts, should a spill occur, would range from insignificant to minor depending on the VC. Cedar noted that if a loss of containment were to occur, it is possible that an interaction between released LNG and Marine Resources, Wildlife, Human Health and GHGs could occur. An LNG release could cause a sudden temperature change to the surface of the water and displace oxygen from near the water surface. Underwater sound transmission from a rapid phase transition could potentially negatively impact some marine mammals and fish near the surface of the water. Risks to wildlife and human health from an LNG release that does not ignite are asphyxiation, exposure to cold temperatures, and exposure to the pressure wave if a rapid phase transition occurs. An accidental release of LNG would also result in a one-time release of methane into the environment that would increase the Project's GHG emissions but would be small in comparison to annual project emissions. Cedar concluded the risk of this accident for all VCs to be low.

### *6.1.2.3 Spills of Hazardous Material*

Spills of hazardous material scenarios described in the Application include spills on land and in the marine environment, other then of LNG, and may include amine (used to remove carbon dioxide and hydrogen sulphide from the natural gas), ethylene, propane and isopentane refrigerants (used to chill the natural gas), diesel (used in backup generators), natural gas liquids, as well as vehicle fuel and lubricants.

#### 6.1.2.3.1 Mitigation Measures

Cedar LNG identified the following measures that would be applied to mitigate the potential for smaller spills:

- Establish designated equipment refueling areas for vehicles and mobile equipment; and
- Develop and implement a spill response plan as part of the CEMP and the operation HSSE program.

Mitigation measures that would be applied to mitigate the potential for larger spills include:

- Implementing a project-specific Emergency Response Plan and emergency response

program, which would be developed in accordance with CSA Z246.2 (Emergency preparedness and response for petroleum and natural gas industry systems); and

- Developing and implementing a maintenance program for operation that includes regular inspections of its equipment and infrastructure to ensure the facility is maintained in a state of good repair, following the guidance of equipment manufacturers.

#### 6.1.2.3.2 Potential Effects

With the implementation of mitigation measures, including designing the project to avoid spills and developing a spill response plan, Cedar considered the likelihood of a spill of hazardous material other than LNG to be rare to unlikely and the consequence, should a spill occur to be insignificant to minor, depending on the VC. VCs potentially affected would include air quality, vegetation resources, wildlife, freshwater fish, land and resource use, infrastructure and services, marine use and human health. Cedar concluded the risk of this accident to VCs would be low to moderate.

### *6.1.2.4 Emergency FLNG Shutdown*

A malfunction at the FLNG facility could lead to a partial or full shutdown of LNG production. Cedar noted that an unforeseen equipment failure or process upset leading to an emergency shutdown is a credible hazard and was identified during the pre-FEED HAZID as having potential for escalation to a major incident (Risktec 2021a). Cedar also noted that the most likely cause would be an interruption of the BC Hydro power supply to the FLNG facility.

If the facility is shutdown, the inlet natural gas, refrigerant, and/or vaporized LNG would be diverted to the flare tower where it would be combusted. A partial or full emergency shutdown may result in the redirection of one or more of these gasses to the flare system to enable the safe depressurization and disposal of hydrocarbons being processed within the facility. The length of time for flaring is typically linked to the time necessary for pressure in the pipeline to drop to a level that allows the pipeline valves to be closed. Scheduled flaring is often associated with commissioning and maintenance activities. Unscheduled flaring during operation would be predominantly related to short duration events that are triggered and mitigated by the emergency shutdown system.

Cedar noted the potential GHG impact of flaring activities. The application noted an estimate of 4,500 tonnes of CO2 emissions during maintenance flaring for a single 1.5 million tonne per annum liquefaction train. In a worst-case emergency shutdown event, both trains would be fully depressurized and the maximum GHG emissions would be approximately 9,000 tonnes of CO2. Cedar stated that this is approximately 3 percent of the annual facility emissions.

#### 6.1.2.4.1 Mitigation Measures

Cedar identified mitigation measures in the Application that would reduce the likelihood or consequence severity of an emergency FLNG Shutdown, including:

- Implementing an emergency management program for operation consistent with CSA Z246.2 (Emergency preparedness and response for petroleum and natural gas industry systems) and the applicable regulations. The emergency management program would outline Cedar's response efforts for emergency shutdown event. Cedar notes that the preventative design measures and regulatory response procedures are expected to work together to protect workers and the environment when flaring;
- Implementing a maintenance program for operation that includes regular inspections and maintenance of its equipment and infrastructure to ensure the facility is maintained in a state of good repair, following the guidance of equipment manufacturers; and
- Implementing an HSSE management program. The HSSE management program would ensure that all staff onsite are trained to ensure safety and appropriate response to incidents during operation.

#### 6.1.2.4.2 Potential Effects

With the implementation of mitigation measures, including Project design, maintenance and training, Cedar was of the view that an emergency LNG production unit shutdown causing a redirection gas from the FLNG facility to a flare stack was rare, and the consequence of this accident would range from insignificant to minor depending on the VC. VCs potentially affected would include air quality, acoustics, wildlife, human health, and GHGs. Cedar stated that the risk of this accident would be low for all VCs.

### *6.1.2.5 Fire or Explosion*

Natural gas hazards are addressed in this section along with hazards from other flammable, combustible or explosive materials arising from various potential spills. This section excludes events associated with LNG carriers.

In the event that a gas release (natural gas or refrigerant) or a vapour cloud that has evaporated off an LNG release encounters a source of ignition a flash fire, jet fire, or vapour cloud explosion is possible.

For LNG and flammable liquids (diesel, lubricants, and vehicle fuels) a pool fire scenario can also occur. Pool fires arise from the immediate or delayed ignition of a flammable liquid release including the evaporating natural gas associated with a pool of LNG that is on land or water.

The major consequence of all fires is the thermal radiation impacts. For vapour cloud explosions there is also the potential for exposure to damaging overpressure conditions.

#### 6.1.2.5.1 Mitigation Measures

In addition to constructing Cedar LNG to applicable codes and standards and including design features to mitigate the risk of fire and loss of LNG containment, Cedar identified mitigation measures in the Application that would reduce the likelihood or consequence severity of a fire, including:

- The FLNG facility would have a seawater-based firewater system and use a water curtain when loading LNG carriers.
- Cedar would establish designated equipment refueling areas and develop a spill response plan for then construction phase of the Project. This would be incorporated into the CEMP.
- Implementing an emergency management program for operation in consistent with CSA Z246.2 and the applicable regulations.
- Implementing a maintenance program for operation that includes regular inspections and maintenance of its equipment and infrastructure to ensure the facility is maintained in a state of good repair, following the guidance of equipment manufacturers.
- Implementing an HSSE management program. The HSSE management program would ensure that all staff onsite are trained to ensure safety and appropriate response to incidents during operation.

#### 6.1.2.5.2 Potential Effects

With the implementation of mitigation measures, including Project design, a firewater system and an emergency response plan, Cedar concluded the likelihood was rare that a flammable product could be released from the FLNG facility due to a malfunction or accident and that the consequence on VCs of such an incident would be low. VCs potentially affected would include air quality, vegetation resources, wildlife, freshwater fish, land and resource use, infrastructure and services, employment and economy, marine use, and human health. This low consequence rating was in part due to the relatively remote location of the Facility Area and absence of important habitats (such as salt marshes or old growth forest), recreational areas, or infrastructure in the immediate vicinity. Cedar concluded the risk of this accident to all VCs would be low.

### *6.1.2.6 LNG Carrier Grounding, Collisions, and Allisions*

Grounding could occur if the LNG carrier encounters shallow water, loses power, loses control of steering, or is subject to extreme environmental conditions that cause it to drift into the shoreline. LNG carrier collision occurs when an LNG carrier makes unplanned contact with another vessel or vice versa during transportation. FLNG allision is addressed separately in Section 6.1.2.7: FLNG Allision.

LNG carrier grounding, collisions or allisions are all events that could cause damage to the hull of the ship, and potentially lead to a release of hazardous material, including diesel fuel, bunker fuel, or LNG and therefore are addressed together.

Cedar's assessment indicated that in most shipping incidents it is unlikely that a grounding, collision or allision would lead to a release or containment loss due to the double-hulled design of LNG carriers. LNG is stored in insulated membrane tanks within the hold. The combined three walls between the LNG and the environment makes the carriers less prone to accidental

spills. Cedar noted that if an impact occurs with sufficient force, it is possible that a breach through both ship hulls could lead to a release of hazardous material into the environment. LNG cargo is contained in multiple membrane tanks within the hold that are often divided by bulkheads, which in the event of an incident reduce the portion the cargo could be spilled.

The severity of impacts of a grounding event, a collision or allision would depend on whether the event resulted in a release of hazardous material (LNG, diesel, or bunker fuel) and how much is released, the location and duration of the event, the speed at which emergency resources can respond to the event, and the oceanographic conditions at the time of the grounding.

If a release of bunker fuel occurred, it would remain in the environment as an oil slick on the surface of the water and could contaminate the surrounding waters and shoreline. Cedar noted that containment efforts are only moderately effective at mitigating adverse impacts of a bunker fuel release, and a bunker fuel release could take considerable time to naturally degrade. This means that the consequence would be higher than diesel, but the likelihood of occurrence would be reduced due to mitigation measures.

#### 6.1.2.6.1 Mitigation measures

Cedar identified the following mitigation measures in the Application related to LNG Carrier grounding, collisions, and allisions:

- The *Pilotage Act* and Pacific Pilotage Regulations establish compulsory pilotage requirements for non-pleasure craft vessels over 350 gross tonnes transiting British Columbia waters.
- The *Canada Shipping Act,* 2001 establishes a legislated framework that that regulates Canada's marine safety system and protects the marine environment from negative impacts from shipping. This includes navigational safety aids to prevent groundings (for example: buoys, lights, radar reflectors), collision-prevention devices (such as compasses, radar or emergency steering), hull construction standards for strength and stability, fire detection and extinguishing system requirements, and construction standards and inspection protocols for vessels carrying pollutants.
- LNG carriers would follow existing shipping routes to and from the facility.
- LNG carriers would be operated in compliance with the Canada Shipping Act, 2001.
- LNG carriers would be piloted by BC Coast Pilots from the Triple Island Pilot Boarding Station to the terminal and back.
- LNG carriers would be escorted by tugs between the Triple Island Pilot Boarding Station and Kitimat—it is expected that the LNG carriers would be tethered to one or more tugs at key points in the transit for greater safety.
- Cedar would develop a Marine Transportation Management Plan that would include:
    - Use of the CCG's Marine Communication and Traffic System to provide notice of

planned arrival time at the Triple Island Pilot Boarding Station;
    - LNG carrier shipping schedule notification processes for Indigenous nations with traditional territories overlapping the shipping route;
    - Methods to establish a safety zone around the marine terminal during operation;
    - Methods for regular communication on operation activities with marine users; including recreational users, commercial tourism operators, fishers, Transport Canada, and other relevant stakeholders; and
    - Use of tugs to assist with berthing and deberthing/departure.
- Cedar would engage with Western Canada Marine Response Corporation to establish the process for LNG carriers visiting the Project to establish appropriate arrangements for spill response in the event of a grounding, collision or allision that results in the release of diesel or bunker fuel.
- During Application Review, Cedar also proposed an additional Mitigation Measure under the IAA to report out any marine shipping malfunctions and accidents, which is described further below in section 6.1.4.1.

#### 6.1.2.6.2 Potential Effects

With the implementation of mitigation measures, including piloted LNG carriers, tug assistance, careful planning, monitoring, incorporation of internationally accepted design and construction standards for LNG carriers, and implementation of spill response measures, Cedar concluded that the likelihood of an LNG carrier grounding, collision or allision event would be rare, and the consequence of this accident, should it occur would range from insignificant to major depending on the VC. VCs potentially affected would include air quality, marine resources, wildlife, marine use, infrastructure and services and human health. Cedar noted that, if the incident resulted in a spill of bunker fuel, it could affect the ability to safely harvest shellfish in the vicinity of the incident with recovery taking up to five years, as a result the risk of this accident to VCs would range from low to high.

### *6.1.2.7 FLNG Allisions*

As the FLNG facility would be a permanently moored structure in Douglas Channel, it is possible that an LNG carrier, tug, pleasure craft or other vessel may have an allision with it. These events are similar but distinct from LNG carrier allision due to different equipment and facilities associated with the FLNG facility.

#### 6.1.2.7.1 Mitigation measures

Cedar identified the following mitigation measures in the Application related to FLNG allisions:

- LNG carriers would operate in compliance with the Canada Shipping Act, 2001. LNG carriers would be piloted by BC Coast Pilots and would be assisted by tugs when berthing and deberthing.
- Cedar would develop a Marine Transportation Management Plan that would include:

- Methods to establish a safety zone around the marine terminal during operation, including berthing and departure of LNG carriers;
- Methods for regular communication on operation activities with marine users, including recreational users, commercial tourism operators, fishers, Transport Canada, and other relevant stakeholders; and
- Use of tugs to assist with berthing and deberthing/departure.

- Implementing an emergency management program for operation in consistent with CSA Z246.2 and applicable legal requirements. The emergency management program would establish response protocols in the event of the release of hazardous substances from an allision.
- Cedar would engage with Western Canada Marine Response Corporation (WCMRC) to establish appropriate arrangements for spill response in the event of an allision that results in the release of a hazardous substance.

#### 6.1.2.7.2 Potential Effects

With the implementation of mitigation measures, including Project design and an emergency response program, Cedar concluded that the likelihood of allision with the FLNG facility would be rare, that the consequences would range from insignificant to minor depending on the VC impacted. VCs potentially affected would include air quality, wildlife, marine resources, marine use, infrastructure and services and human health. Cedar noted that the risk to VCs would be low with the exception of wildlife, which is rated as moderate due to the presence of species at risk in the area.

### 6.1.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group and Indigenous nations, the following key issues related to the assessment of Malfunctions and Accidents for Cedar LNG were identified:

- FLNG Emergency response and health services capacity;
- Marine shipping malfunction or accident – mitigation and emergency response;
- Health assessments following a malfunction or accident; and
- Marine shipping malfunction or accident – environmental, health and cultural effects.

#### *6.1.3.1 FLNG Emergency Response and Health Services Capacity*

Gitga'at, Northern Health, and the CCG raised questions relating to health service and emergency services capacity in relation to malfunctions and accidents at the project site, including the FLNG Facility. Northern Health noted the need for inclusive consultation when developing applicable plans and programs, including the HSSE, CEMP and Emergency Response Plan. Northern Health viewed the potential impacts of workers from malfunctions on accidents on local health services and emergency health service as outside of the scope of the

WorkSafeBC framework and requested that this be managed through the EA. Northern Health stated that the emergency response planning needs to include table-top exercises that include Northern Health and Health Emergency Management British Columbia and should consider information regarding the types and quantity of emergency health services that may be required for staff impacted by accidents or malfunctions.

In response to these comments Cedar noted it would be required to prepare an emergency response program in accordance with CSA Z246.2 (Emergency preparedness and response for petroleum and natural gas industry systems) and the Emergency Management Regulation under the *Oil and Gas Activities Act*. The preparing of the program and plan would include engagement with emergency services providers, including Northern Health.

Cedar noted that it assessed the potential effects of normal construction, operation, and decommissioning activities on local health services and emergency health services in the assessment of the infrastructure and services VC and the implications of a malfunction or accident on people other than workers in the malfunctions or accidents assessments. For each incident with the potential to interact with infrastructure and services, the likelihood was rated rare (i.e., highly unlikely to occur over the 40-year life of the Project) and the consequence was rated insignificant (i.e., no measurable impact; localized to point source; no recovery required). In consideration of the rare likelihood of a malfunction or accident occurring and the insignificant consequence on infrastructure and services, Cedar rated the risks to local and regional health/ambulance services as low.

Cedar committed to developing a CEMP that outlines the environmental protection measures to be implemented during construction, which would include a spill response plan. Cedar also noted that it was initiating engagement with the organizations that may be involved in emergency response for the Project (for example: Kitimat Fire Department, Kitimat RCMP, Regional District, Kitimat-Stikine Emergency Response, Thornhill Fire Department). These engagements would continue as project development progresses, including during development of the Project's CEMP and Spill Response Plan.

The EAO notes that if Cedar LNG receives an EAC and federal IAA approval, it would need to obtain provincial permits. This permitting process would be administered by the OGC. As noted above, Cedar would be required to prepare an emergency management program consistent with CSA Z246.2 (emergency preparedness and response for petroleum and natural gas industry systems) and the requirements of the Emergency Management Regulation under the *Oil and Gas Activity Act* as part of this process. The development of an Emergency Response Plan would be expected to include spill response and management processes. A site-specific plan would be required before the introduction of any process fluids, including refrigerant gases. Northern Health would be engaged during emergency management planning on the development of Cedar LNG's emergency response plan.

The EAO also recommends a condition (9) requiring Cedar to develop a CEMP, including spill response measures to be developed in consultation with OGC, Northern Health, LWRS, ECCC, CCG, Transport Canada, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and

Metlakatla. The EAO also recommends mitigation measures under the IAA for malfunctions and accidents, as described in section 6.1.4.1 below, which includes the requirement that Cedar implement programs during construction and operation that address site safety and response to unplanned incidents. With these recommendations, the EAO considered the issue to be adequately addressed for the purpose of the EA.

#### *6.1.3.2 Marine Shipping Malfunction or Accident - Mitigation and Emergency Response*

**Risk to Navigation and Mitigation**

Concerns were raised on the risk to navigation by the CCG and Haida.

The CCG noted concerns on how the risk to navigation is assessed in the Application including the characterization of risk associated with berthing and maneuvering of LNG carriers in Kitimat. The CCG stated that it believed Cedar should provide a detailed review of the risk of collision with non-LNG vessels, such as tugs and barges as well as additional information on the collision of an LNG carrier with fuel barge or another vessel, and that it believes that the risk, and the associated mitigation approach should be more thoroughly examined. In addition, Transport Canada requested additional information on Cedar's use of the TERMPOL reports to inform the Application, including if and how they were used to identify proposed mitigation measures and if a gap analysis was performed.

In response, Cedar stated it would work with the BC Coast Pilots to identify the required studies; these studies would be expected to include bridge simulations that will model the berthing and deberthing as part of the detailed design process which will help reduce the risk of allision at or near the FLNG. The modelling work would be used to refine the FLNG orientation and establish the physical conditions when berthing and deberthing can occur safely. Cedar noted the legislative framework and proposed mitigations identified for the Project, which include consideration of TERMPOLs previously completed, meeting all requirements of the *Canada Shipping* Act, 2001 and its regulations, use of escort tugs, using BC Coast Pilots, providing notice of planned LNG carrier arrival time at the Triple Island Pilot Boarding Station, and the proposed Marine Transportation Management Plan. Cedar noted the existing TERMPOLs by Kitimat LNG, Northern Gateway, and LNG Canada and that it understands from engagement with Transport Canada there is a robust understanding of shipping safety along the shipping route and another TERMPOL was not needed between the Triple Island Pilot Boarding Station and Kitimat. Cedar believes the available information is sufficient for the EA stage of the Project. Cedar stated that it would engage with Transport Canada and the BC Coast Pilots to identify any supplemental studies required in advance of Project operation (such as berthing studies).

Cedar also provided a supplementary memo regarding accidents and malfunctions that provided additional information on LNG carriers and related accidents and malfunction, northern B.C. marine traffic density and large vessel anchorages, and shipping incidents in B.C. Cedar committed to sharing a report with the Agency, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla in the event that a marine shipping malfunction or accident with the potential to result in an environmental effect (such as collision, grounding or spill) occurs. The report would include a description of the incident, a summary of environmental information collected (if any), and mitigation measures to prevent future occurrences (if applicable).

Haida noted that the analysis of malfunctions and accidents had not considered the expected increase in congestion through Dixon entrance resulting from the new IMO speed and fuel rules and new projects. Haida also noted that Cedar's analysis in the Application and supplementary memos did not consider consequence of Government of Canada recorded shipping malfunctions and accidents even though Cedar's risk framework required the assessment of consequence. Haida also noted that near "miss records" were not considered, which would help to pinpoint areas where additional measures may be considered. Finally, Haida noted the focus on the LNG carriers was misleading and Haida recommended incorporating information from Clear Seas, which offers more useful categorizations of ship types with comparable risk profiles.

Cedar has also submitted an application to Transport Canada to join the Proactive Vessel Management project, and if the recommendations from this project are implemented, should Cedar LNG proceed, Cedar would work with the BC Coast Pilots and Transport Canada to implement mitigation measures for the LNG carriers visiting Cedar LNG.

In consideration of the concerns raised, the EAO recommends a Mitigation Measure under the IAA requiring Cedar to submit a report describing the accident, outcome and potential changes to mitigation measures, in the event of a marine shipping accident or malfunction, as described in section 6.1.4.1 below. The EAO also recommends a Mitigation Measures requiring Cedar to develop a marine transportation plan in consultation with Indigenous nations, which includes the recommendation that Cedar work with the Pacific Pilotage Authority and BC Coast Pilots to determine guidance on safe vessel speed for LNG carriers visiting Cedar LNG facilities. In acknowledgement of the importance of considering the wider regional context and cumulative effects of marine shipping, the EAO also recommends a provincial condition (16) and a federal Mitigation Measure requiring Cedar to participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region. In combination with the existing regulatory framework, the EAO considered these Mitigation Measures to be adequate to address the issues identified during the EA.

**Spill Response**

Gitxaała, Kitselas and Metlakatla, CCG and Transport Canada raised concerns about lack of details on Cedar's response to a spill resulting from a marine shipping malfunction or accident. Gitxaała, Kitselas and Metlakatla stated concerns regarding the potential impacts of bunker fuel releases, noting that a release of bunker fuel as compared to diesel would have greater consequence and that both have the same mitigations listed in the Application. They stated that additional mitigation, in the form of a detailed spill response plan based on shoreline sensitivity mapping and detailed pre-Shoreline Clean-up and Assessment Technique (SCAT) studies along the shipping route should be developed prior to commencement of operations. In addition, ECCC recommended that Cedar provide a detailed discussion on possible shoreline contamination from spills of hazardous materials including shoreline clean-up and noted its (SCAT) manual may be a useful reference. Gitxaała, Kitselas, Metlakatla, Transport Canada and the CCG requested that Cedar engage with WCMRC during the EA to obtain further details on what would happen in the event of a spill.

Cedar provided a supplementary memo regarding shipping spill response and mitigation measures.

Cedar noted that regulation and management of shipping activities in Canadian waters is the responsibility of the Government of Canada and that a robust management regime exists under the *Canada Shipping Act*, 2001 and its regulations including the Response Organizations Regulation, Oil Handling Facilities Regulations and Environmental Response Regulations, as well as the *Pilotage Act*. Cedar stated that all LNG carriers visiting the Project would be subject to both Acts, which includes having agreements in place for spill response. As part of its emergency response program required under the *Oil and Gas Activities Act* Cedar would initiate a first response to spills from the FLNG facility itself and from an LNG carrier at berth.

Cedar also described that there would be a clean up program led by WCMRC. WCMRC is the Transport Canada-certified marine spill response organization established under the Response Organizations Regulation and Oil Handling Facilities Regulation. Its mandate is to be prepared to respond to marine oil spills along all the BC coastline, and to mitigate the impacts if spills occur. Under the regulations, vessels conducting business in Canadian marine waters off B.C. are required to have an arrangement, for which they pay fees, with WCMRC. They are also required to have a shipboard oil pollution prevention plan and oil pollution emergency plan. Cedar noted that it understands that WCMRC is developing protection strategies to identify where spill response equipment should be located to reduce risk to environmentally and culturally sensitive areas.

CCG expressed the view that the memo did not adequately represent CCG's mandate, authority and role within the Canadian Oil Spill Regime. CCG pointed to the documents: Canadian Coast Guard Marine Spills Contingency Plan – Western Region and North Coast North Coast Integrated Response Plan for Marine Pollution Incidents (which outlines Coast Guard's plan), as accurately defining the scope and framework within which CCG will operate to ensure a

response to marine pollution incidents. CCG noted its mandate to respond to ship sourced pollution incidents and that the ship owner is responsible for damages incurred from that spill, but, CCG, ECCC, Transport Canada, ENV and the coastal communities impacted by such spills work to resolve those spills together as partners. CCG noted that proponents have a responsibility in this as well and need to ensure appropriate notice is provided that a vessel is leaving their facility, that there are robust plans for any occurrence that takes place in their facility, and that they are working with all response partners, including CCG, in order to flesh out processes and plans between jurisdictional authorities. Cedar agreed to work with the CCG during development of the emergency response program to establish roles, responsibilities, and communication processes for responses to incidences that may occur at the facility during operations.

Transport Canada noted that WCMRC is only certified by Transport Canada as a responder to oil/petroleum and they are not mandated to respond to LNG pollution incidents. Canada is signatory to the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) Convention, which provides a framework for dealing with pollution incidents, including oil pollution, either nationally or in co-operation with other countries. Canada is working on the development of a Hazardous & Noxious Substances (HNS) framework, that would be part of the overall Canadian marine pollution preparedness and response regime, in order to ratify the OPRC-HNS Protocol (Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000) which is an extension of the OPRC Convention. This HNS framework could bring similar measures into effect for LNG that exist for oil pollution. Cedar has also noted that LNG does not pose the same risks to the marine environment as oil spills because it would evaporate quickly without adversely impacting water quality or marine life.

The EAO recommends the Mitigation Measures under the IAA for malfunctions and accidents, as described in section 6.1.4.1 below. The EAO also notes that there is an existing marine shipping and spill response regulatory framework, and planned changes, in place regarding marine shipping spills. Further, the EAO notes that there are a number of other initiatives that also address spill response, as described in section 3.1 of Part A. The EAO considered this issue to be adequately addressed for the purpose of the EA.

**Engagement with Indigenous Nations on Response**

Gitxaała, Lax Kw'alaams, Metlakatla, and Haida expressed the view that Indigenous nations should be involved in spill response planning.

Lax Kw'alaams noted that the Application did not identify plans to engage with Indigenous nations in the development of a spill response plan. The Application only identifies that mitigation for LNG carrier grounding, collision or allision will include establishment of spill response arrangements with WCMRC. As Indigenous nations are sometimes the first to arrive

on the scene of an accident or malfunction, they can play a crucial role in disaster response, as such Lax Kw'alaams requested that Cedar identify plans to engage with Indigenous nations to establish a spill response plan. Lax Kw'alaams also requested information on how the risk associated with LNG carrier grounding, collision or allision would be analyzed on an ongoing basis, or whether Cedar had considered additional mitigations such as working with Indigenous nations to develop measures to mitigate perceived risk and ongoing avoidance of harvestable marine resources in the event of a bunker fuel spill.

Gitxaała and Metlakatla also noted they remained concerns about the consequences of grounding, collision or allisions and that mitigations would be strengthened if they included requirements for Indiginous nations' participation in actual response activities and the provision of equipment, training, and resources to participate in planning response activities in their territories. Haida noted that any plans related to marine accidents prevention and/or response must address Haida waters and be co-developed with Haida. The EAO has considered the views of Indigenous nations in its analysis of residual adverse effects and notes that further discussion of effects to Indigenous natons from marine shipping is contained in Part C.

In response, Cedar acknowledged the concerns and agreed that the potential for a malfunction or accident that results in a spill is risk that must be mitigated to the greatest extent possible. Cedar affirmed that the implications of a spill on marine resources, marine use, and exercise of Indigenous rights are all extremely important, but noted that the legislative regime and legal instruments for preventing a LNG carrier grounding, collision or allision are well defined and solely within the jurisdiction of the Government of Canada. Cedar further noted that it does not have responsibility for development of shipping-related spill response plans or other agreements subject to requirements of the *Canada Shipping Act*, 2001 and its regulations. These plans are required to be developed by the owners of the LNG carriers, WCMRC, and Transport Canada. However, Cedar noted it would participate, as relevant, in the development of shipping-related spill plans or other agreements subject to requirements of the *Canada Shipping Act*, 2001 and facilitate the involvement of Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Met lakatla, Haida and CCG in the development of these plans, where appropriate. The EAO recommends this as a federal Mitigation Measure, as described in section 6.1.4.1 below. The EAO notes that that, in addition to the regulatory framework surrounding spill response, there are a number of non-regulatory initiatives that also address spill response and planning in collaboration with Indigenous nations, as described in section 3.1 of Part A. The EAO considered this issue to be adequately addressed for the purpose of the EA.

#### *6.1.3.3 Health Assessments Following a Malfunction or Accident*

Northern Health, Kitselas, Gitxaała and Haida expressed interest in understanding how health effects following a malfunction or accident would be managed.

Northern Health noted the value of a human health risk assessment or health impact assessment following an accident or malfunction, which may be required to inform Northern Health in making appropriate public health advisories and actions (for example, food

consumption advisories, recreational water use restrictions, etc.), and understand the types of health services that would be required for impacted workers and the public. Northern Health also noted the importance of knowing which types of malfunctions or accidents will trigger a Health Impact Assessment (HIA) or Human Health Risk Assessment (HHRA), and who will be responsible for ensuring that such assessments take place. Northern Health's view was that typically this information is generally not captured under OGC's mandate/regulations but can be ordered under the *Public Health Act* if required – and requested that provisions to require such informationbe included as a condition in the EAC. Haida noted that baseline data nees to be in place prior to an accident occurring.

Regarding the FLNG Facility, Cedar noted that it would implement the emergency response program developed in accordance with the Emergency Response Regulation under the *Oil and Gas Activities Act* and applicable standards.

Regarding a malfunction or accident on the Marine Shipping Route, CCG is the lead agency for responding (in the case of oil spills) to ship-sourced pollution incidents. For LNG incidents, CCG would not respond directly but would support consequence management. In the unlikely event of a larger spill (i.e., one that takes more than a few days to clean-up), the CCG would set up an Incident Command System that would bring together federal and provincial environmental agencies to direct the spill response. Key agencies that would provide advice on the clean-up and end-points are: ECCC, ENV and possibly, DFO. In addition, Indigenous nations would be engaged on clean-up requirements in aquatic environments. Spills originating from the marine environment and reaching the shore are managed, in part, by both ECCC/CCG and ENV. ECCC also operates the National Environmental Emergencies Centre (NEEC). ECCC's National Environmental Emergencies Centre (NEEC) responds to pollution-related emergencies, 24 hours a day. The NEEC manages the receipt of spill notifications, evaluates that reasonable measures are taken to protect the environment and human health, and is able to take or direct reasonable measures, if required. ECCC plays a scientific support role to the lead government (federal or provincial) agency that has oversight of the spill cleanup. During a pollution emergency, the NEEC provides scientific information to agencies leading the response to an emergency, such as maps to show resources that may be impacted or at risk.

Closure end-points are assessed using field and/or laboratory data from the area of affected shoreline. SCAT data are used to develop treatment strategies that remove as much of the pollutant as possible without causing unduly detrimental impacts from the clean-up activity itself. In other words, the requirements to clean-up the spill are balanced with minimizing adverse impacts of the clean-up work itself. The goal of the clean-up program is to reach a "no further treatment" consensus between the environmental agencies, participating Indigenous nations, and stakeholders. If there is a "no further treatment" consensus but residual impacts remain, a follow-up monitoring and assessment program is used to determine if the natural environment is returning to baseline conditions. This follow-up work is typically one to three years in length. A human health and ecological risk assessment or fishing closure may be

recommended/required by the environmental agencies, but this is not standard practice. It is only implemented in unique circumstances; the goal is to achieve consensus on a safe and environmentally sound clean-up that precludes the need for a risk assessment or closure. ECCC and ENV would direct a human and ecological risk assessment. If a closure is deemed necessary, DFO is the agency responsible for establishing the fishing closure.

The responsible party is responsible for covering the cost of the human and ecological risk assessment, if required. Each spill is managed according to site specific conditions and treatment targets (endpoints) determined by the Incident Command System.

ENV follows up with the responsible party to ensure that they are taking the appropriate actions to restore the environment.

Health Canada and the Public Health Agency of Canada are collectively referred to as the federal Health Portfolio (HP). The role of the HP during a chemical emergency, including a spill from marine shipping or pipelines, is to provide support when requested from a Provincial/Territorial health authority or a federal government department (such as ECCC), to help manage environmental public health consequences.

The HP's support provided is consistent with its areas of mandated responsibilities and includes:

- Scientific advice (such as a review of human health risk assessments that may be required for consequence management);
- Surge capacity for analytical laboratory analysis; and
- Medical countermeasures, supplies and personnel.

Regarding potential spills at the FLNG facility, the EAO is of the view that OGC has the regulatory tools necessary to ensure that appropriate response including assessment and management of risks to human health is undertaken.

The EAO is of the view that there are adequate provisions in place to ensure the health effects of a spill are considered and addressed, including though the use of a human health and ecological risk assessment, if required. The EAO does not recommend any specific conditions on this topic and considers this issue to be addressed for the purposes of the EA.

#### *6.1.3.4 Marine Shipping Malfunction or Accident – Environmental, Health and Cultural Effects*

**Reversibility of an Oil Spill Event**

Kitselas, Metlakatla, Gitga'at and Gitxaała noted concerns regarding Cedar's characterization of an oil spill as a moderate risk event and reversible within two to five years. Lax Kw'alaams noted that perceived risk and avoidance behaviors may persist beyond five years. Lax Kw'alaams also requested that Cedar identify any evidence of Indigenous avoidance of

harvesting areas associated with marine accidents and spills, such as the sinking of the Queen of the North at Gil Island in Wright Sound and the NES Steward Tug at Athlone Island in Seaforth Channel.

In response, Cedar stated that the timelines for recovery from a spill were derived from several sources including: the chemical and physical characteristics of natural gas, marine diesel and bunker fuel; various National Oceanic and Atmospheric Administration publications, various scientific and consulting reports, and evidence submitted to the Review Panel for the Northern Gateway Project. Cedar recognized that there may be different opinions on the ranking of risk and consequences. For the marine use assessment, Cedar rated the risk as rare and the consequence as major, resulting in a high-risk score. This acknowledged the anticipated avoidance of the area by marine users while remedial work may be ongoing.

With respect to evidence of Indigenous avoidance of harvesting areas associated with marine accidents and spills, Cedar stated that it only has the information shared by the Indigenous nations participating in the Cedar LNG EA. Cedar noted that it was aware of Indigenous concerns regarding effects of a spill on marine use and Indigenous rights to harvest, and that many of these concerns were realized with the sinking of the Queen of the North and the Nathan E Stewart (tugboat).

Lax Kw'alaams reiterated its comment that perceived risk and avoidance behaviors following accidental release of bunker fuel may persist beyond the five years estimated by Cedar. However, Lax Kw'alaams acknowledged that consideration of a longer period of avoidance would not change the risk ranking, which was already estimated to be high. The EAO notes that it has recommended mitigation measures under the IAA for malfunctions and accidents, as described in section 6.1.4.1 below and is aware there are a number of non-regulatory initiatives that also address spill response and planning in collaboration with Indigenous nations, as described in section 3.1 of Part A. The EAO is of the view that this issue has been discussed and is adequately resolved for the purposes of the EA. The EAO notes the concern of Kitselas, Metlakatla, Gitga'at and Gitxaała regarding shipping accidents and notes that the effect of potential malfunctions and accidents on Indigenous Interests is discussed further in part C of this Report.

**Effects on Marine Resources and Wildlife**

Kitselas, Metlakatla, and Gitxaała noted that hull breaches resulting from carrier groundings, collisions, or allisions could lead to a release of hazardous materials which would have the potential to have direct contact effects on intertidal and nearshore subtidal species and habitats, with potential domino effects on marine use. They requested that Cedar assess the potential impacts to habitat resulting from grounding as these may have effects that must be carried into other sections of the assessment. Lax Kw'alaams also noted that release of contaminants from vessels can reach shores and affect birds and species such as mink and otter

and requested that Cedar identify interactions between LNG carrier grounding, collision or allision that results in a release of marine diesel or bunker fuel and terrestrial wildlife and estimate the associated risk.

In response, Cedar noted that the assessment process was intended to help identify appropriate mitigation measures to prevent an LNG carrier grounding, collision, or allision. Cedar noted that the identified mitigation measures were generally applicable to all VCs and had a high level of confidence in the identified mitigation measures. Cedar agreed that spills of marine diesel or bunker fuel could affect terrestrial wildlife that use shoreline and nearshore marine areas and noted that the risk for an LNG carrier grounding, collision or allision on terrestrial wildlife that use shoreline areas would be consistent with the risk to marine birds (such as oiling and toxicological effect).

The EAO notes the concern of Kitselas, Metlakatla, Lax Kw'alaams and Gitxaała regarding the potential effects of a malfunction or accident on wildlife and marine resources. The EAO has considered the potential for these effects to impact Indigenous Interests and use further in Part C of this Report. The EAO considered the assessment of the effect of a malfunction or accident on marine resources and wildlife adequate for the purpose of the EA.

**Cultural, Social and Harvesting Effects**

Health Canada, Northern Health, Lax Kw'alaams, Gitga'at, Gitxaała, Haida, and CCG had questions and concerns in relation to the potential consequences of malfunctions and accidents, including bunker fuel spills, in relation to cultural or social effects, including potential and perceived impacts to marine traditional foods (including formal or informal harvesting closures) and culturally sensitive areas.

Additional impacts from large vessel movements along the marine shipping route attributable to the Project may prevent or reduce Haida access to fishing or shoreline harvesting sites, which would disproportionately affect Haida citizens who heavily rely on the marine environment and its resources for food and for other purposes (e.g., ceremonial purposes, cultural, social, economic, spiritual, trade). If access to harvesting sites or the quality and quantity of resources available is diminished, Haida citizens' physical and mental health and well-being, culture, sense of identity, and governance systems may be impacted.

In response, Cedar noted that it considered the concerns raised by, and information shared by, Indigenous nations and that although not specifically identified, the proposed mitigation measures are applicable to potential effects on culturally sensitive areas, cultural practices, and heritage values. Cedar noted that if an LNG carrier grounding, collision or allision were to result in a release of marine diesel or bunker fuel, there could be impacts of concern for marine resources and wildlife as well as interference with the use of the area and associated resources by Indigenous nations.

Cedar noted that the consideration of effects to marine use and harvesting from a bunker fuel spill caused by an LNG carrier grounding, collision or allision took into consideration mitigation measures that would be applied in response to an incident. As described above, Cedar noted that vessels must have shipboard oil pollution emergency plans and a contract with WCMRC for spill response.

Following the emergency response phase of the clean-up, there would be ongoing work to remediate impacted areas to target endpoints (often CCME guidelines). If there were residual risks to human health after completing the remediation, responsible authorities could establish a local harvesting ban to reduce exposure to contaminants of concerns from harvesting and consuming fish and shellfish from this area. While this process would mitigate the risk to human health, the Application acknowledges that consequence and residual risk for marine use would be major and high, respectively.

The EAO recommends mitigation measures under the IAA for malfunctions and accidents, as described in section  below.

The EAO notes that it has considered the views of Working Group members on the VCs affected in its ratings and conclusions in section  and considers this issue to have been adequately addressed for the purpose of the EA. The EAO notes issues related to cultural, social and harvesting effects of malfunctions and accidents are further discussed in Part C.

### 6.1.4 EAO ANALYSIS AND CONCLUSION

#### *6.1.4.1 Proposed Provincial Conditions and Federal Key Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan, the EAO proposes the following provincial conditions related to malfunctions and accidents in addition to the provincial permitting processes and other regulatory requirements in place:

- CEMP (condition 9), including spill response measures; and
- Marine transportation communication report, as proposed in Section 5.9: Marine Use (condition 12).

The EAO notes that Cedar LNG must be designed in accordance with the Liquefied Natural Gas Facility Regulation (LNGFR) (*Oil and Gas Activities Act*), and BC Building Code and District of Kitimat bylaws. Cedar must also prepare an emergency management program following the Emergency Management Regulation (*Oil and Gas Activities Act*), and under the LNGFR must implement a Security Management Plan, and display signage at the facility including emergency notification information. Based on the safety studies submitted to the OGC a decision maker

may require the establishment of a marine safety zone. The EAO is of the view that there is a well-established provincial permitting process and regulatory regime that covers emergency management and detailed engineering design reviews and requirements for the FLNG Facility.

The EAO notes that marine shipping is a federally regulated activity and navigation, communication and safety, and emergency response are regulated and controlled by Transport Canada, the CCG, and the Pacific Pilotage Authority. See Part A of this Report for further details on the Marine Regulatory Framework. The EAO is of the view that the existing federal regulation of marine shipping in combination with the proposed provincial conditions and federal key mitigation measures would address the potential effects of a marine shipping malfunction or accident identified during the EA.

The EAO recommends the following Mitigation Measures under IAA:

- Marine transportation plan, and a community feedback process, as recommended in Section 5.9: Marine Use;
- Implement a maintenance program for operations that includes regular inspections and maintenance of the FLNG equipment and infrastructure to ensure the facility is maintained in a state of good repair, following the guidance of equipment manufacturers;
- Implement programs during construction and operation that address site safety and response to unplanned incidents;
- Implement an emergency management program for operations consistent with CSA Z246.2;
- Work with the CCG during development of its operations phase emergency response program to establish roles, responsibilities and communication processes for responses to incidences that may occur at the facility (operations); Participate, as relevant, in the development of shipping-related spill response plans or other agreements subject to requirements of the Canada Shipping Act, 2001 plans and facilitate the involvement of Haisla, Gitga'at, Gitxaała, Haida, Kitselas, Kitsumkalum, Lax Kw'alaams and Metlakatla in the development of these shipping-related spill response plans, where appropriate; and
- Share information with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, Haida and CCG, on any Cedar LNG carrier incident that results in a release of cargo or fuel to the environment. The report will include a description of the incident, identification of the government agencies that are engaged in a response to the malfunction or accident, a summary of environmental information collected (if available), and mitigation measures adopted and implemented to prevent future occurrences (if applicable).

#### *6.1.4.2 Ratings and Conclusions*

The EAO considered the views of Cedar and the Working Group in its rating of the likelihood, consequence, risk, and VCs potentially affected for each potential malfunction and accident, as

summarized in Table 33. The EAO notes that the effect of potential malfunctions and accidents on Indigenous Interests is discussed further in part C of this Report.

**Table 33: Summary of potential malfunctions or accidents, potentially affected VCs, likelihood, consequence and risk.**

| Malfunction or Accident | Potentially Affected VCs | Likelihood | Consequence | Risk |
|---|---|---|---|---|
| Loss of containment of LNG from the FLNG Facility | Air Quality, Wildlife, Marine Resources, Marine Use, Human Health, GHGs | Rare | Insignificant to Minor | Low |
| Spills of Hazardous Materials | Air Quality, Vegetation Resources, Wildlife, Freshwater Fish, Marine Resources, Land and Resources, Marine Use, Infrastructure and Services, Human Health | Rare to Unlikely | Insignificant to Moderate | Low to Moderate |
| Emergency FLNG Shutdown | Air Quality, Acoustic, Wildlife, Human Health, GHGs | Rare | Insignificant to Minor | Low |
| Fire or Explosion | Air Quality, Acoustic, Vegetation Resources, Wildlife, Marine Resources, Land and Resources, Marine Use, Human Health, GHGs | Rare | Insignificant to Minor | Low |
| LNG Carrier Grounding, Collisions, and Allisions | Air Quality, Wildlife, Marine Resources, Marine Use, Infrastructure and Services, Human Health, Heritage | Rare | Insignificant to Major | Low to High |
| FLNG Allision | Air Quality, wildlife, Marine Resources, Marine Use, Infrastructure and Services, Human Health | Rare to Unlikely | Minor to Moderate | Low to Moderate |

The EAO understands that public safety risk from activities at the Cedar LNG site would be discussed further following additional design, analysis, and review of potential mitigations during the OGC permitting process (should an EAC and federal IAA approval be issued).

The EAO appreciates that there is a high level of public, government and Indigenous concern regarding risks associated with LNG activities, particularly regarding shipping. While the consequences for the marine environment of an oil spill used to fuel LNG carriers could be major, the EAO notes that the likelihood of such an event is rare. The EAO also notes that that there is a well-established federal regulatory regime that covers shipping, pilotage, and spill response that is applicable to Cedar LNG and related shipping. The EAO has also proposed additional measures to address regulatory gaps and concerns heard from Indigenous nations and Working Group members during the EA. These relate to response planning, engagement with Indigenous nations, Northern Health, and local government and follow-up studies and reporting.

The EAO is satisfied that the potential accidents and malfunctions associated with Cedar LNG have been adequately identified, assessed, and mitigated for this EA.

## 6.2 CONSISTENCY WITH LAND USE PLANS

### 6.2.1 BACKGROUND

Section 25 of the Act (2018)[55] states that every assessment must consider how the Project is consistent with any land-use plans for the government or an Indigenous nation if the plan is relevant to the assessment. This chapter considers regional, municipal, and Indigenous land use plans in relation to Cedar LNG, including the following plans:

- Kalum Land and Resource Management Plan;
- Kalum Sustainable Resource Management Plan;
- Pacific North Coast Integrated Management Area;
- Marine Plan Partnership for the North Pacific Coast;
- Kitimat Official Community Plan;
- South West Kitimat Area Plan;
- Haisla Comprehensive Community Marine Use Plan;
- Haisla Nation Community Plan;
- Gitga'at Land Use Plan;
- Gitxaała Marine Use Plan and Land Use Plan;
- Kitselas First Nation Land Use Plan;
- Kitsumkalum Marine Use Plan;
- Strategic Land and Resource Use Plan for Metlakatla Territory, Metlakatla Land Use Plan, and Metlakatla Marine Use Plan; and
- Lax Kw'alaams Band Land and Natural Resource Management Plan.

Cedar LNG would include the on-site project area and off-site facilities. The on-site facility portion would be located on land and water lot owned in fee simple by Haisla Enterprises, an affiliate of Haisla Nation. Cedar LNG requires a water lot tenure for the submerged Crown land to encompass the area required for the FLNG facility, mooring LNG carriers and to safely operate Cedar LNG. The transmission line corridor crosses a mixture of private property and provincial Crown land.

### 6.2.2 LAND USE PLANS

The following section describes land use plans and the degree to which the Project is consistent, based on information provided by Cedar and Indigenous nations.

[55] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

#### *6.2.2.1 Kalum Land Resource Management Plan and Sustainable Resource Management Plan*

In British Columbia, regional Land and Resource Management Plans (LRMPs) provide guidelines and strategies for the management of public land and resources within their respective planning areas. Regional LRMPs are the responsibility of the Ministry of Land, Water and Resource Stewardship.

Cedar LNG falls within the Kalum LRMP. The Kalum LRMP describes general resource management directives to accommodate a mix of resource development (including recreation, tourism, trapping, guiding, timber, and mineral extraction), and resource conservation (including biodiversity, wildlife habitat, rare or endangered species, visual quality and community watersheds) uses and values. The general management directives of the Kalum LRMP include the management of visual resources, with the objective to ensure a level of visual quality that meets the expectations of the community yet is consistent with the principles of integrated resource management. It strives to maintain visual quality and other tourism resources to a high standard in areas important to tourism. Use of appropriate landscape design is advocated for industrial development and harvest opening, to maintain aesthetic values and address visual effects.

The Kalum Land and Resource Management Plan provides direction for the Kalum Timber Supply Area, Tree Farm Licence 41- Skeena Cellulose, and Tree Farm Licence 41- Skeena Sawmills as well as Crown lands within the communities of Terrace, Kitimat, Kitamaat Village and other surrounding rural communities. The plan has three main categories providing direction on General Resource Management, Resource Management Zone, and Protected Areas.

Sustainable Resource Management Plans (SRMPs) translate the broad objectives of the LRMPs into more focused resource management policies to facilitate operation planning and decisions related to resource management (such as visual resources). Objectives and recommendations from the Kalum LRMP are legalized through the Kalum Sustainable Resource Management Plan under the Land Use Objectives Regulation Order.

Implemented in 2006, the Kalum SRMP legally establishes wildlife areas for coastal tailed frogs and ungulate winter range for mountain goats and moose within the Kalum Timber Supply Area and Tree Farm Licence 1 and 41. The Kalum SRMP encompasses an area of 1.6 million hectares in northwestern British Columbia. Since 2006 the Kalum SRMP has been updated to fulfill the Gitanyow Recognition and Reconciliation Agreement, amend Objective to better protect the Skeena Islands, and to improve consistency with old growth management areas established under the *Oil and Gas Activities Act* and the *Forest and Range Practices Act*.

Cedar noted that the Facility Area falls within the Kalum LRMP and SRMP where planning activities and land use decision-making are undertaken. Land and resource management activities within the Kalum planning area are guided by various government resource management policies and strategies developed for Resource Management Zone categories.

Under the Kalum LRMP, the Facility Area is in the Settlement zone. This zone includes areas subject to separate planning processes known as Official Community Plans (OCPs). In the Settlement zone, settlement and industrial development are given greater emphasis over forestry. The Kalum LRMP recognizes OCP boundaries, as well as lands strategically identified for potential industrial development. The Facility Area is located within a proposed industrial development area under the Kalum LRMP. Furthermore, the Kalum SRMP is consistent with the Kalum LRMP objectives regarding development of mineral and energy resources.

In addition to the Kalum LRMP, the Kalum SRMP provides direction for the management of visual resources under the *Forest and Range Practices Act*. Visual quality objectives have been defined for the management of visual resources based on the following visual quality classes: Preservation, Retention, Partial retention, Modification, and Maximum modification. Much of the southern portion of the LAA surrounding the Facility Area has been identified with a visual quality objective of Partial retention (i.e., an alteration easy to see, that is small to medium in scale, and is natural and not rectangular or geometric in shape). The Project will increase the amount of industrialized landscape within the LAA but will not change the overall visual character in the Kitimat area, which has already been altered by waterfront developments (such as Rio Tinto or LNG Canada). The planning areas do not preclude development subject to the application of defined mitigation measures and obtaining appropriate permits.

#### *6.2.2.2 Pacific North Coast Integrated Management Plan Area*

The Application describes that the Pacific North Coast Integrated Management Area (PNCIMA) is one of five national Large Ocean Management Areas. It includes ecosystem-based management guides for marine activities and resource development. Within the PNCIMA, ecosystem-based management guides marine activities and resource development. In the near term, five plan priorities have been identified: governance arrangements for implementation; marine protected area network planning; monitoring and adaptive management; integrated economic opportunities; and tools to support plan implementation.

The PNCIMA plan is the product of a collaborative process led through an oceans governance agreement between the federal, provincial and First Nations governments, and contributed to by a diverse group of organizations, stakeholders and interested parties. The PNCIMA plan provides guidance and commitment to integrated, ecosystem-based and adaptive management of marine activities and resources in the planning area. The ecosystem-based management framework requires the consideration of social, cultural and socio-economic effects and cumulative effects, all of which have been considered in the Application. The PNCIMA plan recognizes B.C. as a major gateway for Asian trade to and from North America and identifies Stewart, Kitimat, and Prince Rupert as ports poised for expansion to facilitate increased trade with Asian markets.

The Project is situated within the PNCIMA planning area, which extends from the Canada-US border of Alaska to Brooks Peninsula on northwestern Vancouver Island and to Quadra Island in the south. The Project aligns with the PNCIMA's goals and priorities (i.e., its goal to support sustainable economic opportunities, livelihoods and economic diversification among ocean-related businesses, industries and coastal communities and its priority for short-term implementation to provide integrated economic opportunities). The PNCIMA plan describes its commitment to achieving health, fully functioning ecosystems, and human communities. A key component of this commitment is ensuring that sustainable economic opportunities and diversification among marine-based businesses support all users. Economic opportunities are also identified as a priority in the Marine Plan Partnership for the North Pacific Coast (MaPP) plans. Cedar was of the view that the Project would provide sustainable economic opportunities to communities located in the north coast region.

#### *6.2.2.3 Marine Plan Partnership for the North Pacific Coast*

The Application describes that MaPP is a partnership initiative between the Province of British Columbia and 16 Indigenous nations that is implementing marine use plans for the MaPP region (divided into four subregions: Haida Gwaii, North Coast, Central Coast, and North Vancouver Island). MaPP Plans provide recommendations for marine management, uses, activities, and protection and are intended to inform economic development and stewardship of British Columbia's coastal marine environment. The North Coast Marine Plan covers an area extending from Portland Inlet in the north to the south end of Aristazabal Island and is bounded by the coastal boundaries of the Kitimat-Stikine and North Coast Regional Districts to the east and the Haida Gwaii MaPP plan area to the west. Over this area the North Coast Marine Plan prescribes four overarching themes[56], 14 topic-specific general management directions[57], and subdivides the plan into three management zones (general, special, and protection) that together guide sustainable management of marine resource and activities. Cedar stated that the Project is aligned with the strategic marine planning objectives outlined in the MaPP.

The purpose of the North Coast Marine Plan is to provide recommendations for achieving ecosystem health, social and cultural well-being, and economic development through an ecosystem-based approach to planning and management. The North Coast Marine Plan adopted to ecosystem-based management framework, which was established through the PNCIMA initiative, and it recognizes the economic well-being of communities and residents as an integral component of the ecosystem-based management approach. The Project will provide

[56] Ecosystem-based management, governance, cumulative effects assessment, and climate change adaption and mitigation

[57] Compliance and enforcement; monitoring; marine protection; marine pollution' marine response; tenured activities: land policies and procedures; tenured activities: renewable energy; tenured activities: shellfish and marine plant aquaculture; tenured activities: marine-based forestry operations; tourism and recreation; marine fisheries economy; economic well-being; heritage sites and Indigenous nations cultural areas; Indigenous nations resource use and management.

sustainable economic opportunities to communities located in the north coast region. Its positive residual effects on regional businesses and the regional economy are discussed in Section 7.8: Employment and Economy of the Application.

The North Coast Marine Plan defines three types of marine spatial zones: the General Management Zone (GMZ), which allocates space for a wide range of marine uses and activities that are governed or managed using an ecosystem-based management framework, Special Management Zone (SMZ), which allocates space for high priority and/or high potential sustainable marine uses and activities, and Protection Management Zone (PMZ), which allocates space primarily for conservation purposes or objectives, and may provide a basis for protecting localized conservation values. The Project and its related activities (such as marine shipping) are mostly located in the North Coast Marine Plan's GMZ. The Project and its related activities do not intersect the North Coast Marine Plan's High Protection PMZ, which include areas of the highest conservation value with an emphasis on protecting marine species, ecosystems, and ecological processes in their natural state.

#### *6.2.2.4 Kitimat Official Community Plan*

Official Community Plans (OCP) are mandated local government planning documents that set out the objectives and policies for the physical and social development of a community. After an OCP is formally adopted, all bylaws enacted by the municipality must be consistent with the OCP. In May 2007, the District of Kitimat began preparation of the Kitimat OCP. It was adopted in 2008 and has been regularly updated, most recently in November 2021. The Application described that the Kitimat OCP prescribes planning and development controls for building and land development within municipal government districts. The Facility Area is located on lands within the District of Kitimat designated as "Industrial" under the District of Kitimat OCP and "M1 - Manufacturing" under Part 9, Division 6—Industrial Zoning of the Kitimat Municipal Code By-law Part 9 (Planning). Industrial development is encouraged in the "Industrial" land use under the Kitimat OCP. The transmission line overlaps land use Zones M1 and G5 with lands zoned G5 being intended for forestry uses. Based on this zoning, Cedar noted that there would be no conflict between the development of the site or transmission line and the OCP.

#### *6.2.2.5 South West Kitimat Area Plan*

As described in the Application, the District of Kitimat proposed a new local area plan for municipal lands on the west side of Douglas Channel. This plan would be an extension of the Kitimat OCP applied to specific areas or issues within the municipality. The Cedar LNG Project is located within the local area plan boundary west from Douglas Channel to the District of Kitimat boundary. The planning process for this plan is currently not scheduled for completion. Cedar has met with the District of Kitimat and reported it did not identify the Cedar LNG Facility Area as an area of concern.

#### 6.2.2.6 Haisla Nation Plans

Cedar described in the Application that the Facility Area is located within the traditional territory of the Haisla Nation and in 2006, the Nation started their Marine Use Planning initiative and in 2014 produced the Haisla Community Marine Use Plan. This plan guides marine resource management, and the Nation is developing, an updated community based marine use plan to support sustainable economic development initiatives.

Haisla Nation developed a Comprehensive Community Plan[58] to guide community development in their traditional territory. This plan includes nine inter-connected goals identified by community members, which relate to the topics of: housing, language and culture, youth, education, economic development, elders, environment, health and wellbeing and community safety.

The Haisla Land Use Plan provides priorities and recommendations for Haisla reserves but does not explicitly speak to marine shipping or govern Haisla fee simple lands (on which Cedar LNG would be located).

#### 6.2.2.7 Gitga'at Nation Plans

The Application notes that Gitga'at developed their Marine Use Plan (MUP)[59] in 2011 and their Land Use Plan (LUP) in 2003; the MUP and LUP continue to evolve today and are being developed by the Gitga'at Ocean and Lands Department in response to the changing needs and management objectives of the Nation. The MUP aims to educate governments, proponents, and others about the proper management and protection of the marine, intertidal, and other nearby environments in Gitga'at traditional territory that are accessed and used for traditional purposes. The MUP was developed by Gitga'at Chiefs, elected councillors, Gitga'at stewardship staff, and other individuals. The LUP similarly aims to educate about and ensure protection of the lands and terrestrial resources in Gitga'at traditional territory. Both the MUP and LUP include zoning and management strategies guided by the enduring cultural principles, values, and laws of Gitga'at.

The Gitga'at MUP states the following:

> The Queen of the North sinking brought the risks of shipping and marine transportation home to Giga'at. Our people now know firsthand how even a small fuel spill could impact our waters and resources. It also highlighted the need to engage more effectively in decision making related to coast shipping and international tanker traffic. Existing shipping of condensate now causes real concern and worry. The risks posed by large scale shipping of oil and gas through our territory are high. The consequences of a large oil spill are unimaginable to our people.

[58] Haisla Nation Comprehensive Community Plan (September 2020 version) available here.

[59] Gigta'at Marine use Plan (revised November 12, 2020 available here.

Clearly our first choice is to eliminate unacceptable risks to our territory and our future generations by not allowing our marine waters to be used in ways that create a high level of risk to our environment and way of life. We will do everything we can to achieve that goal.

If for whatever reason, we cannot prevent uses from occurring then we must make sure they are regulated so that our interests are taken into account first and so that we are protected in event of any accidents or incidents. We cannot imagine what our territory would look like should an oil tanker have even a small spill.

**Objectives**

With respect to use of our territory for shipping the outcomes we plan to achieve include:

- Use of our territorial waters for shipping is regulated such that large oil and gas tankers and other marine traffic which poses a high risk to our environment, culture and way of life are not allowed to pass through our territory;
- Gigat'at have the capacity to monitor and respond effectively in the event marine accidents and contaminating oil, fuel or other spills do occur; and
- We play an effective role in the development and implementation of policies and decisions regarding shipping and tanker traffic in our territory.

Because Cedar LNG would involve LNG carriers traveling along the Marine Shipping Route, through Gitga'at traditional territory, the Project is not consistent with the Gitga'at Marine Use Plan.

#### *6.2.2.8 Gitxaała Nation Plans*

The Application notes that Gitxaała began their Marine Planning Process in 2007, guided by representatives of the Gitxaała Harvesters Association and Gitxaała Environmental Monitoring staff; the Gitxaała Marine Use Plan (MUP) was developed in 2009–2011 and continues to evolve today. The MUP sets out marine protection standards, a series of recommendations regarding approach and values, and outlines the objectives and strategies necessary to guide sustainable management of marine resources, such as for shellfish and marine plant aquaculture. The MUP informed the Government of British Columbia's collaboration with the Nation towards the development of the spatial plan for the MaPP.

The Application further describes that in the early 1990s, Gitxaała Nation began Land Use planning activities through the North Coast LRMP, and the initial Gitxaała Land Use Plan (LUP) was finalized in 2004. Gitxaała undertook land use planning with community members, and later signed a Sustainable Land Use Planning Agreement (SLUPA) with the province in 2006. The North Coast LRMP set out management objectives for cultural heritage, resources, and wildlife habitat, outlined procedures for the maintenance of ecological integrity, and identified the need for active participation on Kennedy Island, Stephens Island and West Porcher Island.

As indicated to the EAO by Gitxaała, work is ongoing to update the Gitxaała MUP and LUP both within the Gitxaała Nation, and as part of collaborative planning processes with the provincial and federal governments, which will have implications for current and future management of lands and resources within Gitxaała Nation territory. Given the ongoing work to update the plans, Gitxaała indicated that the Gitxaała MUP and Gitxaała LUP are not currently relevant to the assessment of Cedar LNG.

#### *6.2.2.9 Kitselas First Nation Land Use Plan*

In the Application, Cedar notes that Kitselas First Nation's Land Use Plan[60] was published in 2019. This is an update of the Nation's 2012 Land Use Plan and is intended to guide development decisions for reserve lands.

The Kitselas Land Use Plan states:

> The Land Use Plan provides for land use that reflects and reinforces Kitselas' values relating to the land base. It is an important policy document for implementing the Kitselas Reserve Lands Management Act (2005). It also provides guidance for the development and implementation of a future Kitselas Zoning Law and Subdivision. Development and Servicing Law and Process which will provide regulations and processes for land use, site development and design and enforcement on Kitselas Reserve Lands.

The EAO notes that the Kitselas Land Use Plan provides priorities and recommendations for Kitselas Reserves but does not explicitly speak to marine shipping or provide a land use designation for any area that overlap the Cedar LNG Facility Area or Marine Shipping Route.

#### *6.2.2.10 Kitsumkalum First Nation Plans*

In the Application, Cedar describes that Kitsumkalum developed a Marine Use Plan[61] in 2014 with an "overarching goal to manage resources using a stewardship model so that there is a sustainable balance between economic development, social and cultural well-being and ecosystem health". The Marine use Plan involves a Community Coordinator who is supported by a Marine Planning Committee, with representatives including Elders, hereditary Chiefs, council members and fish and wildlife managers. The role of the Marine Planning Committee is to guide the development and implementation of the Marine Use Plan based on the values and Interests of the Kitsumkalum First Nation.

The EAO notes that the Kitsumkalum Marine Use Plan has designated draft zones (including marine conservancy, special management, and aquaculture) to facilitate sustainable resource use in their traditional territory. These draft zones do not overlap the project footprint or Marine Shipping Route.

[60] Kitselas First Nation Land Use Plan (2019). Available here.

[61] An executive summary of the Kitsumkalum Marine Use Plan is available here.

The Application also describes that Kitsumkalum First Nation developed a draft Comprehensive Community Plan[62] to support goals, objectives, and activities for health, infrastructure development, culture, social, education, economy, and governance. The Comprehensive Community Plan is a tool used by Kitsumkalum to guide decisions to develop and protect their lands in a way that reflects their environmental, spiritual, social, and economic values.

The EAO notes that the Kitsumkalum Marine Use Plan provides priorities and recommendations for the Kitsumkalum Marine Planning Area. However, this area does not overlap with the Cedar LNG Marine Shipping Route.

#### *6.2.2.11 Metlakatla Plans*

The Application noted that Metlakatla produced a first draft of a Strategic Land and Resource Plan for Metlakatla Territory in 2004. In 2009, the Metlakatla worked with Coastal First Nations to develop a Land and Resource Protocol Agreement which provides for a collaborative, Government to government implementation of land use planning agreements.

The Metlakatla Land Use Plan[63], developed in 2019, specifically guides the development and use of Metlakatla reserve lands and resources.

The Metlakatla Marine Use Plan[64] is a strategic document developed to guide marine resource management in Metlakatla territory. The Plan is comprehensive and covers jurisdiction, resource management, economic development, and capacity needs across all sectors of the marine market and non-market economy. The Executive Summary of the Plan notes the following regarding marine transportation:

> Numerous industrial marine development proposals are being pursued within the North Coast and our territory. Several new terminal and marine transportation projects for North Coast ports in Prince Rupert, Kitimat and Stewart are at various levels of development. In aggregate, the marine transportation proposals are expected to substantially increase shipping traffic throughout British Columbia and particularly in the confined approach waters to the North Coast ports. Metlakatla First Nation does not support the proposed Northern Gateway Project.
>
> Current and planned projects impact our traditional territory. Marine Transportation is of particular concern as it impacts Metlakatla Pass and the Tree Knob group which are core areas providing food and livelihood for our community. With increased traffic comes an increase in frequency and severity of accidents and associated spills. This is significant since several projects involve the transport of hydrocarbons. In addition, small commercial and transient vessels travel our territorial waters. Vessels of all types

[62] Kitsumkalum Draft Comprehensive Community Plan (2016) available here.

[63] Metlakatla Land Use Plan (2019) available here.

[64] Metlakatla Draft Marine Use Plan Executive Summary is available here.

> affect marine water quality which can in turn affect sediments or marine organisms. Metlakatla is concerned that we receive little or no economic benefit from shipping and transportation, yet we are exposed to significant risk. Improved regulation and better monitoring and enforcement are needed to reduce the harm to our marine resources.

Metlakatla noted to the EAO that its concerns around marine shipping are broader than just the Metlakatla Pass and Tree Knob group and would apply to the Marine Shipping route for Cedar LNG. Metlakatla noted that the Project is not consistent with Metlakatla's Marine Use Plan and objectives without further attention to improved regulation and oversight of project related marine shipping and transport, and to cumulative effects of marine transport in Metlakatla Territory.

#### *6.2.2.12 Lax Kw'alaams Band Land and Natural Resource Management Plan*

The Lax Kw'alaams Band Land and Natural Resource Management Plan was approved in 2004 and is currently being updated. The Plan describes management goals for Lax Kw'alaams traditional territory and incorporates its cultural, environmental, economic, and natural resource values.

Lax Kw'alaams provided the following information about the Plan:

> In accordance with the Lax Kw'alaams Lands and Natural Resource Management Plan (2021) every project is evaluated to determine potential impacts on the environment and ensure that the activities are in alignment and compliance with the Lands and Natural Resources Management Plan strategies. The LUP cross-referencing process ensures that all resources within Lax Kw'alaams traditional territory are maintained, enhanced, and protected for future generations while defining the potential impacts the project activity may pose on Lax Kw'alaams rights and title. The condition of any infrastructure development activity within Lax Kw'alaams traditional territory is to ensure that Lax Kw'alaams has meaningful management authority over all development within the territory. Generations of development and over-harvesting within the traditional territory have resulted in cumulative impacts that continue to be felt generationally.
>
> Land use zones provide strategic direction regarding the types of permissible activities in various areas of the territory and highlight the priorities for management. These zones delineate what kind of activities can occur, where they can (or cannot) occur, and how such activities should be managed within these zones. It must be understood that the Aboriginal rights of Lax Kw'alaams Band members to hunt, gather, fish, trap and continue activities for food, social, cultural, ceremonial or subsistence are not limited by the delineation of any land use zone. The Cedar LNGProject falls within both the Kwil-mass and Ksgaxl (CNA) of the Lax Kw'alaams Land Use Plan. Cultural and Natural Areas (CNA's) are areas within Lax Kw'alaams traditional territory with high traditional use and cultural and biological significance. The primary goal of management is to ensure that

these areas remain in a largely natural condition to protect and enhance their traditional use, cultural heritage, and biophysical values for the current and future generations of the Lax Kw'alaams people. These core areas are the backbone of our land and natural resources plan and are essential in providing long-term security and certainty for Lax Kw'alaams members. They will always be places where Lax Kw'alaams can harvest resources and practice the Tsimshian way of life, as our ancestors have always done providing a land base for culturally appropriate opportunities. Traditional uses will continue and only should be enhanced through the designation and management of these areas.

The Management intentions/compliance for the Kwil-mass and Ksgaxl CNA's are as follows:

- Protect and where necessary restore resource harvesting areas;
- Protect and where necessary restore traditional use opportunities;
- Identify, Conserve and Protect archaeological sites and values;
- Restore abundance of depleted resources through reductions in commercial/industrial shipping activities; and
- Protect and Restore fish habitat, inter-tidal (beach resources) and terrestrial/marine harvest areas.

Lax Kwa'alams stated to the EAO that the proposed Cedar LNG activities (shipping) which will transect these two CNA's of Lax Kw'alaams traditional territory do not comply with the approved activities and management regulations under the Lax Kw'alaams Lands and Natural Resource Management Plan for Scheduled Land use Zoning designated as Cultural and Natural Areas.

### 6.2.3 ISSUES RAISED DURING APPLICATION REVIEW

No key issues were raised during Application review pertaining to the consistency of Cedar LNG with land use plans.

### 6.2.4 THE EAO'S ANALYSIS AND CONCLUSIONS

The EAO notes that for the land use plans in the area of Cedar LNG, the regional and municipal plans and several Indigenous land use plans are either consistent or not specifically inconsistent with the Project. The Gitga'at Marine Use Plan, Metlakatla Marine Use Plan, and Lax Kw'alaams Lands and Natural Resource Management Plan are not consistent with the Project. The EAO engaged Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla and Haida during the EA and sought to address concerns raised regarding malfunction and accidents and the effects of marine shipping. Concerns on this topic are discussed further in this Report (see Part A; Section 5.9: Marine Use; Section 6.1: Malfunctions and Accidents; and Part C).

# 6.3 POTENTIAL CHANGES TO THE PROJECT THAT MAY BE CAUSED BY THE ENVIRONMENT

## 6.3.1 BACKGROUND

The Application assessed the likelihood of the potential changes to Cedar LNG that may be caused by the environment, and their consequences on relevant VCs. The following environmental effects and processes have the potential to affect Cedar LNG and result in changes or effects to the VCs assessed in the Application:

- Climate change;
- Extreme weather, including:
  - Extreme temperatures;
  - Precipitation;
  - Flooding; and
  - Wind and waves;
- Seismic events and tsunamis;
- Geohazards; and
- Forest fires.

## 6.3.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

### *6.3.2.1 Climate Change*

#### *POTENTIAL PROJECT EFFECT*

The Application stated that the average annual temperatures in the area where Cedar LNG would be located is projected to increase 3.0 degrees Celsius (°C) by 2055, with minimum temperatures increasing more than maximum. The mean annual precipitation is forecasted to increase by approximately 7 percent with the snow component of precipitation decreasing 72 percent. The most probable effects on Cedar LNG from climate change are those resulting from sea level rise, precipitation, storm events and likelihood of forest fires. LNG vessels may also be impacted/delayed by extreme rain, wind and waves from large storms, but this is not expected to significantly affect operation. However, sea level is expected to rise by 20 to 35 centimetres (cm) by 2050 and 60 cm or more by 2100. This could cause land and marine infrastructure to become compromised if not considered in the project design.

#### *PROPOSED MITIGATIONS*

The Cedar LNG nearshore marine infrastructure (such as its mooring system) and FLNG facility would be designed to consider a potential 50 cm sea level rise. A 1:50 year return period for weather conditions (such as wind or precipitation) would be used to design onshore structures,

in accordance with the British Columbia Building Code. Design conditions for the FLNG facility mooring system would consider a 1:100 year return period wind and waves combined with the 1:10 year return period current. Any culverts/conveyance systems that would be in place for three years or less would be designed for a 1:10 year runoff event, and any systems designed to stay in place for more than three years would consider the 1:100 year runoff event. Lastly, Cedar LNG would be equipped with an automated safety system that would facilitate safe shutdown and isolation of hydrocarbon containing equipment during extreme adverse conditions.

#### *6.3.2.2 Extreme Weather*

***POTENTIAL PROJECT EFFECT***

The local extreme temperatures range from a low of -26°C in December to a high of 36.7°C in August. The change in temperatures from climate change could result in similar extremes more frequently occurring during the lifespan of Cedar LNG. Elevated temperatures could require increased energy demand for cooling or making working conditions safe to avoid heat-induced illnesses. An increase in ice loads on the marine infrastructure, as well as risk of travel from Kitimat, could result from colder temperatures.

The local extreme 24-hour precipitation events for rainfall and snowfall at the Environment Canada weather station closest to the Cedar site are 179.4 mm and 82.6 cm, respectively. Approximately 34 days per year receive 25 mm of rainfall or more. The Cedar LNG infrastructure could be damaged from erosion resulting from heavy precipitation or flood events (snow or rain) overwhelming the stormwater management systems. Heavy precipitation could also cause unsafe working conditions. There is the potential for ocean flooding from a combination of strong winds and high tides, resulting in surge tides.

Cedar LNG would be protected from the open ocean as it is located on the Kitimat arm, which is a relatively sheltered section of the Douglas Channel with several small islands. While winds are funneled up Douglas Channel, the irregular alignment of the fjord and presence of the islands helps to protect the marine terminal from extreme wind and wave action. The maximum recorded wind for the area was measured at 56 km/hr; however, monthly averages are relatively moderate, ranging from 10 to 20 km/hr. The Douglas Channel water currents are dominated by fjord estuarine circulation, which involves freshwater outflow from the Kitimat River and landward tidal saltwater. High winds and large waves could occur with the potential to impact Cedar LNG by damaging marine infrastructure (such as its mooring systems), creating unsafe conditions at the FLNG facility or erosion of the shoreline.

***PROPOSED MITIGATIONS***

Cedar LNG would be designed so that it can operate in both low and high extreme temperatures as extreme weather conditions are expected to occur more frequently. A 1:50 year return period for weather conditions (such as wind or precipitation) would be used to

design onshore structures. Design storm conditions for the FLNG facility mooring system consider a 1:100 year return period wind and waves combined with the 1:10 year return period current.. Culverts/conveyance systems that would be in place for three years or less would be designed for a 1:10 year runoff event, and any stormwater systems designed to stay in place for more than three years would consider the 1:100 year runoff event. LNG carrier mooring considers a 1:10 year weather event for side-by-side mooring and the upper limits of LNG carrier birthing would be established based on specific weather conditions. Cedar would also develop a Marine Transport Management Plan that would include methods to establish a safety zone around the marine terminal during operation and use of tugboats to assist LNG carrier with berthing/departure, which would serve as a mitigation measure against the impacts of extreme winds and waves.

#### *6.3.2.3 Seismic Events and Tsunamis*

***POTENTIAL PROJECT EFFECT***

The Pacific Coast is the most seismically active area of Canada. The north coast areas of the mainland, in which Cedar LNG would be located, are within a moderate seismic hazard zone. Cedar LNG would be most likely to be impacted by shaking and vibration, which could affect the structural integrity of both the marine and terrestrial infrastructure. There is potential for a sufficient level of damage to result in release of LNG or other hazardous materials into the surrounding environment from a seismic event of sufficient magnitude; however, this is highly unlikely.

Cedar undertook a tsunami analysis for the Project Area. This study noted that any tsunami generated along the Cascadia Subduction Zone or from other parts of the Pacific Rim would be attenuated before reaching Kitimat Arm. Accordingly, tsunamis of sufficient height to cause infrastructure damage are not foreseen to reach Cedar LNG. However, there is a risk of tsunamis caused by a local landslide (rapid and substantial of a slope along the sides of Kitimat Arm), resulting from seismic activity. This type of tsunami is considered to be a geohazard event and discussed below.

***PROPOSED MITIGATIONS***

Cedar would ensure that Cedar LNG is designed in accordance with the Liquefied Natural Gas Facility Regulation (*Oil and Gas Activities Act)*, BC Building Code and District of Kitimat bylaws. An emergency management program would be prepared by Cedar for operation to follow the Emergency Management Regulation (*Oil and Gas Activities Act*). The design of onshore infrastructure would consider a 1:475-year seismic event for operability and 1:2,475-year event for survivability.

#### *6.3.2.4 Geohazards*

***POTENTIAL PROJECT EFFECT***

The risk to infrastructure from landslides, debris flows, rockfalls, avalanches and erosion are all considered geohazards. The most prominent geohazard concern for the Kitimat area is potential for submarine slope failures and the subsequent tsunamis that may occur in the Kitimat Arm. Two such tsunamis have been experienced in the Kitimat Arm in the past 50 years with the generated wave heights reaching 8.2 and 2.8 meters (m) and causing local infrastructure damage. The factors that contribute to landslide risks include slope angle, aspect, precipitation, permafrost, surficial geology and vegetation and based on these factors the Kitimat region has been determined to have a high level of susceptibility to landslide events. This risk of contributing factors is expected to increase over the operation phase as an effect of climate change.

#### *PROPOSED MITIGATIONS*

Cedar LNG would be designed in accordance with the Liquefied Natural Gas Facility Regulation for LNG production, storage, handling, design requirements for near shoreline FLNG facilities, BC Building Code and District of Kitimat bylaws. An emergency management program would be prepared by Cedar for operation to follow the Emergency Management Regulation (*Oil and Gas Activities Act)*. The design of onshore infrastructure would consider a 1:475-year seismic event for operability and 1:2475 year even for survivability. All critical infrastructure would be located above the predicted tsunami inundation line.

#### *6.3.2.5 Forest Fires*

#### *POTENTIAL PROJECT EFFECT*

As Kitimat is within a very wet marine biogeoclimatic zone, the forest fires tend to be rare, minor and of low to moderate intensity, with fire danger ratings in the area tending to be low year-round. There is the potential for a forest fire during construction, operation or decommissioning with the extent of effects from the fire depending on the location and size of event. Currently it is unlikely for a forest fire to affect the Cedar LNG project infrastructure; however, this risk is expected to increase over the operation phase as an increase in forest fires is anticipated as an effect of climate change.

#### *PROPOSED MITIGATIONS*

Cedar would prepare an emergency management program for operation in accordance with the Emergency Management Regulation (*Oil and Gas Activity Act*), as amended from time to time. Cedar would also follow the *Wildfire Act* and Wildfire Regulation, and develop and implement a health, safety, security, and environment management plan that includes procedures such as equipping the marine terminal site and vehicles with fire extinguishers and fire-fighting equipment.

### 6.3.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS

## IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of the potential changes to the project that may caused by the environment were identified:

- Emergency anchorages and shipping;
- Seismic events and geohazards; and
- Climate change.

### *6.3.3.1 Emergency Anchorages and Shipping*

Gitxaała, Kitselas, and Metlakatla raised concerns about the potential for climate change to result in increased wind and waves in the Principe Channel and to increase the risk of accidents and malfunctions and the need for emergency anchorages. Commenters inquired if any studies relating to this effect would be completed. Gitxaała and Metlakatla stated that without additional information on potential impacts and mitigations for mariner safety (i.e., additional anchorages) it is not possible to verify that the effects of climate change on the Project would be low.

Cedar responded that it does not believe that any additional emergency anchorage locations would be required in Principe Channel. Cedar noted that emergency anchors are identified in the existing TERMPOL assessments for the shipping route. Cedar also stated that Government of Canada has implemented a strict regulatory regime for shipping in Canada. For LNG carriers visiting the Project this includes the use of BC Coast Pilots to provide local knowledge of the waters along the shipping route, and the use of escort tugboats to provide additional navigation safety along the shipping route.

Gitxaała, Kitselas and Metlakatla did not submit follow-up comments on this topic. The EAO notes that BC Coast Pilots have indicated that emergency anchorages are not used for adverse weather. BC Coast Pilots noted that while wind and weather conditions that would be too rough for passage would be unusual in Principe Channel, in the event that these did occur, ships would wait outside of the Principe Channel until it was safe to navigate. The EAO considers this issue to be adequately addressed for the purpose of the EA.

### *6.3.3.2 Seismic Events and Geohazards*

Natural Resources Canada (NRCan) requested additional information and analyses on:

1) Seismic events and the potential for effects on Cedar LNG from earthquakes including the origin, time, and distance of the largest earthquake within a 200-km radius;
2) Geohazards, including how risks from submarine landslides and slope failure related to tsunamis would be mitigated;
3) Possible restrictions to be imposed on the activities of ground infilling, dredging, pile driving, and blasting so that these do not coincide with low tides;

4) Seabed mapping for this area to determine conditions of gas in sediment, sediment thickness, artesian flow, and geotechnical slope stability; and
5) Tsunami modelling of a reasonable size failure in this location as has been done for the Moon Bay Slide in Kitimat in 1975.

NRCan also requested that seabed and upland piezometers be deployed in this area for a period of at least one year as part of the geotechnical investigation to determine excess pressure conditions in sediment pore waters, especially in the offshore at extreme low tides.

Cedar conducted a search of earthquakes within 200 km of the project site using NRCan's Earthquake Database which his identified 1,573 earthquakes dating back to February 1985. Of these, 966 earthquakes with a magnitude <2.0, 555 earthquakes with a magnitude of 2.0 to 2.9, 43 earthquakes with a magnitude of 3.0 to 3.9, eight earthquakes with a magnitude of 4.0 to 4.9, and one earthquake with a magnitude of 5.0 to 5.9. Ten percent of these were located within 100 km of the site[65]. Cedar noted the closest earthquake of magnitude ≥2.5 local magnitude (ML) was a 2.8 ML event that occurred on February 7, 2009, at a distance of 22 km from the site. The next three closest earthquakes of magnitude ≥2.5 ML were 41 km (2.5 ML), 43 km (2.6 ML), and 52 km (2.5 ML) from the Project.

Cedar noted geotechnical conditions and geohazards are important considerations as part of FEED and detailed design as well as *Oil and Gas Activities Act* permitting processes. Project geotechnical studies would be led by qualified professional engineers or geoscientists. These professionals would be responsible for determining the studies required to support design as well as conditions placed on construction. The LNG Facility Permit application would include a seismic study, tsunami study and preliminary geotechnical study.

Cedar stated that its application under the LNG Facility Permit process would include tsunami modelling for a 1 in 2,475-year return period tsunami. To support project design, metocean and bathymetric data has also been collected. A comprehensive geotechnical program is scheduled for 2022. Cedar clarified that there would be limited disruption to the marine environment as the Project does not include marine dredging, infilling, or blasting.

NRCan disagreed with Cedar's assessment that the mitigation measures and engineering strategies would reduce the risk of slope failure to low. NRCan stated that the probability of slope failure in this precise area is high, and that the risk associated with a slope failure in this area is high. Gitxaała requested information how NRCan's comments were reflected in the risk matrix for geohazards.

Cedar acknowledged NRCan's comment and noted that Cedar would be required to work with OGC to undertake the appropriate geotechnical investigations and engineering design work needed to mitigate geohazards as part of the LNG Facility Permit application process.

[65] Results of the search, including the location (origin), time and location are available at on NRCan's website here

NRCan did not have further comments on this topic and deferred to OGC's consideration of this topic during permitting. The OCG confirmed that it requires seismic, geotechnical and tsunami hazard studies to be conducted as part of the permitting process and could liaise with NRCan during the process. The EAO considered NRCan's concerns in its conclusions on the risks of geohazards in section 6.3.2.4 below, as well as the future studies that would be undertaken to manage this risk during permitting, and is of the view that this issue is adequately addressed for the purpose of the EA.

#### *6.3.3.3 Climate Change*

Metlakatla and Gitxaała noted concern that the assessment in the Application may not be conservative enough considering that extreme weather is a subset of climate change and that predicted extreme weather must account for events that are over-and-above weather patterns predicted as a result of climate change, which may result in a project design that is unable to weather future climate-induced extreme weather events.

ECCC notes that climate change itself is not a "Potential Effect (or change) to Project" though it may alter weather patterns, climate (including extreme weather), and/or environmental conditions in the project area and that climate change could further influence some of the other categories of effects (i.e., forest fires, extreme weather, geohazards). ECCC also asked if the Climate Resilience Assessment was considered in the Application chapter, and requested clarification of the risk table as it relates to climate change.

Cedar's Application stated that climate change is expected to continue throughout the lifetime of the Project and is predicted to affect the frequency and severity of storms as well as lead to sea level rise in the north coast of British Columbia, and that the Application's chapter on potential changes to the project that may be cause by the environment considered the Strategic Assessment of Climate Change Technical Report, including the Climate Resilience Assessment, prepared for Cedar LNG.

The EAO clarified that risk matrix for potential changes to the Project that may be caused by the environment speaks to the likelihood that climate change would impact the operations of Cedar LNG after the implementation of mitigation measures (including legislative or regulatory frameworks), and considers Metlakatla, Gitxaała, and ECC's comments and concerns. The EAO is of the view that this issue is adequately addressed for the purpose of the EA.

### 6.3.4 CONCLUSIONS

#### *6.3.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the analysis and information contained in the Joint Permitting /

Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[66], the EAO does not propose any provincial conditions related to potential changes to the project that may be caused by the environment, due to the provincial permitting processes and other regulatory requirements in place.

The EAO notes that Cedar LNG must be designed in accordance with the Liquefied Natural Gas Facility Regulation (*Oil and Gas Activities Act*), and BC Building Code and District of Kitimat bylaws. Cedar must also prepare an emergency management program following the Emergency Management Regulation (*Oil and Gas Activities Act*). The application for an LNG Facility Permit includes the requirement for geotechnical studies and consideration of geohazards. Cedar would be required to work with OGC to undertake the appropriate geotechnical investigations and engineering design work needed to mitigate geohazards. The EAO is of the view that there is a well-established provincial permitting process and regulatory regime that covers emergency management, detailed engineering design reviews, and consideration of geohazards.

The EAO recommends the following Mitigation Measures under IAA:

- Consider specified seismic design criteria in applicable codes and standards in the design of onshore infrastructure.

#### *6.3.4.2 Ratings and Conclusions*

The EAO considered the risk of each of the above potential effects to the project, following mitigation, using the following classification.

**Table 34: Risk Matrix Definitions**

Likelihood

**Low –** <40 percent chance of effect occurring
**Medium –** 40 to 80 percent chance of effect occurring
**High –** >80 percent chance of effect occurring
Consequence can be assessed as minor, moderate, or major based on the combination of magnitude and extent.

Risk is Consequence x Likelihood (see risk rating table) and may be assessed as low, moderate, or high.

| | | Consequence | | |
|---|---|---|---|---|
| | | Major | Moderate | Minor |
| Likelihood | High | High | Moderate | Low |
| | Medium | High | Moderate | Low |
| | Low | Moderate | Low | Low |

The risk of most effects is considered to be low, with the exception of geohazards which would be low to moderate (Table 35). The EAO notes that risk to the project from geohazards is potentially higher than other types of effects because of the higher likelihood of geohazards and their potential consequence. However, the EAO is satisfied Cedar has adequately considered potential geohazard risks for the purpose of the EA and they would be appropriately mitigated.

[66] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

**Table 35: Risk Matrix for Potential Changes to The Project that may be caused by the Environment**

| Potential Effect to Project | Risk | Likelihood | Consequence |
|---|---|---|---|
| Climate Change | Low | Low | Minor |
| Extreme Weather | Low | Low | Minor |
| Seismic Events | Low | Low | Moderate |
| Geohazards | Low to Moderate | Low to Medium | Moderate to Major |
| Forest Fires | Low | Low | Minor |

# 6.4 GREENHOUSE GAS EMISSIONS

## 6.4.1 BACKGROUND

This chapter provides information and an analysis of the direct effects of the greenhouse gas (GHG) emissions from the designated project (Cedar LNG). Conclusions on the extent to which Cedar LNG hinders or contributes to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change is provided in Section 6.9: Requirements of the *Impact Assessment Act*. As required for designated projects under the IAA, Cedar prepared its Application for an EAC to provide the information required by ECCC's Strategic Assessment of Climate Change (SACC), including a net-zero emissions plan describing how Cedar LNG would achieve net-zero emissions by the year 2050. ECCC has provided its assessment of Cedar LNG's GHG information in its GHG Analysis[67]. Further, Section 25 of the Act (2018)[68] states that every assessment must consider greenhouse gas emissions, including the potential effects on the province being able to meet its targets under the *Greenhouse Gas Reduction Targets Act*. In addition to provincial and federal requirements, GHG emissions were identified as a topic to be assessed for Cedar LNG due to interest from Indigenous nations, the public and other stakeholders.

### *6.4.1.1 Regulatory Context*

GHG emissions are subject to provincial and federal requirements and guidelines. The provincial requirements include:

- *Greenhouse Gas Industrial Reporting and Control Act* (establishes a GHG emission intensity limit of 0.16 tonnes of carbon dioxide equivalents ($CO_2e$) per tonne of LNG produced and the GHG emission reporting requirements);
- *Climate Change Accountability Act* (previously titled the *Greenhouse Gas Reduction Targets Act*) requires the province to reduce GHG emissions 40 percent below 2007 by 2030, 60 percent by 2040, and 80 percent by 2050; oil and gas sector required to reduce GHG emissions 33 percent to 38 percent below 2007 levels by 2030);
- Flaring and Venting Reduction Guideline (BC Oil and Gas Commission regulatory requirements and guidance for flaring, incinerating, and venting at natural gas well sites, facilities and pipelines);
- First Nations Climate Initiative (sets out policy goals in support of climate change mitigation, alleviation of poverty and transition to low carbon economy);
- *Carbon Tax Act* (Cedar will be required to follow the carbon tax rate of $50 per tonne of $CO_2e$); and

[67] Available on EPIC here: https://www.projects.eao.gov.bc.ca/api/public/document/631b8d7117bc0a0022a18053/download/ECCC_Cedar%20LNG_GHGs_2Sept2022.pdf

[68] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report

- *CleanBC Roadmap to 2030* (climate plan to reach the emissions of the Paris Agreement by 2030 and continue to net-zero by 2050).

The federal GHG emission requirements applicable to Cedar LNG include:

- Greenhouse Gas Reporting Program (facilities that emit more than 10 kilotonnes (kt) $CO_2e$ annually must report their emissions to ECCC);
- Canada's 2030 Emissions Reduction Plan (requiring 40-45 percent emissions reductions below 2005 levels by 2030); and
- *Canadian Net Zero Emissions Accountability Act* (requires national five-year emissions targets to reach net-zero by 2050).

#### *6.4.1.2 Boundaries*

GHG emissions spatial boundaries are not defined because GHGs and climate change are, by nature, both regional and global.

The temporal boundaries of the assessment are the period over which the GHG emissions of Cedar LNG were predicted. Cedar estimated GHG emissions during construction and operations. Cedar determined that decommissioning was expected to result in lower GHG emissions than both construction and operations; therefore, these emissions were not included in the Application. The EAO considered GHG emissions from the full lifetime of the project in its analysis and conclusions (section 6.4.4).

### 6.4.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

#### *6.4.2.1 Existing Conditions*

The national and provincial GHG emissions from all reportable activities in Canada and BC for 2019 were estimated to be 730,000 kt $CO_2e$ and 65,700 kt $CO_2e$, respectively. The 2019 estimate also determined that in Canada and BC the oil and gas sector produces 191,000 kt $CO_2e$ (approximately 26 percent of the total) and 13,700 kt $CO_2e$ (approximately 20.9 percent of the total), respectively.

#### *6.4.2.2 Potential Project Effects*

The Application considered the activities that would generate direct and indirect emissions during construction and operations, as well as upstream GHG emissions during operations. Potential emissions from decommissioning were not estimated as they are expected to be less than those resulting from construction and, therefore, can be characterized based on the construction emissions information for the purposes of the assessment.

Direct emissions during the expected four years of construction would result from off-road and on-road construction equipment, blasting and land clearing (including burning and decay of cleared vegetation). The direct GHG emissions from these construction activities were estimated to be a total of 36.7 kt $CO_2e$. The majority (73 percent) of this consisted of land

clearing biomass burning and residual decay, totalling 26.7 kt $CO_2e$. Direct GHG emissions during decommissioning are expected to be lower than the construction emissions as there will be less land clearing biomass burning and residual decay.

Cedar determined that these total direct emissions from Cedar LNG during construction would contribute only 0.06 percent to provincial and 0.005 percent to federal GHG emissions during construction (in comparison to 2019 emission totals).

**Table 36: Total Direct GHG emissions from Cedar LNG during construction**

| Source | Total GHG Emissions (kt $CO_2e$) |
|---|---|
| Off-road construction equipment | 9.8 |
| On-road construction equipment | 0.064 |
| Blasting | 0.083 |
| Land clearing biomass burning (biomass-derived) | 16.2 |
| Land clearing decay residuals (biomass-derived) | 10.6 |
| Total emissions during construction[69] | 36.7 |

Direct emissions would occur during operations from stationary combustion (i.e., heater, boiler, pumps, generators), acid gas thermal oxidizer[70], flare stacks and marine operations (LNG carriers and tugboats emission from maneuvering and loading at the terminal and travel to and from the Triple Island Pilot Boarding Station). As shown in Table 37, below, most of these direct emissions (86 percent) will result from the thermal oxidizer. Cedar noted that venting emissions are considered negligible because the design of Cedar LNG is such that typical venting sources, such as from compressors, are directed to the flare instead of to atmosphere. The emissions from flaring of these sources are included in the GHG calculations. The direct GHG emissions from operations was estimated to be a total of 226.6 kt $CO_2e$.

Direct emissions associated with LNG carriers and tugboats both in port and in transit between the Triple Island Pilot Boarding Station and the FLNG facility were predicted by Cedar to be 10.9 kt $CO_2e$ per year, and less than 5 percent of the total direct emissions during operations.

Indirect emissions, as in acquired energy emissions, will be from electricity required during operations, of which all will be acquired from the electrical grid with none generated onsite. It has been assumed that Cedar LNG will require 1,461 gigawatt-hours per year, resulting in 24.7 kt $CO_2e$ annually.

The upstream GHG emissions associated with Cedar LNG will occur during operations and include activities from the location the natural gas is extracted (production and processing) and its transportation to the Cedar LNG Project site. Cedar LNG will be designed to process and

[69] total may not sum due to rounding

[70] Used to clean the exhaust of pollutants.

liquefy approximately 11.3 million cubic metres per day of natural gas, resulting in approximately 959 to 975 kt $CO_2e$ of upstream GHG emissions annually during operations. These upstream GHG emissions are not considered to be as a result of Cedar LNG and, therefore have not been included in Table 37.

Cedar LNG is estimated to produce approximately 3,000 kt of LNG annually during operations. The total combined direct and acquired emissions are approximately 251.3 kt $CO_2e$ annually. The resulting emissions intensity is approximately 0.08 t $CO_2e$ per t of LNG produced, which is less than the emissions intensity target of 0.16 t$CO_2e$ per t LNG produced required for LNG processing facilities under the *Greenhouse Gas Industrial Reporting and Control Act*.

Cedar determined that, as Cedar LNG would be powered by electricity from BC Hydro, the remaining activities and sources of direct and indirect emissions from Cedar LNG would contribute 0.38 percent to the provincial and 0.034 percent to the federal GHG emissions during operations (in comparison to 2019 emission totals).

**Table 37: Annual direct and indirect GHG emissions from Cedar LNG during operations**

| Source | Annual GHG Emissions (kt $CO_2e$/yr) |
|---|---|
| Stationary combustion sources | 16.2 |
| Thermal oxidizer | 192.4 |
| Flares | 7.1 |
| Marine (LNG carriers and tugboats in port and transit) | 10.9 |
| Total Direct Emissions | 226.6 |
| Purchased electricity (average indirect emissions) | 24.7 |
| Total Direct and Indirect Emissions[71] | 251.3 |

#### 6.4.2.2.1 Impacts of Cedar LNG on provincial and federal emission reduction efforts

The predicted GHG emissions from Cedar LNG compared to provincial and federal oil and gas sector and total emissions are provide in Table 38.

The predicted GHG emissions from Cedar LNG compared to provincial and federal oil and gas sector and total emissions are provide in Table 38.

Cedar was of the view that the emissions resulting from Cedar LNG would be low due to its being powered entirely by electricity from BC Hydro, and would be a minimal contributor to BC's (0.38 percent) and Canada's (0.034 percent) GHG emissions inventories. Further, Cedar LNG GHG emissions were considered in relation to the federal 2030 Emission Reduction Plan targets. Under this plan, Canada must reduce its emission by 40 percent from 2005 levels by 2030. Canada's current projection for GHG emissions is 443,000 kt $CO_2e$ (representing the 40

[71] total may not sum due to rounding

percent reduction, as provided by ECCC in their GHG Analysis[72]). Cedar emissions in 2030 are projected to be 246 kt $CO_2e$ (0.06 percent of the 443,000 kt $CO_2e$).

Cedar stated the assumption that Cedar LNG would support global decarbonization through displacement of higher emitting fuel sources (such as coal) and shorter shipping distances than competitors to Asia-Pacific markets, as the global demand increases. Cedar stated that these factors would make Cedar LNG one of the lowest carbon-intensity LNG facilities worldwide.

**Table 38: Comparison of GHG emissions from Cedar LNG during operations to provincial and federal emissions**

| Source | Annual GHG Emissions (kt $CO_2e$/yr) | Project Total as a Relative Percentage (%) |
|---|---|---|
| **Comparison of Total Provincial and Federal Emissions from the Oil and Gas Sectors to Cedar LNG** | | |
| British Columbia (2019) | 13,700 | 1.83 |
| Canada (2019) | 191,000 | 0.13 |
| **Comparison of Total Provincial and Federal Emissions to Cedar LNG** | | |
| British Columbia (2019) | 65,700 | 0.38 |
| Canada (2019) | 730,000 | 0.034 |

#### 6.4.2.2.2 Strategic Assessment of Climate Change

Cedar provided information in Appendix 8B of the Application based on the requirements of the Strategic Assessment of Climate Change Technical Report (Appendix 8B of the Application) in order to meet the requirements of ECCC's SACC. This included information on carbon sinks, upstream GHG emissions, best available technology and best environmental practices determination, a net-zero emissions plan, a climate resilience assessment and an assessment of uncertainty in regards to the quantitative and qualitative information.

Cedar provided an assessment of Cedar LNG's impact on carbon sinks as per the requirements of the SACC. The assessment indicated that the removal of the trees would completely interrupt the carbon sink capacity of the land, having a total loss of 1.7 kt of carbon storage, resulting in the release of 6.4 kt $CO_2$ if all carbon is oxidized. However, ECCC noted that their calculations indicate a loss of 2.8 kt of carbon storage, resulting in the release of 10.4 kt $CO_2$ if all carbon is oxidized.

The best available technology/best environmental practices (BAT/BEP) determination within the SACC Technical Report included an analysis to determine the most effective measures that were technologically and economically feasible to reduce GHG emissions. The first scenario

[72] Available on EPIC here: https://www.projects.eao.gov.bc.ca/api/public/document/631b8d7117bc0a0022a18053/download/ECCC_Cedar%20LNG_GHGs_2Sept2022.pdf

considered several currently available technologies and environmental practices, including usage of BC Hydro electricity and combustion of natural gas liquids for process heat while the second scenario took an optimistic approach, combining the technologies and environmental practices currently available with an optimistic availability of the addition of emerging technologies and environmental practices associated with marine vessels and on-land equipment. The first scenario was selected based on feasibility and forms the basis for the emissions presented in the Application. This scenario includes the following potential key components, during their respective phase, to reduce the GHG emissions:

- Multiple Phases
  - Diesel would be used for on-land equipment which would not reduce GHG emissions; however, BEP would reduce diesel consumption.
  - Conduct regular maintenance to manage vehicle and equipment emissions; and
  - BEP measures would also reduce fuel and/or electricity consumption, resulting in fewer GHG emission.
- Construction
  - Gas processing and liquefaction and LNG storage located on the FLNG facility to reduce earthwork and vegetation clearing.
  - Revegetate the temporary work areas (such as the transmission line route) following completion of construction to reduce change to carbon sinks.
- Operations
  - Electricity would be acquired by connecting to the BC Hydro electricity grid, with back-up diesel generators. This would result in a 96 percent reduction in potential GHG emissions for power generation as compared to a liquefaction process powered by combined cycle natural gas generators.
  - Combustion of natural gas liquids onsite rather than purifying, shipping, and selling to reduce GHG emissions.
  - Use flaring only for maintenance, emergencies, etc.
  - Diesel was selected for marine equipment which would not reduce GHG emissions, with future consideration of dual fuel (LNG/diesel) and fully electrified tugboats.
  - Use dual fuel carriers for transit and at terminal (however, Cedar cannot control the LNG carrier type that is used as these are expected to be contracted by third parties).
- Decommissioning
  - Carbon sinks via revegetation of the Cedar LNG Project-area.
  - Renewable diesel would be used, if available, and could reduce emissions up to 94 percent as the CO2e emissions from biomass combustion are not included in the provincial or national inventories.

The key decision made as part of this plan is to connect to the BC Hydro grid, which would result in reductions of approximately 537 kt $CO_2e$/year (96 percent). The BAT/BEP

Determination section of the SACC Technical Report provided an analysis of technologies and practices for the reduction of GHG emissions. In April 2022, the Government of Canada signaled its intent to develop guidance that will require proponents of new oil and gas projects subject to the IAA to demonstrate that they will have "best-in-class" low-emissions performance. Cedar LNG was not requested to assess how the project demonstrates best-in-class emissions performance as the guidance was not available at the time of assessment. A draft of the best-in-class guidance for public comment is expected to be published in fall 2022.

The Cedar LNG net-zero emissions plan within the SACC Technical Report provided information demonstrating how the Cedar LNG net GHG emissions will equal 0 kt $CO_2e$ by 2050, in accordance with the requirements of the SACC and in alignment with the *Canadian Net-Zero Emissions Accountability Act*. The net-zero plan addresses Cedar LNG's emissions from construction, operations, and decommissioning. Cedar has stated that they will reduce GHG emissions by 30 percent by 2030 (relative to the baseline 2019 emissions). To offset the remaining GHG emissions, ensuring Cedar LNG reaches net-zero by 2050, Cedar plans to purchase offset credits; however, in the future Cedar will consider alternative options to meet Canada's net-zero by 2050 target.

#### 6.4.2.2.3 Positive Effects

Cedar LNG would produce GHG emissions and therefore, would not directly have a positive effect on GHG emissions for the province or Canada. However, Cedar LNG could have a positive impact on GHG emissions globally, if the importing countries were to use the natural gas as a replacement for coal in power production, due to the fact that natural gas-fired electricity generation results in approximately 40 percent less GHG emissions than coal-fired electricity generation. In ECCC's GHG analysis, ECCC noted that Cedar LNG's key mitigation measure to use BC Hydro's clean grid electricity provides significant GHG emissions reductions and may offer further reductions as renewable electricity expands. Cedar LNG is likely to be one of, if not the lowest emission intensity producers of LNG globally, largely because of its reliance on clean B.C. electricity.

#### 6.4.2.2.4 Consideration of Indigenous Knowledge

Cedar did not receive traditional knowledge or traditional use informationrelated to GHG emissions during its consultation and information sharing activities. Therefore, Cedar used publicly available data to describe the existing conditions of GHG emissions and predicted GHG emissions using standard calculation methods.

### *6.4.2.3 Mitigation Measures Proposed in the Application*

The mitigation measures Cedar proposed for construction, operations and decommissioning to avoid or minimize GHG emissions were composed of those listed above in the first scenario following analysis of the BAT/BEP. The primary ones are listed below:

- Conduct regular maintenance to manage vehicle and equipment emissions (all phases);

- Ensure compliance with the BC OGC Flaring and Venting Reduction Guideline by reduction of flaring and venting to reduce quantity of GHG released to the atmosphere (operations);
- Revegetate the transmission line route following completion of the transmission line to reduce change to carbon sinks (construction); and
- Equip facility leak detection and repair equipment and programming to reduce fugitive leakage of gas (operations).

In addition to the identified mitigation measures listed, Cedar has integrated certain design decisions into the Project to help reduce the effects of Cedar LNG. The key design decision relevant to GHGs include:

- Use of BC Hydro electricity as the power source during operations; and
- Gas processing and LNG storage being located on the FLNG facility to reduce earthwork and vegetation clearing.

During Application Review, Cedar also proposed a Follow-up Program under IAA for GHG emissions, which is described further below.

### 6.4.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IDENTIFIED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group and the public, the following key issues related to the assessment of GHG management for Cedar LNG were identified:

- Climate change;
- Emissions from shipping; and
- Emissions from decommissioning.

#### *6.4.3.1 Climate Change*

Kitimat Terrace Clean Air Coalition (KTCAC) submitted a comment (via the public comment period) regarding the assessment of Cedar LNG's impacts on climate change from GHG emissions. KTCAC and the Terrace Chapter of the Council of Canadians (Terrace Chapter), requested that both Cedar LNG's implications on the federal GHG reduction commitments and transition to a carbon neutral economy be taken into consideration.

Cedar has committed to the purchase of emission offset credits, as necessary but indicated that further specifics were unavailable at that time as a number of factors may change. Cedar would consider alternatives to offsets to reach net-zero and would periodically revisit the net-zero plan throughout the lifetime of Cedar LNG to update the feasibility of other alternatives.

Considering the predicted GHG emissions for Cedar LNG and to ensure Cedar LNG aligns with the direction of the Clean BC Roadmap, the EAO proposes a condition requiring Cedar to develop a GHG reduction plan, as described below in section 6.4.4.1. The EAO also recommends Mitigation Measures under the IAA for GHGs, including a Follow-up Program for GHGs and a requirement that Cedar LNG does not emit greater than 0 kt $CO_2e$/year by January 1, 2050, as calculated in equation 1, section 2.1, of ECCC's *Draft Technical Guide Related to the Strategic Assessment of Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment*.

In consideration of the recommended provincial conditions and federal Mitigation Measures, the EAO was satisfied the issue was adequately addressed for the purpose of the EA.

#### *6.4.3.2 Emissions from Shipping*

Concerns were raised by Haida, Lax Kw'alaams, the Terrace Chapter of Council of Canadians (via the public comment period on the Application) and ECCC, regarding how marine vessel (including tugboat) emissions were considered in the assessment and the exclusion of LNG carrier emissions from the net-zero plan. ECCC is of the view that shipping emissions from Kitimat to the Triple Island Pilot Boarding Station are within the scope of the project and must be included in the net-zero plan, which is aligned with the SACC.

Cedar clarified that marine vessel emissions associated with construction are those from construction vessels and are considered in the category of off-road equipment. Cedar noted that estimates of emissions from LNG vessels and tugboats in transit between the Triple Island Pilot Boarding Station and the marine terminal and in port are included in the assessment and account for approximately 10.9 kt $CO_2e$/year or 5 percent of direct emissions (as shown in Table 37). Cedar provided a supplementary memo clarifying its calculations and approach around emissions from marine shipping. While Cedar provided this information in support of the assessment, Cedar noted that it was of the view that shipping emissions should not be part of the net-zero plan for the following reasons:

- LNG vessels are not owned or operated by Cedar;
- Emissions while berthed will be included but those while in transit are not associated with Cedar as per the BC GHG Emission Reporting Regulation;
- Shipping is already subject to both international and federal legislation, and including the vessels in Cedar LNG calculations could duplicate offsetting efforts; and
- Requiring proponents of new projects to account for shipping emissions in their net-zero plans places them at a business disadvantage compared to smaller projects or those expanding existing projects.

However, despite these views, Cedar confirmed, in response to a June 2022 information request, that its net-zero plan would conform to the SACC requirements, including the inclusion of shipping emissions, where required.

The EAO acknowledges that shipping emissions from Kitimat to the Triple Island Pilot Boarding Station are within the scope of Cedar LNG and must be included in the conditions and in the net-zero plan, as per the SACC. The EAO recommends the greenhouse gas reduction plan (Condition 10), a Mitigation Measure under the IAA for GHGs which requires Cedar to ensure that net GHG emissions (including those from marine shipping out to the pilotage station) reach zero by 2050, and a Follow-up Program for GHGs, as described below in section . The EAO was satisfied this issue was adequately addressed for the purpose of the EA.

#### *6.4.3.3 Emissions during Decommissioning*

ECCC commented that an estimate for Cedar LNG's GHG emissions during decommissioning should be included with a clear description of how it was reached.

Cedar noted that the GHG emissions that are expected during the decommissioning phase are expected to be similar to, or less than, those from the construction phase. However, as decommissioning is approximately 45 years in the future, a theoretical emission estimate for decommissioning would likely be inaccurate. Cedar stated that while it is expected that the GHG emissions during decommissioning will be less than those of construction, if necessary, the GHG emissions for construction can be considered as an approximate estimate of GHG emissions for decommissioning.

The EAO is of the view that these issues that have been discussed are adequately resolved for the purposes of the EA. For the purpose of the assessment, the EAO assumed that that GHG emissions, as predicted for construction would also occur during decommissioning, without inclusion of the land-use change emissions (such as land clearing). The EAO notes that the proposed condition for a GHG reduction plan (10) would apply during decommissioning. In addition, the recommended federal Mitigation Measure under the IAA that Cedar LNG does not emit greater than 0 kt CO2e/year by January 1, 2050 would also apply to decommissioning.

### 6.4.4 THE EAO'S ANALYSIS AND CONCLUSION ON EFFECTS TO GREENHOUSE GAS EMISSIONS

This section presents the EAO's conclusions on the potential adverse residual effects from Cedar LNG on GHG emissions. Consideration of the extent to which Cedar LNG hinders or contributes to Canada's ability to meet its environmental obligations and commitments in respect of climate change (under Section 22(1)(a)(i) of the IAA) is provided in Section 6.9 – the Requirements of the *Impact Assessment Act*.

#### *6.4.4.1 Proposed Provincial Conditions and Federal Key Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the information contained in the Joint Permitting / Regulatory Coordination Plan, the EAO proposes a provincial condition for a GHG reduction plan (Condition 10), in consultation with additional parties, including Indigenous nations and the Climate Action Secretariat. This plan would include estimation of GHG emission, consideration of provincial

emission reduction targets and schedules, analysis of BAT/etc. to minimize GHG emissions and an explanation for technologies and measures to be and not to be implemented.
This plan would work in tandem with legislation regarding GHGs, including the *Greenhouse Gas Industrial Reporting and Control Act*, which establishes a GHG intensity limit for LNG produced, the *Climate Change Accountability Act*, which sets GHG emission reduction requirements for the oil and gas sector and the CleanBC Roadmap to 2030, which sets out a series of actions for BC to meet the 2030 emissions reduction target and prepare for net-zero at 2050, and the additional relevant provincial and federal regulatory requirements referenced in section 6.4.1.1.

The EAO recommends the following Mitigation Measures under the IAA:

- Meet the federal requirement that Cedar LNG does not emit greater than net 0 kt CO2e/yr by January 1, 2050, as calculated in Equation 1 (Net GHG Emissions) in Section 2.1 of Draft Technical Guide Related to the Strategic Assessment on Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment (August 2021). Cedar must develop a Net-Zero Plan to demonstrate how Cedar will prioritize the implementation of BAT/BEP to reduce GHG emissions between the start of Construction and January 1, 2050 over relying on offset measures to achieve net-zero on January 1, 2050;
- Conduct regular maintenance to manage vehicle and equipment emissions (all phases); and
- Take into account the BC OGC Flaring and Venting Reduction Guideline to reduce quantity of GHG released to the atmosphere by reduction of flaring and venting (operations).

In addition, the recommended federal Mitigation Measures for the vegetation resources VC to naturally revegetate or actively reclaim temporary construction areas on Crown land and are not required for operations (reclamation on private land to follow lease agreements) would also mitigation effects to GHG emissions.

In addition, the EAO also proposes a Follow-up Program for GHG emissions, in consultation with ECCC, under the IAA be developed prior to construction and implemented during operations, which would include:

- During the first five years of operations of the Project: compare the GHG emissions calculated to meet the federal reporting requirements under ECCC's Greenhouse Gas Reporting Program, to the predicted GHG emissions from the Application, and outline and justify discrepancies
- Annually estimate and report Cedar LNG's GHG emissions throughout the lifetime of Cedar LNG
- During Operations, annually quantify GHG emissions intensity from Cedar LNG, and outline and justify discrepancies between predicted values and actual values.

#### *6.4.4.2 Residual Effects*

After considering all relevant proposed mitigation measures, the EAO concludes that Cedar LNG would have residual adverse effects due to increased GHG emissions. The EAO's characterization of the expected residual effects of Cedar LNG on GHG emissions is summarized below and reflects the EAO's level of confidence in the effects determination (including their likelihood and significance). The EAO considered that GHG emissions would occur during construction, operations and decommissioning and, for the purpose of the analysis, emissions during decommissioning would be equivalent to those during construction, not including land-use change GHG emissions (such as land clearing). Significance characterization is provided below to support the assessment under the IAA.

**Table 39: Summary of residual effects to Greenhouse Gas Emissions.**

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Context | Low | The EAO considers GHGs to have low resiliency/be acutely sensitive to existing conditions. The Intergovernmental Panel on Climate Change (IPCC) has confirmed that GHG emissions are at levels that are affecting the global climate and the Government of Canada declared a climate emergency in 2019. As such, the EAO considers GHGs to have low resiliency/be acutely sensitive to existing conditions. Although GHGs have global effects, the EAO also notes that, regionally, high levels of GHG emissions are expected to result from the LNG Canada facility (approximately 4,000 kt $CO_2e$/year during operations). |
| Direction and Magnitude | Adverse and Low | The highest level of Cedar LNG-related GHG emissions (direct and indirect), including all marine emissions, will occur during operations and is expected to be an average of 251 kt $CO_2e$/yr. GHG emissions during operations will be about 2.5 times above the provincial and Greenhouse Gas Reporting Program reporting threshold, and annual reporting will be required. Annual emissions during operations would be approximately 0.38 percent of BC's total emissions (2019), 0.034 percent of Canada's total emissions (2019), and approximately 1/16 of predicted of predicted emissions from LNG Canada. During operations, the facility's GHG emissions intensity will be 50 percent of the 0.16 tonnes $CO_2e$ per tonne of LNG production set out in the Schedule of Regulated Operations and Emission Limits in the *Greenhouse Gas Industrial Reporting and Control Act*. |
| Extent | Beyond Regional | The geographic effect of GHG emissions from Cedar LNG is cumulative globally. |
| Duration | Permanent | GHG emissions will be produced for the lifetime of Cedar LNG (minimum of 40 years). The residual effects of GHG emissions will be permanent as these effects will continue to be experienced long after (hundreds of years) emissions are no longer produced. |
| Frequency | Continuous | GHG emissions will occur throughout the lifetime of Cedar LNG and be greatest during operations of Cedar LNG. |

| Criteria | Assessment Rating | Rationale |
|---|---|---|
| Reversibility | Irreversible | While GHG emissions will cease after decommissioning, given current technology and the persistence of $CO_2$ in the atmosphere, the effects of the GHG emissions resulting from Cedar LNG are effectively irreversible. |
| Risk (likelihood and consequences) | Likelihood: There is a high likelihood that the levels of GHG emissions reported will be produced with the current design of Cedar LNG, and that these emissions will contribute to a residual effect, climate change.<br>Consequence: Moderate consequence based on the low magnitude extending beyond regional.<br>Risk: based on the likelihood and consequence of residual effects from GHGs, it was determined that there would be a moderate level of risk. | |
| Uncertainty | The EAO has a high level of confidence in the likelihood of adverse residual effects based on the there being a good understanding of the predicted GHG emissions and their contributions to climate change. There is a low degree of uncertainty associated with data inputs and modelling techniques. | |
| Significance | In consideration of the low magnitude of the predicted effects, as well as the proposed provincial condition and federal Mitigation Measures, the EAO concludes that Cedar LNG would not have significant adverse effects on GHG emissions. | |

*Note: Criteria and assessment ratings are defined in Appendix 4: Residual Effects Characterization Definitions.*

#### *6.4.4.3 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 effects associated with these emissions levels. As such, the EAO did not require the Application for Cedar LNG to include a cumulative effects assessment for GHG emissions and the EAO did not conduct a cumulative effects assessment for the same reasons. Further, the Agency considers GHG emissions to be inherently cumulative in the context of their potential effects related to climate change. Consequently, cumulative effects are considered within the analysis of climate change impacts in Section 6.9 – Requirements of the *Impact Assessment Act*, and therefore a separate cumulative effects assessment is not described here.

#### *6.4.4.4 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of GHG emissions.

In the Application, Cedar noted that it did not receive traditional knowledge or traditional use information related to GHG emissions during its consultation and information sharing activities.

During the EA, Haida and Lax Kw'alaams provided comments on the assessment of GHG emissions, including related to proposed mitigation measures and conclusions. The information provided is summarized above in section 6.4.3 or discussed in the nation-specific sections in

Part C of this Report. Key ways in which the EAO took these comments into account in the assessment of GHG emissions included:

- Provincial conditions:
  - Greenhouse Gas Reduction Plan (Condition 10);
- Federal Mitigation Measures:
  - Mitigation Measure for GHGs to ensure that net GHG emissions (including those from marine shipping out to the pilotage station) reach zero by 2050

#### *6.4.4.5 Conclusions*

The EAO is satisfied that Cedar LNG would not have significant adverse effects on GHG emissions. This conclusion considers the information and analysis presented in this chapter; the views of the technical Working Group (including the information provided in ECCC's GHG Analysis), Indigenous nations, and Cedar; the proposed mitigation measures identified in the provincial TOC including, Condition 10: greenhouse gas reduction plan; and recommended Mitigation Measures under the IAA related to GHGs (Appendix 1).

## 6.5 ALTERNATIVE MEANS

### 6.5.1 BACKGROUND

Section 25 of the Act (2018)[73] states that every assessment must consider alternative means of carrying out the Project that are technically and economically feasible, including through the use of the best available technologies, and the potential effects, risks and uncertainties of those alternatives. In addition, under Section 22(1)(e) of the IAA, the assessment of a designated project (Cedar LNG) must consider alternative means of carrying out the designated project that are technically and economically feasible, including using best available technologies, and the effects of those means.

The Application describes the process through which Cedar evaluated alternate design options for Cedar LNG. Cedar provided information to Indigenous nations on alternate project designs and configuration options during early consultation. Comments received by Cedar were incorporated into refining the Cedar LNG project design. Cedar selected the floating LNG (FLNG) design described in the Application because Cedar concluded that it would minimize the impact to the local community and environment and is technically feasible. The FLNG facility would include LNG storage in the hull and air-cooled, electric-powered gas treatment and liquefaction equipment located on the deck. The FLNG facility will have an innovative berth design that avoids the need for in-water piled structures. It will also have a seawater firewater system, and direct loading LNG which avoids the need for a dedicated LNG carrier jetty. To support these decisions, Cedar evaluated several alternative designs and technologies more common in current LNG facilities including the following:

- Location of Gas Treatment, Liquefaction Facilities and LNG Storage
  - Onshore LNG facility
  - Floating LNG facility
- Cooling options for the liquefaction
  - Water-based (seawater or freshwater)
  - Air-cooled
- Alternative marine terminal and jetty designs
  - Marine terminal location
    - North side of District Lot 99
    - South side of District Lot 99
  - Jetty Designs
    - Conventional Jetty Designs

[73] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

        - Floating system
        - Strut Mooring system
    - Number of berths
        - Single berth with side-by-side berthing
        - Two berth system
- Power Supply Options
    - Self-Generation
    - Grid Electricity

Cedar investigated two additional project design features but did not assess alternatives for these because there was only one acceptable technology. These related to 1) separation and stabilization of natural gas liquids and 2) water source for the firewater system.

The separation and stabilization of natural gas liquids involved removing small amounts of natural gas liquids from the feed gas prior to liquefaction to avoid them freezing under cryogenic conditions. Most LNG facilities in operation today remove these components and fractionate them to use as refrigerants or to export to market. Cedar investigated this option, but ultimately chose to use these components as fuel for the process heat required for the natural gas pre-treatment, including incineration of the impurities removed in the gas pre-treatment. Advantages of using the natural gas liquids for process heat include reducing the energy intensity of the Project eliminating the need to export a refined product (either by water or by rail) and reducing the storage volumes of products that could affect air quality or potentially interact with the marine environment in the event of a spill. Furthermore, producing a natural gas liquids product for export would result in incremental capital costs, operation cost, and complexity in the design and operation. The potential for accidents associated with transport of natural gas liquids was a concern that Cedar heard from Indigenous nations during engagement regarding the Project.

A review of water sources for the firewater system was completed and while a typical firewater system for an onshore facility would use freshwater, Cedar has chosen not to use freshwater for firewater for similar reasons to the decision not to use freshwater for cooling noted below in section 6.5.3. As there are not any major watercourses in the Facility Area, there would be insufficient freshwater during summer months to accommodate the firewater requirements. Seawater was selected as firewater for the FLNG facility for the Project due to the proximity and accessibility of the water source. Using seawater for firewater does not have the same inherent risks to marine life as were identified in the cooling options alternatives due to the fact that the firewater intake flow rate is substantially lower than the cooling water intake flow rate. In addition, firewater will be used in emergency circumstances only (except for testing of the firewater system). Due to the fact that using seawater for firewater is the only technically feasible option, an alternative assessment was not completed.

### 6.5.2 LOCATION OF GAS TREATMENT AND LIQUEFACTION FACILITIES AND LNG STORAGE

Cedar considered two locations for siting the gas treatment and liquefaction units and LNG storage tanks: onshore within District Lot 99 and on a floating facility. Most LNG plants globally have onshore gas treatment, liquefaction, and storage infrastructure. While there are now several operating FLNG facilities globally, it has only been in the past five years that these facilities have been developed.

Considerations as to where to locate this infrastructure focused on technical feasibility, construction and operation costs, and relative risk to the environment. Criteria for technical feasibility included successful application/use on other projects, engineering requirements, space requirements, and safety. Criteria for construction and operation costs included location of manufacturing and local workforce requirements.

Risk to the environment considered area of land disturbance and relative risks (between the options) to terrestrial and freshwater habitats as well as archaeological and heritage resources.

Cedar noted that during early consultation with Indigenous nations, some Indigenous nations saw more safety risk associated with a FLNG facility than a land-based facility. Based on the environmental and geographical constraints of the Facility Area, Cedar preferred the FLNG facility alternative early in project development.

The key differentiators between an onshore LNG facility and a FLNG facility are described below in Table 40.

**Table 40: Comparison of the alternate means for the location of gas treatment and liquefaction facilities and LNG storage.**

| Factor | Onshore LNG Facility | Floating LNG Facility |
|---|---|---|
| Technical Feasibility | • Proven technology with 37 operating liquefaction (export) facilities worldwide. The oldest facility began operation in 1970.<br>• Requires blasting to level an area large enough to construct the LNG storage tank. | • Proven technology but relatively new with four operating facilities worldwide. The oldest FLNG facility began operation in 2017. |
| Environmental, economic, social, cultural and health implications | • Requires a larger construction workforce to build the onshore facility and would require non-local workers based on labour force availability in the region, which would increase demand on local services (including accommodation and transportation) | • FLNG facility reduces the need for a large non-local workforce during construction. This is expected to reduce potential adverse socio-economic effects to the local community, Infrastructure and Services, Human and Community Well-Being, including disproportionate effects and GBA Plus. |

| Factor | Onshore LNG Facility | Floating LNG Facility |
|---|---|---|
| | and have potential adverse effects on local socio-economic conditions and on human community well-being.<br>• The berth for the LNG carriers visiting an onshore facility is likely to be more complicated and have greater marine effects than the selected berthing configuration for the FLNG facility.<br>• The terrestrial footprint is larger; therefore, more terrestrial environmental factors will be disturbed. There is also higher potential for impacts to archaeological sites and heritage resources. | • The FLNG facility has a substantially smaller footprint than would be required to accommodate an onshore LNG facility and associated storage. As a result, construction of the FLNG facility will have fewer GHG emissions and smaller impacts on vegetation communities, wildlife habitats, freshwater streams, and archaeological/heritage. Smaller impacts on local biophysical and cultural resources and less land disturbance will also have less effect on local land and resource users. |
| Effects to Indigenous Interests | • Greater terrestrial impacts to Indigenous interests (such as terrestrial harvesting) due to larger Project footprint and land disturbance and greater potential for effects from an onshore LNG Facility.<br>• An onshore LNG Facility has the potential for marine impacts to Indigenous interests (such as marine harvesting) due to vessel berthing and cargo loading (for example: collision, grounding or spills). | • Smaller impacts on local terrestrial biophysical and cultural resources and less land disturbance will have less effect on local land and terrestrial resource users, which reduces select potential effects on the Indigenous nations (such as terrestrial harvesting).<br>• During early consultation with Indigenous nations, concerns were raised regarding higher safety risk associated with a FLNG facility than a land-based LNG facility. However, the effects to Indigenous interests would not significantly differ from a loss of containment of onshore vs. offshore LNG facility.<br>• Based on the environmental and geographical constraints of the Project Area, Cedar preferred and selected the FLNG facility alternative early in project development. |
| Consideration of Best Available Technology | • Technologies are similar regardless of whether onshore or floating. | • Technologies are similar regardless of whether onshore or floating. |
| Risks and Uncertainties | • An onshore LNG facility has the potential for exposure to adverse geotechnical conditions, including rock integrity and slide risk, that could | • Locating the gas treatment and liquefaction facilities and LNG storage on the FLNG facility reduces the geotechnical risk associated with the Project. If unfavorable ground conditions were |

| Factor | Onshore LNG Facility | Floating LNG Facility |
|---|---|---|
| | increase the capital cost of this type of facility.<br>• Tsunami risk present with both options; however, critical infrastructure would need to be located above the tsunami run-up zone, which would result in larger excavation volumes to meet grading requirements.<br>• Within the Facility Area, traffic on the Bish Creek Forest Service Road poses a potential safety and security risk to an onshore development scenario. By having the gas treatment, liquefaction facilities and LNG storage on a floating facility, the Bish Forest Service Road is not expected to need to be realigned around the Project. | encountered in the Facility Area, extensive ground improvements (such as soil compaction, stabilization or piling) could be required to support modules and LNG storage. The footprint and slope of the site is also not adequate or appropriate for this infrastructure to be located on land.<br>• Tsunami risk present with both options; however, FLNG facility can be designed with the capacity to rise/fall with the changing water levels associated with a tsunami.<br>• The integrated storage tanks in the hull of the FLNG facility result in less cryogenic piping and, as a result, a lower risk of LNG spillage or leakage.<br>• Constructing the FLNG facility in a shipyard allows work to occur in a controlled environment. This reduces uncertainties and construction delays due to weather conditions or craft labour productivity and allows for enhanced quality control measures. It also allows the equipment to be tested as an integrated system prior to being brought to the Project site. |

Cedar also noted the following additional considerations regarding the two options:

- An onshore liquefaction facility may be slightly more cost effective to maintain compared with the processing equipment located on the FLNG facility. This is due to spare parts being able to be trucked directly to the required location versus transferred by forklift or crane to the FLNG facility.
- There would likely be no difference in the operation staffing requirements between the onshore and FLNG facility options.
- Decommissioning of an FLNG facility at the end of the Project is simpler due to the ability to re-use the FLNG facility elsewhere or tow away the bulk of the equipment and infrastructure to a dedicated salvage yard.

The FLNG facility was selected because it best reflects Cedar's design philosophy to minimize the impact to the local community and environment. It is technically feasible with the added benefits of the ability to reduce impacts to land-based valued components, the ability to minimize potential adverse socio- economic effects, increased ability to control access to the Project, and reduced construction cost.

### 6.5.3 ALTERNATIVE COOLING OPTIONS FOR THE LIQUEFACTION PROCESS (WATER-BASED OR AIR-COOLED)

Cedar assessed three proven cooling technologies for the Project: seawater cooling, freshwater cooling, and air cooling. Prior to the evaluation of cooling options, the FLNG facility alternative was identified as the preferred development scenario, and therefore the assessment of cooling options was completed with the understanding that the cooling systems would be located on the FLNG facility.

Considerations between cooling methods included technical feasibility, construction and operation costs, and relative risk to the environment. Criteria for technical feasibility included availability of the cooling medium and space requirements; all options were considered implementable and safe. Criteria for costs was the cost to build and maintain the cooling system. Relative risk to the environment focused on Haisla Nation guidance, including effects to marine resources and freshwater fish.

The key differentiators between water-based cooling (seawater or freshwater) and air-cooling, are described below in Table 41.

**Table 41: Comparison of the alternate means for the cooling options for the liquefaction process.**

| Factor | Freshwater Cooling | Seawater Cooling | Air Cooling |
|---|---|---|---|
| Technical Feasibility | • Proven technology used in industrial facilities in Canada<br>• Up to 35 percent more energy efficient that air cooling<br>• Requires large volumes of freshwater, which is not available in the Project Area<br>• Would require additional Project infrastructure (i.e., dedicated water supply pipeline)<br>• Cooling towers require more space than is available on the FLNG facility<br>• A high construction cost | • Proven technology that is broadly used in offshore oil and gas production<br>• Provides more long-term stable operating conditions due to the consistency of the sea temperature<br>• Direct seawater cooling is compact, requiring limited equipment (in comparison with indirect systems) and highly energy-efficient<br>• Closed loop seawater cooling systems have lower efficiencies and therefore high surface requirements for contact with seawater<br>• Indirect seawater cooling has the same considerations related to potential environmental impacts from waste heat in | • No additional footprint<br>• There is a larger degree of uncertainty in design temperatures for air cooling compared to seawater cooling<br>• Air cooling fan technology works best in areas with lower year-round seasonal temperature changes (appropriate for Kitimat); however, the capacity of air to adsorb heat is substantially lower than water. This results in a number of technical challenges and adverse effects:<br>• Relatively poor heat conductance of air results in the need for a large number |

| Factor | Freshwater Cooling | Seawater Cooling | Air Cooling |
|---|---|---|---|
| | • Relatively high long-term operation cost | the discharge. Cedar' s pre-FEED studies found the volume of seawater required for indirect seawater cooling is much higher than direct seawater cooling and; therefore, has higher capital and operating costs. | of fans and a relatively large surface area for the cooling system<br>• Large number of fans results in a larger number of point noise emitters<br>• Air cooling systems have a relatively high energy demand to operate the fans<br>• During pre-FEED, Cedar confirmed the FLNG facility deck space is sufficient to accommodate the number of air cooler bays and fans required for the Project. |
| Environmental, economic, social, cultural and health implications | • Would require withdrawals from the Kitimat River and a new large diameter water supply pipeline to the Project Area. This would increase the Project's adverse effects to vegetation, wildlife, freshwater fish, and archaeological/ heritage resources<br>• The Kitimat River is the water supply for the District of Kitimat and any upstream withdrawals need to avoid effects to water quality and availability<br>• The unnamed watercourse bisecting District Lot 99 (watercourse 19 [WC-19]) would be effectively dewatered to meet the supply demands, which would | • Seawater cooling may affect human health through the use of anti-biofouling agents and changes to marine water temperatures<br>• Direct seawater cooling has the potential for entrainment of fish and other marine life in the pump system<br>• Direct seawater cooling requires the addition of anti-biofouling agents, which has the potential to affect ambient water quality in the vicinity of the outfall, potentially affecting the health and behaviour of fish and other marine life<br>• Both seawater cooling systems will increase surrounding water temperatures, which could have positive and adverse effects for fish and marine animals | • The large number of cooling fans will result in higher operation noise levels than other cooling methods<br>• Using air cooling avoids the need for screening large volumes of seawater as well as the uncertainties associated with the effectiveness of screening that seawater in a manner that avoids impingement and entrainment of marine life<br>• A key benefit of air cooling is that it does not require water and therefore does not impact aquatic systems.<br>• No adverse effects to terrestrial ecosystems |

| Factor | Freshwater Cooling | Seawater Cooling | Air Cooling |
|---|---|---|---|
| | have adverse effects to the local environment. | • Slight increases in water temperature could increase the productivity of the local environment, but elevated temperatures could have a range of adverse effects for fish including reduced reproductive capacity, limiting feeding and recruitment success, and increasing species sensitivities to a variety of toxic substances. | |
| Effects to Indigenous Interests | • Effects associated with the extraction of water from a river that provides high-value salmon and oolichan habitat, which are species of importance to Haisla Nation and other Indigenous nations in the region | • Haisla Nation does not support the use of seawater cooling as they do not consider the marine effects associated with this cooling method to be acceptable.<br>• Based on Haisla Nation guidance and the potential effects to the marine environment, the use of seawater for cooling was not considered further and Cedar's preferred cooling method was determined to be air cooling. This decision avoids disproportionate social or economic effects on the Haisla Nation members that would arise from effects on marine resources. | • Air cooling avoids disproportionate social or economic effects on the Haisla Nation members that would arise from effects on marine resources. |
| Consideration of Best Available Technology | • Freshwater cooling towers were considered for dissipating excess process heat. This process results in some evaporation and therefore make-up water is needed to maintain the water volume needed for its | • Two seawater cooling system options were evaluated: direct (once-through) seawater cooling and indirect (as known as closed-loop) seawater cooling. Direct seawater cooling systems pump seawater through heat exchangers to dissipate the | • Air cooling fans were considered to blow ambient air through heat exchangers to dissipate the heat from the liquefaction process.<br>• Although air cooling is a technology used worldwide in many different industries, Cedar will be the |

| Factor | Freshwater Cooling | Seawater Cooling | Air Cooling |
|---|---|---|---|
| | operation. In addition, minerals buildup in the water over time (due to the ongoing evaporation) and it is necessary to discharge some of the water from the cooling tower and add make-up water. | waste heat from the liquefaction process thereby using seawater as the cooling fluid. An indirect system utilizes two sets of exchangers and an intermediate fluid as the heat exchange medium for the liquefaction process. | first FLNG facility to utilize air cooling |
| Risks and Uncertainties | • Proven technology used in industrial facilities in Canada<br>• See risks and uncertainties identified above in respect of environmental and cultural implications. | • Proven technology that is broadly used in offshore oil and gas production<br>• See risks and uncertainties identified above in respect of environmental implications. | • There is a larger degree of uncertainty in design temperatures for air cooling compared to seawater cooling<br>• See risks and uncertainties identified above in respect of environmental implications. |

In summary, while seawater cooling is a well-proven technology, compact, and incurs lower capital costs, it is potentially unsafe for aquatic species and to the aquatic environment. This is due to the potential of entrainment of aquatic organisms (including fish) into the pump systems as well as impingement on screens. Additionally, discharge from the water-cooling system has environmental implications to the surrounding waters. Due to these potential environmental effects, and Haisla Nation guidance, the use of seawater for cooling was not considered further for the Project.

Freshwater cooling systems are often a preferred method by many industrial facilities due to their high energy efficiency (35 percent more energy efficient than air coolers). However, they require a substantial and regular freshwater supply. This freshwater requirement is not readily available within the Project vicinity. Additionally, it could incur a high environmental footprint from constructing the water supply pipeline, and extraction of freshwater from the nearby river which contains both salmon and oolichan habitat. For these reasons, as well as the high cost of construction for freshwater cooling, it was also not considered for the Project.

Air cooling was selected for cooling method for the Project due to a number for reasons. Air cooling does not require water and therefore does not impact aquatic systems. While air has relatively poor heat conductance compared to water and thus has higher energy demands, the FLNG facility deck space is sufficient to accommodate the number of air cooler bays required for the Project.

### 6.5.4 ALTERNATIVE MARINE TERMINAL AND JETTY DESIGNS

District Lot 99 was acquired by Haisla Nation with the intent of developing an energy export facility. This location had been previously considered by two small-scale LNG proposals. Within the property boundaries, Cedar investigated two locations for locating the marine terminal, one site in the northern portion of the property and one in the southern portion of the property. A third potential location was not carried forward for detailed investigation because it straddled an unnamed third-order stream (WC-19) that provides tailed frog habitat and blocked a Haisla Nation cultural feature. Selection of this location would have potential disproportionate effects on Haisla Nation members.

The two potential berth locations were assessed in terms of technical feasibility (specifically upland and marine constructability and operability, including economic feasibility) and environmental risk (specifically interactions with fish habitat (marine and freshwater) and wildlife). Because the footprint and construction approach would be generally consistent between the two berth locations, changes to health, social or economic conditions, effects to heritage resources, GHG emissions, and effects to Indigenous interests are not expected to differ materially between the options.

Cedar also considered jetty design options as part of selecting the marine terminal location; in particular, conventional jetty and strut mooring design options. The objectives of the mooring system for the Project are to:

- Permanently moor the FLNG facility to the shore for the design life;
- Be constructible in a manner that aligns with the Project's environmental and safety objectives;
- Be suitable for scheduled summer maintenance campaigns without requirements to cease operation;
- Be suited to all loading conditions for the FLNG facility and for all potential combinations of tidal and meteorological and oceanographic conditions (i.e., wind, wave, current);
- Be capable of withstanding the 1 in 2,475-year tsunami event (CSA Z276);
- Allow a minimum of two ways for personnel to access to the FLNG facility from shore;
- Allow natural gas, utilities, electrical power and communications to remain connected to the FLNG facility; and
- Require no dredging during installation and operation.

As with the potential berth locations, jetty designs were assessed in terms of technical feasibility (specific criteria were constructability and operability) and environmental risk (specifically interactions with marine habitat). Economic feasibility is not considered separately.

In addition to the assessment of the various mooring options, Cedar also assessed the preferred location and number of berths. As the Project Description identifies, Cedar originally considered a two-berth option: one for the FLNG facility and one for LNG carriers. However, pre-FEED studies confirmed that the mooring system is suitable for side-by-side berthing. The safety and

simplicity advantages offered by side-by-side berthing (for example, less cryogenic piping, less LNG transfer, no onshore flare system) resulted in the second berth being discarded as an option. Because it eliminates construction of a second berth, the technical feasibility, construction cost, environmental risk, effects to heritage resources, changes to health, social or economic conditions, and effects to Indigenous interests are all expected to be less with the single berth configuration.

The key differentiators involved with the Marine Terminal Location, Jetty Designs, and Number of Berths, including risks, are described below in Table 42, Table 43, and Table 44.

**Table 42: Comparison of the alternate means for the marine terminal location**

| Factor | North side of District Lot 99 | South side of District Lot 99 |
|---|---|---|
| Technical Feasibility | • Gentler terrain resulting in less construction complexity and risk and easier personnel and vehicle access<br>• The analysis found that the marine terminal construction and operation considerations were roughly equal between the two sites. The northern site had an advantage for land access to the marine terminal (the area of the property is not as steep)<br>• For the onshore facilities, the northern portion of District Lot 99 was determined to be more suitable for locating the Project based on technical feasibility. The gentler topography will provide a lower degree difficulty for construction, improved access for vehicles and personnel, and more space for siting key infrastructure. Based on these advantages, the northern site was selected for progressing the Project. | • Steeper terrain resulting in reduced length of strut mooring system but increased construction complexity/risk<br>• The southern location is in close proximity to an unnamed third-order stream (WC-19), while the northern location would require realignment of two small unnamed second-order streams. All three streams are not fish-bearing. Given the full suite of factors considered at both sites, there was not a material advantage to one location from an environmental perspective. |
| Environmental, economic, social, cultural and health implications | • Requires realignment of two small unnamed non-fish-bearing streams | • Located in close proximity to an unnamed non-fish bearing stream that provides tailed frog habitat<br>• There is a bald eagle nest located on the southern half of District Lot 99; this nest was confirmed active in 2021 |
| Effects to Indigenous Interests | • Effects to Indigenous interests are expected to be similar regardless of the marine terminal location. | • Effects to Indigenous interests are expected to be similar regardless of the marine terminal location. |

| Factor | North side of District Lot 99 | South side of District Lot 99 |
|---|---|---|
| Consideration of Best Available Technology | • Technologies are similar regardless of the marine terminal location. | • Technologies are similar regardless of the marine terminal location. |
| Risks and Uncertainties | • The gentler topography will provide a lower degree of difficulty for construction, improved access for vehicles and personnel, and more space for siting key infrastructure. | • The proximity to tailed frog habitat and a bald eagle nest increases the environmental risk. |

**Table 43: Comparison of the alternate means for the Jetty Designs**

| Factor | Conventional Jetty Designs | Floating System | Strut Mooring System |
|---|---|---|---|
| Technical Feasibility | • Steep topography and bathymetry in the Project Area do not suit conventional jetty designs as well as the need to undertake in-water work, including dredging, to support the construction activities. | • Mooring lines would require continuous adjustment.<br>• More complex LNG loading during adverse weather conditions.<br>• The option of a floating system and soft-line design considers the FLNG facility berthed against a floating pontoon fixed to the shoreline by pins and trusses. This option would be similar to a pleasure craft marina with approximately 14 to 20 soft mooring lines requiring constant adjustment depending on tide and loading condition of the FLNG facility.<br>• Although the adjustment would be expected to be undertaken by remotely controlled system of winches, it would be an active system requiring | • Design suited to the steep bathymetry.<br>• Provides direct access to the FLNG facility by personnel and equipment<br>• Has not been previously used for an FLNG facility.<br>• The preferred solution for the Project was determined to be the strut mooring system that utilizes four solid struts anchored to two onshore foundations with universal joints and swivels to keep the FLNG facility in position without the need for mooring lines to shore (the number of struts in this system will be finalized as design advances).<br>• This option is a passive system that requires no direct intervention during operation and facilitates direct access from shore to the FLNG by personnel and equipment. |

| Factor | Conventional Jetty Designs | Floating System | Strut Mooring System |
|---|---|---|---|
| | | constant oversight and maintenance with an inherent risk of failure.<br>• The floating pontoon solution also introduces the complexity of dynamic response for multiple moving bodies (i.e., the pontoon, the FLNG facility and the LNG carrier), which may make side-by-side mooring of the LNG carrier difficult in adverse weather conditions. This option would also require a larger number of foundations to support the additional mooring line locations. | |
| Environmental, economic, social, cultural and health implications | • Dredging resuspends sediment, which can cause bioaccumulation of contaminants in marine life and adversely affect the health of consumers.<br>• Pile driving would result in increased noise over a prolonged period of time.<br>• Require in-water work, including pile driving and dredging that would destroy marine habitat and | • Reduced construction noise and potential for health effects (as compared to conventional jetty designs.<br>• Smaller in-water footprint than conventional jetty designs.<br>• More foundations (i.e., larger footprint) than the strut mooring system. | • Reduced construction noise and potential for health effects (as compared to conventional jetty designs).<br>• Struts will be fabricated offsite and brought to the Project Area via barge, which reduces the need to import specialized labour.<br>• Avoids the need for in-water work.<br>• Smallest effect on marine resources. |

| Factor | Conventional Jetty Designs | Floating System | Strut Mooring System |
|---|---|---|---|
| | generate underwater noise.<br>• Larger marine footprint has more potential to disturb wet archaeology sites. | | |
| Effects to Indigenous Interests | • Noise generated during pile driving would disproportionately affect Haisla members residing in Kitamaat Village and other Indigenous nations' members residing within the Kitimat area.<br>• Potential contamination of marine resources would affect Indigenous nation marine users. | • Reduced construction noise and marine effects (as compared to conventional jetty designs) reduces disproportionate effects to Indigenous marine users, Haisla members residing in Kitamaat Village and other Indigenous nations' members residing within the Kitimat area. | • Reduced construction noise and marine effects (as compared to conventional designs) reduces disproportionate effects to Indigenous marine users, Haisla members residing in Kitamaat Village and other Indigenous nations' members residing within the Kitimat area. |
| Consideration of Best Available Technology | • Not considered a best available technology as compared to the strut mooring system. | • Not considered a best available technology as compared to the strut mooring system. | • The strut mooring system is an innovative design that reduces effects to the marine environment as well as the community, including disproportionate effects to Haisla Nation. |
| Risks and Uncertainties | • See risks and uncertainties identified above in respect of environmental, economic, social, cultural and health implications. | • See risks and uncertainties identified above in respect of environmental, economic, social, cultural and health implications. | • The pre-FEED assessment found this option to have a high feasibility with lower capital costs than other options considered; however, this system has not previously been used for an FLNG facility. |

**Table 44: Comparison of the alternate means for number of berths**

| Factor | Single berth with side-by-side berthing | Two berth system |
|---|---|---|
| Technical Feasibility | • Elimination of a second berth improves technical feasibility and construction cost.<br>• Less cryogenic piping, less LNG transfer, no onshore flare system. | • More complex than a single berth. |
| Environmental, economic, social, cultural and health implications | • Due to the fact that single berth eliminates construction of a second berth, environmental risk, effects to heritage resources, and changes to health, social or economic conditions are expected to be less with the single berth configuration. | • Expected to be greater than a single berth. |
| Effects to Indigenous Interests | • Due to the fact that single berth eliminates construction of a second berth, effects to Indigenous interests are expected to be less with the single berth configuration. | • Expected to be greater with two berths. |
| Consideration of Best Available Technology | • Technologies are similar regardless of the number of berths. | • Technologies are similar regardless of the number of berths. |
| Risks and Uncertainties | • See risks and uncertainties identified above in respect of environmental, economic, social, cultural and health implications. | • See risks and uncertainties identified above in respect of environmental, economic, social, cultural and health implications. |

In summary, two potential berth locations were assessed in terms of technical feasibility and environmental risk. The analysis found that the marine terminal construction and operation considerations (technical feasibility) were roughly equal between both the Northern site and Southern site. However, For the onshore facilities, the northern portion of District Lot 99 was determined to be more suitable due to a gentler topography which would provide a lower degree of difficulty for construction, improved access for vehicles and personnel, and more space for siting key infrastructure.

Based on these advantages, the northern site was selected for progressing the Project. Jetty design options that were also conserved were the conventional jetty and the strut mooring jetty. The preferred solution was determined to be the strut mooring system that utilized four solid struts anchored to two onshore foundations. This option is a passive system that requires no direct intervention during operation and facilitates direct access from shore to the FLNG by personnel and equipment. It also has the smallest potential impacts to marine fish habitat and a high feasibility with lower capital costs than other options considered; however, this system has

not been used for an FLNG facility before. The single berth option was selected because eliminating construction of a second berth improves the technical feasibility, construction cost, environmental risk, effects to heritage resources, changes to health, social or economic conditions, and effects to Indigenous interests, as compared to a two-berth system.

### 6.5.5 ALTERNATIVE POWER SUPPLY OPTIONS

The power requirements for the Project are anticipated to be approximately 169 megawatts (MW) under normal operation and 179 MW at peak demand (to be confirmed during the FEED studies). Cedar has investigated options of self-generation (i.e., using natural gas to generate power) or purchasing electrical power from the provincial transmission grid (BC Hydro) to meet this demand. However, consistent with Haisla guidance and Cedar's design philosophy, Cedar committed to purchasing electrical power from the provincial transmission grid which reduces GHG emissions by approximately 96 percent in comparison to self-generation because much of the electrical power comes from renewable sources.

The key differentiators between self-generation and grid electricity, including risks, are described below in Table 45.

**Table 45: Comparison of the alternate means for power supply options**

| Factor | Self-Generation | Grid Electricity |
|---|---|---|
| Technical Feasibility | • An onshore power facility has the potential for exposure to adverse geotechnical conditions, including rock integrity and slide risk.<br>• The self-generation option would require the construction of a power generation facility that would be located either onshore, on a temporary self-contained floating power barge, or integrated into the FLNG facility. Located wholly within the Facility Area, the power facility would have an approximate footprint of 1.6 ha (100 m by 160 m).<br>• The power facility would consist of several combined cycle gas-fired turbines directly coupled to a generator to supply the required power and aggregation equipment to distribute power directly to the FLNG facility. Fuel supply for the | • Determined to be feasible during pre-FEED studies.<br>• Electricity supply is subject to potential disruptions due to outages on the BC Hydro system.<br>• Cedar has confirmed that BC Hydro has sufficient power for the Project, and the reliability is sufficient to meet the long-term operation requirements of the Project. Therefore, BC Hydro power will be used to supply electricity to the Project. |

| Factor | Self-Generation | Grid Electricity |
|---|---|---|
| | power facility would be taken from the incoming natural gas.<br>• Approximately 5 percent to 7 percent of the natural gas delivered to the Project would be used by the gas-fired turbines for the liquefaction process and to generate electricity to power the remainder of the FLNG facility. | |
| Environmental, economic, social, cultural and health implications | • Self-generation would result in additional air emissions, including sulphur dioxide and nitrogen oxides.<br>• Increased air emissions may result in increased risk to human health.<br>• Self-generation results in increased GHG emissions.<br>• Additional air emissions may result in acidification of terrestrial and freshwater habitats and eutrophication of freshwater habitats. | • Reduced potential for human health risks when compared to self-generation as it avoids the emissions associated with combusting natural gas to generate electricity, which affects air quality and can result in adverse health effects.<br>• Using grid electricity results in a substantial reduction in GHG emissions as compared to self-generation<br>• Power provided by BC Hydro has the advantage of being largely renewable, which results in substantial GHG emissions reduction when compared to self-generation. As a result, the Project is expected to achieve a greenhouse gas intensity of 0.08 metric tonnes of $CO_2e$ per metric tonne of LNG produced ($tCO_2e$/tLNG). This aligns with the federal and provincial objectives of reducing GHG emissions and will approximately be 50 percent below the 0.16 $tCO_2e$/tLNG GHG emissions limit established in the Province of British Columbia's *Greenhouse Gas Industrial Reporting and Control Act*.<br>• The transmission line corridor requires a larger terrestrial footprint, which results in more potential for disturbance of vegetation communities, wildlife habitat, and archaeological sites and heritage resources. |
| Effects to Indigenous Interests | • Self-generation results in greater effects to Indigenous interests resulting from the effects to air | • Using grid electricity will result in less GHG emissions, reducing negative effects to Indigenous interests (such as air quality and |

| Factor | Self-Generation | Grid Electricity |
|---|---|---|
| | quality, acidification and increased human health risks. | human health) and supports Haisla's interests. |
| Consideration of Best Available Technology | • Most LNG facilities currently in operation globally rely on self-generation of power. | • Cedar considers electrification rather than gas-fired self-generation to be a best available technology. |
| Risks and Uncertainties | • See risks and uncertainties identified above in respect of environmental, economic, social, cultural and health implications. | • Grid electricity not yet been used for an FLNG facility. |

In summary, Cedar investigated two power supply options: self-generated electricity or purchasing electrical power from the provincial transmission grid. The self-generation option would require the construction of a power generation facility that would be located either onshore or on a temporary self-contained floating power barge integrated into the FLNG facility. Natural gas would be required to power the gas-powered turbines and the remainder of the FLNG facility, generating GHG and air emissions. However, BC Hydro has sufficient power for the Project, and its long-term requirements. Power provided by BC Hydro has the advantage of being largely renewable, which results in substantial GHG emissions reduction when compared to self-generation. As a result, the Project is expected to achieve a greenhouse gas intensity of 0.08 metric tonnes of $CO_2e$ per metric tonne of LNG produced ($tCO_2e$/tLNG). This aligns with the federal and provincial objectives of reducing GHG emissions and will result in emissions approximately 50 percent below the 0.16 $tCO_2e$/tLNG GHG emissions limit established in the Province of British Columbia's *Greenhouse* Gas *Industrial Reporting and Control Act*. In addition, it avoids the emissions associated with combusting natural gas to generate electricity, which affects air quality and can result in adverse health effects. Due to these reasons, as well as with Haisla Nation guidance, purchasing electrical power from the provincial transmission grid was identified as the preferred alternative and Cedar considers electrification rather than gas-fired self-generation to be a best available technology.

# 6.6 SUMMARY OF EFFECTS ON BIOPHYSICAL FACTORS THAT SUPPORT ECOSYSTEM FUNCTION

## 6.6.1 BACKGROUND

This chapter summarizes the potential effects Cedar LNG would have on biophysical factors that support ecosystem function. The result of this analysis provides decision makers with greater insight into the sustainability of Cedar LNG, and particularly how it may protect the environment and foster a sound economy and promote the well-being of British Columbians and their communities.

*Section 25(2)(e)* of the Act (2018)[74] requires that effects on biophysical factors that support ecosystem function be considered in every assessment.

Ecosystem function relates to the different physical, chemical, and biological components of an ecosystem (for example, vegetation, water, soil, atmosphere, and biota) and how they operate and interact with each other within ecosystems and across ecosystems. The function of an ecosystem depends upon the long-term integrity of its physical, chemical, and biological elements.

Biophysical factors that support ecosystem function were assessed through the VC framework and in a subsequent Technical Memorandum, and then summarized in a chapter in the Application that collectively describes how these factors were assessed in the EA.

**What are the biophysical factors that support ecosystem function?**

Biophysical factors that support ecosystem function can be grouped into the following ten categories: habitats supporting ecosystem function, habitat patches, natural disturbance regime, structural complexity, hydrologic or oceanographic patterns, nutrient cycling, purification services, biotic interactions, population dynamics and genetic diversity.

These biophysical factors can vary in their contribution to ecosystem function and may be affected by potential project impacts at a landscape or watershed level, ecosystem level or ecological community level. Biophysical factors are assessed at the level that coincides with the potential effect.

## 6.6.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS

### *6.6.2.1 Pathway of Effects*

Cedar LNG has the potential to affect biophysical factors that support ecosystem function through the following pathways:

- Habitats supporting ecosystem function;

[74] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

- Habitat patches;
- Structural complexity;
- Hydrologic or oceanographic patterns;
- Nutrient cycling;
- Purification services; and
- Biotic interactions.

Cedar LNG is not expected to interact with the following pathways:

- Natural disturbance regime;
- Population dynamics; and
- Genetic diversity.

Cedar chose three key biophysical factors to describe the effects of the Project on ecosystem function: habitat diversity and structural complexity, habitat connectivity, and water.

#### *6.6.2.2 Habitat Diversity and Structural Complexity*

Habitat diversity and structural complexity was selected by Cedar as a key biophysical factor because there are predicted to be potential project effects on valued component indicators of habitat diversity and structural complexity (for example: old forest, ecological communities at risk, vegetation species health and diversity, marbled murrelet, grizzly bear) and it encompasses the following biophysical factors that support ecosystem function categories, specifically:

- Habitats supporting ecosystem function;
- Habitat patches;
- Structural complexity; and
- Biotic interactions.

Habitat diversity and structural complexity could be affected by vegetation clearing and $SO_2$ emissions.

Loss of 16.8 ha of mature and old forest and 0.6 ha of wetland due to the Project will result in local loss of forest biodiversity and old forest functions and services for wildlife. The change in forest age and composition from mature and old to early seral stage could reduce the availability of important structures that support wildlife habitat features such as dens, roosts, platforms for marbled murrelet nests and large trees for eagle nests. An increase in edge habitat could result in an overall shift in community assemblages and diversity because the number of edge tolerant and early seral species will increase. Change in old forest and wetland function is predicted within 120 m of the marine terminal footprint due to changes in temperature (air and soil), light conditions, hydrology, soil moisture and nutrients, plant competition with invasive species, and pathogens and/or windthrow. Loss of 360 m of shoreline vegetation and sensory disturbance along the shoreline could result in marine birds and shoreline species avoiding these nearshore and intertidal areas, which would reduce species diversity and interactions that support ecosystem function. The predicted effect on wildlife habitat would be a localized direct and indirect loss of habitat, and effects would not be

expected to exceed the resilience and adaptability limits of the environment or affect wildlife populations.

Project-related increases in $SO_2$ air concentrations and acid deposition may reduce habitat that supports non-vascular plant and lichen species at risk in 14.2 ha of old forest, an important habitat for marbled murrelet. Project-related increases in nitrogen deposition has some potential to cause changes in vegetation types from more shrubs and less herbaceous plants in 16.9 ha of susceptible wetland, potentially altering forage availability for bears that graze on grasses, sedges, and forbs. The change in native vegetation health and diversity due to project air emissions is considered to be low and permanent.

Riparian and instream habitat would be altered during construction in several unnamed tributaries to Anderson Creek, Moore Creek, and Douglas Channel. Riparian clearing would also occur at the one tributary to Beaver Creek. Due to the large spans of the transmission lines, no riparian clearing is expected for the crossings of Anderson or Moore creeks. The change in riparian and instream habitat is considered moderate and will persist in the medium-term. In addition, the EAO proposes mitigation measures for wildlife and vegetation including a Construction Environmental Management Plan (CEMP) and federal Follow-up Programs with monitoring, reporting and mitigation.

#### *6.6.2.3 Habitat Connectivity*

Habitat connectivity was selected as a key biophysical factor because there is predicted to be potential project effects on VC indicators of habitat connectivity (for example: grizzly bear, marbled murrelet, wetland functions) and it encompasses the following biophysical factors that support ecosystem function categories, specifically:

- Habitat patches;
- Hydrologic or oceanographic patterns;
- Nutrient cycling; and
- Biotic interactions.

The creation of linear features, such as the transmission line and access roads, as well as the increase in traffic, could result in changes in wildlife movement between seasonal ranges and foraging areas for amphibians, songbirds, large mammals, bats and marine birds. Linear features could also change predator prey dynamics between carnivores and ungulates within those areas. The fence around the marine terminal and the loss of beach land are barriers to movement for species such as grizzly bear, moose, and western toad. Loss of beach land and sensory disturbance due to the marine terminal could present barriers to movement of species that use both the intertidal and terrestrial environment, such as grizzly bear, marbled murrelet, and bald eagle. Shipping could temporarily disrupt the foraging patterns of marine fish and mammals due to sensory disturbance from light, underwater noise, and transiting vessels. The Project is not anticipated to affect fish migration routes in freshwater because fish passage within the region are restricted to the lower reaches of Anderson and Moore creeks due to natural barriers and there is no project infrastructure or activities in these areas.

The effect on the movement of wildlife is predicted to be moderate locally due to the fencing resulting in physical barriers to movement, and low regionally because the linear features will not be a barrier to movement but could alter movement of wildlife, and effects are not expected to exceed the resilience and adaptability limits of the environment or affect wildlife populations. In addition, the EAO proposes mitigation measures for wildlife and vegetation including a CEMP and federal Follow-up Programs with annual reporting and mitigation.

#### *6.6.2.4 Water*

Water was selected as a key biophysical factor because potential project effects on VC indicators of water (for example: wetland functions, acidification, and total suspended soils in freshwater and marine environments) are predicted and water also encompasses the following biophysical factors that support ecosystem function categories, specifically:

- Hydrologic or oceanographic patterns;
- Nutrient cycling; and
- Purification services.

Clearing, grading, construction and removal of land-based infrastructure during decommissioning is expected to have adverse effects on freshwater and marine water quality. However, with implementation of mitigation and best management practices, the magnitude of these effects is predicted to be low, localized, and reversible. Effects from clearing of riparian habitat may also lead to alteration of instream habitat (such as cover, nutrients or shading). These would be mitigated by limiting clearing to the extent necessary, and creating clearing boundaries delineated prior to site preparation.

Changes in surface water quality caused by increased acidification and total suspended solids, nutrients, and/or contaminants during construction and decommissioning of land-based infrastructure could reduce hydrological function for freshwater and marine aquatic life, as well as vegetation communities. The effect on surface water quality is predicted to be localized and low magnitude. Effluent discharges during construction and operation including stormwater, wastewater, and desalination brine may result in effects on marine water quality. However, effluent would be required to meet provincial regulations and permitting conditions that are protective of water quality and aquatic life and, in addition, the EAO recommends a federal Follow-Up Program for Marine Resources that would include water quality baseline sampling and water quality monitoring.

The Project is predicted to change local soil moisture and nutrients (change in nutrient concentrations) due to clearing and grubbing and emissions that will result in acidic and nutrient deposition. The effect on water is predicted to be small and localized and is not expected to result in adverse effects on ecosystem function.

Freshwater flow is not predicted to change because Cedar is limiting water withdrawal for the Project.

## 6.6.3 PROPOSED MITIGATION MEASURES

Mitigation measures proposed to avoid or reduce potential effects on individual VC chapters (i.e., vegetation resources (section 5.3), wildlife (section 5.4), freshwater fish (section 5.5) and marine resources (section 5.6)) would also manage effects on biophysical factors that support ecosystem functions. See these chapters for a complete list of mitigation measures. Select key mitigation measures are described below.

#### *6.6.3.1 Project design mitigation measures*

Project design mitigation measures include:

- A floating LNG facility that substantially reduced the terrestrial footprint, and therefore reduces the effects on terrestrial vegetation, wildlife, and freshwater fish;
- Use of air cooling to dissipate heat from the liquefaction process, instead of using freshwater or marine water for cooling;
- Choosing the site with the least number of environmental concerns between two candidate sites and located adjacent to an existing forest service road to reduce the amount of new access roads for transportation and transmission line;
- LNG carriers following the well-established shipping route to Kitimat; and
- The transmission line will span Moore Creek and Anderson Creek, reducing the need for riparian clearing and maintaining old forest and riparian corridors and connectivity.

#### *6.6.3.2 Valued component mitigation measures:*

Valued component mitigation measures include:

- For vegetation, implementation of standard best practices to prevent and control the spread of invasive plants and using natural regeneration or active reclamation to restore temporary workspaces. Implementation of erosion and sediment controls through the project-specific CEMP will help to keep harmful sediments out of surface freshwater and out of sensitive water-receiving ecosystems;
- For wildlife, use of avoidance buffers around identified wildlife habitat features, managing human-wildlife contact, reporting wildlife habitat features to Cedar's environmental manager and developing feature-specific mitigation, avoiding, or reducing work during sensitive timing windows for the nesting period for migratory birds, and measures to protect amphibians when grubbing and grading near or within riparian areas or working in wetlands or watercourses;
- For freshwater fish, reducing direct effects to riparian vegetation, which will help to maintain habitat and structural diversity in riparian areas, maintain connectivity along riparian corridors through old forest, and enable natural water processes to continue; and
- For marine resources, implementing erosion and sediment controls, reducing effects of pile driving on fish and marine mammals by avoiding in-water installation, using vibratory methods, potentially using bubble curtains to mitigate underwater noise levels, and placing the seawater intake for fire control in deep waters and covered with a 25 mm screen to reduce potential effects on juvenile salmon and larval oolichan that occur in shallow nearshore and surface waters, respectively.

### 6.6.4 CUMULATIVE EFFECTS

Residual effects of the Project are expected to contribute to cumulative effects on key biophysical factors that support ecosystem function. Potential residual cumulative effects are described in more detail in the cumulative effect assessments for each applicable biophysical valued component.

### 6.6.5 POSITIVE EFFECTS AND ENHANCEMENT MEASURES

Cedar did not identify any positive effects of the Project on biophysical factors that support ecosystem function.

### 6.6.6 COMMENTS RECEIVED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, the following key issues related to the assessment of biophysical factors that support ecosystem function for Cedar LNG were identified by Haida:

- Detail on potential Project effects.

#### *6.6.6.1 Detail on Potential Project Effects*

Haida raised concerns that Cedar grouped the seven biophysical factors identified as likely to interact with the Project into three broad categories (habitat diversity and complexity, habitat connectivity, and water) and in doing so, had failed to provide adequate detail on potential Project effects on each of the affected biophysical factors that support ecosystem function. Haida requested that a detailed discussion of potential Project effects, mitigation measures, and predicted effects on ecosystem function by biophysical factor, be provided using the categories identified in the BC Effects Assessment Policy Ecosystem Function Scoping Tool (Appendix 1 in the Effects Assessment Policy). Haida also raised concerns that information regarding potential interactions with marine vessel traffic and water quality, marine ecosystem features, invasive species populations, and genetic diversity at a population level were not considered in adequate detail.

During Application Review, Cedar submitted a technical memo on biophysical factors as a supplement to the Application. This technical memo was prepared to demonstrate how the Ecosystem Function Scoping Tool was used to select the biophysical factors for the discussion of the overall effect of the Project on ecosystem function in the Application. The memo identified potential project effects on seven of the ten biophysical factors listed in the scoping tool. The memo described how potential project effects on each of the seven biophysical factors were collectively grouped into the three key biophysical factors used in the Application. Cedar also noted that concerns related to marine shipping interactions were considered in the marine resources section, the wildlife section, and the freshwater fish section of the Application. Cedar

provided additional rationale on why the Project was not predicted to affect marine ecosystem features, purification services, invasive species, and genetic diversity.

The EAO considered this supplemental analysis and information on biophysical factors to be adequate for the purpose of the EA.

## 6.6.7 CONCLUSIONS

This section presents the EAO's conclusions on the potential positive and negative effects from Cedar LNG on biophysical factors that support ecosystem function.

### *6.6.7.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Provincial conditions and recommended Mitigation Measures under the IAA are proposed related to the following valued components:

- Air quality (see section 5.1)
- Vegetation (see section 5.3)
- Wildlife (see section 5.4)
- Freshwater fish (see section 5.5)
- Marine Resources (see section 5.6)

No additional conditions or mitigation measures are proposed specific to biophysical factors that support ecosystem functions.

### *6.6.7.2 Residual Effects*

After considering the proposed provincial conditions and federal mitigation measures, the EAO concludes the effects on ecosystem function, as shown in Table 46 are predicted.

**Table 46: Effects on ecosystem functions**

| Ecosystem Function | Assessment Rating | Rationale |
|---|---|---|
| Habitat Diversity and Structural Complexity | Low magnitude, localized, and permanent | Loss of habitat would be localized and is not predicted to have a regional effect. The effects of $SO_2$ and $NO_x$ deposition of habitat is predicted to be low. |
| Habitat Connectivity | Low magnitude, localized, and permanent | Loss of habitat connectivity in the terrestrial, intertidal environments would be predicted to be moderate locally and low regionally. Disturbance to connectivity from shipping is predicted to |

| | | |
|---|---|---|
| | | be temporary during the transit of vessels |
| Water | Low magnitude, localized, and reversible | Changes in water quality are predicted to be low due to minimal disturbance to riparian habitat and water bodies. Effluent discharges and air emissions that could result in changes to fresh and marine water quality would be managed and subject to monitoring and reporting. |

#### *6.6.7.3 Conclusions*

After considering the information provided by Cedar in the Application, the views of the Working Group and the public, the proposed provincial conditions and federal mitigation measures, the EAO concludes that there would be a low magnitude of effects on biophysical factors that support ecosystem function. The EAO is satisfied that effects on these factors would be appropriately mitigated and minimized to the extent possible for the Project.

# 6.7 EFFECTS ON CURRENT AND FUTURE GENERATIONS

## 6.7.1 BACKGROUND

Section 25(2)(f) of the Act (2018)[75] requires that effects on current and future generations be considered in every assessment. This means that both positive and negative project effects on current and future generations must be considered for environmental, economic, social, cultural and health values and in relation to the Indigenous interests that may interact with the Project.

**What is considered a current and future generation?**

25 years is generally considered representative of a single generation however the Act (2018) does not assign a specific numerical value to the term. Generally, effects on current generations would be felt within the next 25 years, while effects on future generations would be felt 25 years and beyond.

## 6.7.2 RELEVANT INITIATIVES AND STRATEGIES

The following federal, provincial, regional, and Indigenous initiatives and strategies are relevant to sustainable development and Cedar LNG:

| |
|---|
| **Clean BC**<br>One of Clean BC's goals is to significantly increase industrial electrification in the province. Cedar LNG would be powered by electricity from BC Hydro and aims to be one of the lowest carbon intensity LNG facilities in the world. |
| **First Nation Climate Initiative (FNCI)**<br>The First Nation Climate Initiative's (FNCI) goals are to simultaneously fight against climate change and alleviate poverty in First Nation's communities. Cedar LNG would support the attainment of global climate change targets while also providing direct economic benefits and opportunities to Haisla and other nations in the region through employment and procurement. |
| **Stronger BC**<br>Stronger BC is an economic plan that aims to increase affordability, promote jobs, support businesses, and foster stronger communities in B.C. post pandemic. Cedar LNG aims to align with Stronger BC by creating local and regional direct, indirect, and induced employment opportunities, and encourage procurement for local and regional businesses. |
| **Kitimat Official Community Plan (OCP)**<br>Cedar noted that the Project aligns with several of Kitimat's Official Community Plan (OCP) themes including cultivating diverse economic growth, reducing adverse effects on the community and natural environment and mitigating effects on Kitimat's sense of place. The Kitimat OCP includes aspirations for future community |

[75] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

| |
|---|
| growth, and industrial projects that would support growth. |
| **Canada's Trade and Export Diversification Strategies**<br>A component of Canada's Trade and Export Diversification Strategies is to help Canadian businesses access new markets. Part of the strategy also involves increasing Canada's overseas exports by 50% by 2025. Cedar LNG, if approved, will deliver approximately three million tonnes per annum of low carbon LNG to oversees markets. |

### 6.7.3 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

This section provides an overview of positive and adverse effects and mitigation and enhancement measures to both reduce adverse effects and distribute positive effects across generations.

#### *6.7.3.1 Pathways of Effects*

Cedar LNG has the potential to affect current and future generations through the following four pathways:

- Project physical activities and marine shipping impacts on land (tenured and non-tenured) and marine uses;
- Impacts on ecosystem function or irreversible effects on VCs;
- Project physical activities and marine shipping impacts on Indigenous Interests and the exercise of rights; and
- Project-related expenditures on labour, goods and services can have adverse and positive effects on human and community well-being.

#### *6.7.3.2 Adverse Effects*

Cedar concluded that after design measures and application of mitigation and management plans, no substantial adverse residual project effects on current and future generations are anticipated. For adverse effects that are expected to extend beyond the life of the Project, such as effects to bog wetlands (see Section 5.3: Vegetation Resources), potential effects are low in magnitude and are not expected to impact future generations enjoyment of land, water, and marine resources.

Cedar determined that adverse project effects on tenured and non tenured (recreational) land, resource, and marine use (see sections 5.8 and 5.9, respectively) were low to moderate in magnitude and reversible upon project decommissioning. Cedar proposes to use a FLNG facility, pre-disturbed and private land for land-based infrastructure and an existing network of access roads to reduce potential disturbance for tenured and recreational users. Marine use will be impacted by the Project when LNG carriers visit the terminal once every 7-10 days, while marine recreation and tourism activities are not expected to overlap with Cedar LNG's Marine Shipping Route. Cedar concluded that project-related shipping traffic will result in low residual effects on marine fisheries and other uses.

Cedar concluded that Cedar LNG is expected to result in changes to aspects of key biophysical factors that support ecosystem function (see section 6.6), including effects on habitat diversity and complexity, habitat connectivity, and water. Cedar noted that these effects are low in magnitude and are not predicted to exceed conservation-based thresholds after the application of mitigation and enhancement measures. Cedar also noted that cumulative effects on ecosystem function are low in magnitude.

#### *6.7.3.3 Indigenous Nation Considerations*

Cedar assessed potential project effects on three categories of Indigenous Interests, as informed through engagement with Indigenous nations:

- Consumption and harvest;
- Use and integrity of sacred and culturally important sites and landscape features; and
- Aspects of traditional Indigenous governance.

Cedar noted that potential direct effects on Indigenous culture and identity from the physical components of the Project would occur in the traditional territory of Haisla. Cedar noted in the Application that Haisla has a history of supporting past LNG proposals in their traditional territory and have actively planned the Project for 10 years. Haisla provided feedback and confirmed that Cedar was aligned with the environmental and economic development objectives of the Nation. Haisla guidance helped inform project components such as electrically powering the Project and air cooling the natural gas liquefaction process to lower potential GHG emissions and reduce impacts to marine resources. Cedar noted that Cedar LNG, if approved, would be the first Indigenous-majority owned LNG export facility in Canada, allowing Haisla to directly own and participate in a major industrial development on its territory. Cedar also noted that ownership of the Project would enable the Nation to be self sufficient and leverage resources to pursue community goals and build for future generations.

Haisla's business philosophy is to advance commercial initiatives and promote environmentally responsible and sustainable development while minimizing the adverse impacts on land and water. Cedar noted that the Project may help Haisla realize the economic and social goals outlined in their Comprehensive Community Plan. The Plan has nine community goals:

- Housing;
- Language and culture;
- Youth;
- Education;
- Economic Development;
- Elders;
- Environment;
- Health and Well-being; and
- Community safety.

Potential effects on culture and identity along the shipping route may extend to the traditional territories of Haisla, Kitselas, Kitsumkalum, Gitga'at, Gitxaała, Lax Kw'alaams, Metlakatla and Haida. Potential effects on culture and identity along shipping routes may also occur in areas used by Metis Nation British Columbia.

Overall, Cedar concluded that Cedar LNG would result in moderate magnitude residual effects on Indigenous Interests in the effects assessment areas.

#### *6.7.3.4 Proposed Mitigation Measures*

Cedar proposed to reduce project-related adverse effects on the local community and environment with the following measures:

| Value Component | Proposed Mitigation |
|---|---|
| Land and Resource Use | • FLNG facility will avoid land-based production and storage, reducing land requirements and avoiding impacts to terrestrial and freshwater habitats<br>• Use of existing access roads<br>• Traffic safety measures<br>• Light control |
| Marine Use and Marine Environment | • Pre-treatment and liquefaction processes will be air cooled, eliminating the need for large seawater supply.<br>• Engagement and communication with marine users<br>• Development of a marine transportation management plan |
| Ecosystem Integrity | • Use of existing roads and access roads<br>• Avoid building transmission line structures within riparian areas or below high-water marks for watercourses |
| Human and Community Well-being | • Use of local workforce accommodation centers for non-local workers<br>• Implement a local hire and procurement policy and promote local training opportunities<br>• Onsite first-aid stations, medical rooms, and communication devices for emergency aid to reduce demand on local health services<br>• Waste management plan, emergency management plan and security services<br>• Community feedback tool or process to receive and address community concerns and complaints |
| Air Quality and GHG Emissions | • Natural gas pre-treatment and liquefaction will be electric powered, reducing adverse effects on air quality and GHG emissions |

#### *6.7.3.5 Positive Effects and Enhancement Measures*

Cedar LNG, if approved, is expected to deliver economic benefits to both Haisla and at the local, regional, and provincial levels. Positive effects to Haisla are anticipated to be diverse career opportunities for current Haisla youth and community members and investments in social, health, and educational programs intended to empower future generations. Cedar LNG is expected to have positive economic effects at the local and regional level by creating direct, indirect, and induced employment for both Indigenous and non-Indigenous residents. Cedar LNG is also anticipated to have positive economic effects at the provincial level through annual tax and GDP contributions.

| Value Component | Proposed Enhancement |
|---|---|

| | |
|---|---|
| Employment and Training | • Work and engage directly with Indigenous nations<br>• Increase and promote opportunities for Indigenous and local community members to participate in the Project<br>• Implement a local hire and procurement policy<br>• Implement a gender equity and diversity policy that focuses on hiring Haisla members, local and Indigenous persons, and women<br>• Provide on-the-job training programs and apprenticeship opportunities |
| Indigenous Businesses and Future Generations | • Engage with Haisla and local, regional, and Indigenous economic development departments<br>• Provide business and contracting opportunities to Haisla, local and regional businesses<br>• Develop work packages for Haisla, local, Indigenous, and regional businesses<br>• Require subcontractors to implement plans, policies and practices that provide opportunities to local businesses and contractors<br>• Include Haisla, local, regional and Indigenous businesses and contractors in corporate database |

### 6.7.4 COMMENTS RECEIVED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, Indigenous nations, and the public, the following issues related to the assessment of effects on current and future generations for Cedar LNG were identified:

- Temporal boundaries; and
- Greenhouse gas increases; and
- Cumulative effects of increased shipping.

#### *6.7.4.1 Temporal Boundaries*

Gitga'at, Kitselas and Metlakatla noted that Cedar's proposed temporal boundaries for the operations phase of the assessment is 40 years. In relation to this, Gitga'at, Kitselas and Metlakatla raised concerns that a 40-year lifespan could represent permanent impacts in the context of passage of knowledge to future generations. Kitselas elaborated that use of the environment for knowledge transfer may be permanently and irreversibly impacted if elders are not able to pass on knowledge at appropriate times or in appropriate ways as a result of project operations. Gitga'at, Kitselas and Metlakatla noted that passage of knowledge to future generations could be impacted by Cedar LNG.

Cedar acknowledged that a 40-year lifespan of the Project would span two generations and may represent permanent impacts in the context of passage of knowledge to future generations under certain conditions.

The EAO notes that the characterizations of effects on all VCs includes consideration of time and that it has considered some effects of the Project to be permanent. Effects on Gitga'at's, Kitselas' and Metlakatla's Indigenous Interests are discussed in Part C of this Report, and include the duration of effects.

#### *6.7.4.2 Greenhouse Gas Effects*

Some members of the public expressed concern that approval of Cedar LNG would contribute GHG emissions that may adversely impact both current and future generations. Other members of the public noted that downstream GHG emission impacts should be assessed with regard to impacts to current and future generations.

Cedar noted that extraction of natural gas is managed by OGC and that the Coastal Gaslink Pipeline has already received an EAC, therefore, both matters are outside the scope of the assessment. Cedar also responded that, in accordance with the Strategic Assessment of Climate Change, estimates of downstream emissions are not required. Cedar further noted that while climate change poses a significant ecological risk to various species and the livelihoods of people in vulnerable areas, GHG emissions from Cedar LNG are not directly responsible for these phenomena. Comments and concerns relating to broader climate change impacts; rising sea levels or frequency of adverse weather events for example, are outside the scope of the assessment.

The EAO notes that GHG emissions are assessed in section 6.4 of this Report. Potential changes to the Project that may be caused by the environment, which includes climate change predictions are assessed in section 6.3 of the report. Climate change, extreme weather events, geohazards, seismic events and forest fires have the potential to affect Cedar LNG and have been considered. As noted in the Section 6.4: Greenhouse Gas Emissions, the EAO proposes a provincial condition requiring Cedar to develop a GHG reduction plan in consultation with Indigenous nations and the Climate Action Secretariat to reduce GHG emissions and to align with provincial and federal climate targets. The EAO has also recommended federal Mitigation Measures for GHGs under the IAA, as described below.

#### *6.7.4.3 Cumulative Effects of Increased Shipping*

Gitxaała raised the concern that the cumulative effects of the increased shipping as a result of industrial development across the region, which Cedar LNG would contribute to, could affect current and future generations. Effects of shipping including on Indigenous Interests are discussed in section 6.9 and Part C of the report. Proposed conditions, and recommended federal Mitigation Measures, and federal Follow-Up Programs addressing marine shipping effects are described in section 5.9 (marine use) and include a marine transportation plan that would be developed in consultation with Gitga'at, Gitxaała, Haida, Haisla, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla.

### 6.7.5 THE EAO'S ANALYSIS AND CONCLUSIONS

This section presents the EAO's conclusions on the potential positive and negative effects from Cedar LNG on current and future generations. Cedar LNG may potentially affect current and future generations by impacting marine and land users as shipping traffic increases in the area

due to the Project. Cedar LNG may also have irreversible effects on VCs or compromise ecosystem integrity and impact the use of these components by various groups now and into the future. Indigenous Interests may be affected by way of increased marine traffic and its impacts on harvesters and marine users. Cedar LNG, through project-related expenditures on labour, goods, and services, may have both adverse and positive effects on human and community well-being in the area, which may impact current and future generations.

#### *6.7.5.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, the EAO notes the following provincial conditions are relevant to effects on current and future generations:

- Greenhouse gas reduction plan (Condition 10);
- Community feedback process (Condition 11); and
- SEMP (Condition 14); and
- Regional cumulative effects initiatives (Condition 16).

In addition, the EAO recommends notes Mitigation Measures under the IAA that have been proposed in previous sections are also relevant to effects on current and future generations:

- GBA Plus Mitigation Measures as described in Section 6.8: Human and Community Well-Being;
- Employment and economy mitigation measures as described in Section 5.7: Employment and Economy;
- Greenhouse gas Mitigation Measures, as described in Section 6.3: Greenhouse Gas Emissions.

#### *6.7.5.2 Additional Considerations*

The community of Kitimat covers approximately 320 square km at the end of the Kitimat Arm of the Douglas Channel on BC's northwest coast. The Douglas Channel is characterized by a deep sheltered harbour which allows for large vessel marine navigation and shipping to take place. These geographical features present economic opportunities for both the community of Kitimat and Haisla to supply global markets with LNG transported from the Coastal GasLink pipeline system.

**Cedar LNG may provide economic opportunities to Haisla and the Kitimat community**

As a Haisla majority-owned and Indigenous-led project, Cedar LNG has the potential to provide direct, indirect, and induced employment not only to Kitimat and regional communities, but to Haisla and other Indigenous group members as well. Haisla have noted that industrial development in the area has occurred on their land for decades, many times at the expense of the environment and without their consent or inclusion. Haisla view Cedar LNG as an opportunity to take ownership of industrial development on their lands and use revenues to

support local social, educational, and health programs. Economic and social benefits are the primary positive effect of Cedar LNG.

To enhance positive economic and social effects, Cedar plans to prioritize, promote and increase employment and procurement opportunities for Indigenous and local community members. This also would include hiring underrepresented groups such as: Haisla Nation members, Indigenous persons, and women. To ensure these opportunities are afforded throughout the lifecycle of the Project, the EAO proposes a federal mitigation measure requiring Cedar to prepare a gender equity and diversity program, as noted in section 6.8.

**Cedar LNG aligns with several Indigenous, regional, provincial, and federal initiatives and strategies**

Cedar LNG's potential economic benefits align and may help in achieving the goals of several strategies and initiatives. Cedar LNG aligns with the First Nation's Climate Initiative (FNCI) which aims to fight climate change, alleviate poverty in First Nation's communities, advance ecosystem restoration and put reconciliation in action. The FNCI was established in October 2019 by the Leadership of the Lax Kw'alaams, Metlakatla, Nisga'a and Haisla First Nations.

Stronger BC is a provincial framework that sets out various goals to guide the province in its socioeconomic recovery from the COVID-19 pandemic. Cedar LNG aligns with the Stronger BC framework by creating economic opportunities for the region, offering training and employment to local community-members, and fostering a comparatively low-carbon intense industry. Cedar LNG would align with components of Canada's Trade and Export Diversification Strategies which aims to grow Canada's international exports by 50% by 2025 and help Canada access new overseas markets.

Kitimat's official community plan (OCP) provides a basis for community-related decisions regarding development in the area. The OCP recognizes that Kitimat has faced a decline in its population. Kitimat hopes to encourage population growth by attracting industrial activity which would simultaneously bring economic development. The OCP also recognizes the importance of economic diversification to avoid boom and bust scenarios that many other natural resource-dependent communities face. Cedar LNG aligns with the OCP's goal of expanding industrial employment but may also contribute further to the community's dependence on natural resource exports and reduce the community's resilience to economic shocks.

**LNG facilities emit GHG and may hinder achievement of Provincial Climate Goals**

Cedar LNG would align with Clean BC's objective to significantly increase electrification of industrial activities in the province by utilizing clean electricity from the BC Hydro grid.

The Province of B.C. through the Clean BC framework introduced a requirement that all new large industrial facilities must have a plan to achieve net-zero by 2050 (Clean BC, 2022). Cedar LNG will need to meet this requirement to remain aligned with Clean BC.

Considering the predicted GHG emissions for Cedar LNG and to ensure Cedar LNG aligns with the direction of the Clean BC Roadmap, the EAO proposes a condition requiring Cedar to maintain a Greenhouse Gas Reduction Plan. This plan would require Cedar to maintain and update a plan to reduce GHG emissions of Cedar LNG, in consultation with Indigenous nations and the Climate Action Secretariat. The plan would need to consider relevant provincial statutes. The EAO also recommends that Cedar be required to meet the federal requirement that Cedar LNG does not emit greater than net 0 kt $CO_2e$/yr by January 1, 2050, as calculated pursuant to equation 1, section 3.1, of ECCC's Strategic Assessment of Climate Change, as well as associated technical guidance documents on quantification of net GHG emissions published by the Government of Canada.

The EAO also notes that Cedar LNG could have a positive impact on GHG emissions globally, if importing countries were to use the natural gas as a replacement for coal in power production, since natural gas-fired electricity generation results in approximately 40% less GHG emissions than coal-fired electricity generation.

#### *6.7.5.3 Conclusions*

After considering the information provided by Cedar in the Application, the views of the Working Group and the public, the proposed provincial conditions and federal mitigation measures, the EAO concludes that there may be negative impacts on Indigenous nations along the Marine Shipping Route as a result of Cedar LNG due to impacts of shipping on the environment and their traditional use, as well as cumulative effects on the region from both shipping and population growth. In addition, GHG emissions from the Project would contribute to climate change. However, some members of the public, communities and Indigenous nations would also be positively impacted as a result of Cedar LNG. Cedar LNG aligns with Indigenous, regional, provincial, and federal initiatives and strategies and as an Indigenous-led project, will bring economic and social benefits to the community. LNG from Cedar LNG may also help to displace the use of energy sources that are more GHG-intensive (such as coal) in importing countries, and thereby, has the potential for positive effects for climate change on a global scale. The Project would also enable Haisla to be self-sufficient and leverage resources to pursue community goals and build for future generations. The EAO has proposed provincial conditions and federal Mitigation Measures aimed at reducing the negative impacts of the Project and maximizing benefits to the extent possible.

# 6.8 HUMAN AND COMMUNITY WELL-BEING

## 6.8.1 BACKGROUND

This chapter summarizes potential Project-related social, economic, cultural and health effects that contribute to changes in social determinants of health and which may impact human and community well-being. These effects can be highly dependent on each other and are interrelated. Effects on social determinants of health can be direct or indirect effects from project activities. They can also change the way people live, work, play, practice their culture and/or organize themselves. The social determinants of health (SDH) are the broad range of personal, social, economic, and environmental factors that determine individual and population health.. Where we are born and how we grow, live, work and age have an important influence on our health.

Changes resulting from Cedar LNG that occur to these values are referred to collectively as *human and community well-being effects.* Human and community well-being effects can be positive or negative and they can also be experienced at an individual, household, family, social/cultural group, community level, or across generations. Effects may be experienced differently, and at different times, by individuals and groups within a community or region.

Section 25(2)(a)(d) of the Act (2018)[76] requires that positive and negative direct and indirect effects of the Project, including environmental, economic, social, cultural and health effects, as well as disproportionate effects on distinct human populations, including populations identified by gender be considered in every assessment. Section 22(1)(s) of the IAA requires the assessment consider the intersection of sex and gender with other identity factors. The concept of well-being includes the relationships between many tangible and intangible aspects of human health and the social, economic, cultural and biophysical environment. Individuals and communities can experience well-being differently, based on their own unique set of cultural, historical and geographic circumstances, and it is

### What is health?

The World Health Organization (WHO) defines health as: "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." These effects are also often closely intertwined with the state of, and trends in, the biophysical environment. Indigenous perspectives on health and wellness demonstrate the need to consider this interconnectedness from a holistic perspective. Indigenous communities identified the following elements as integral to well-being, a deep connection between people, the environment, resource use and culture. This includes use of and access to sacred and culturally important sites to support cultural identity.

[76] While Cedar LNG is assessed under the Act (2002), aspects of the Act (2018) are considered in this assessment, as described in Part A of this Report.

important that definitions of well-being, as provided by Indigenous groups and local communities themselves, are included in the assessment.

The EAO has incorporated consideration of the potential for disproportionate effects throughout this Report, where effects on human populations are assessed (for example: human health, infrastructure and services, employment and economy). This chapter summarizes these potential effects.

Human and community well-being effects within federal jurisdiction including effects to the health, social or economic conditions of the Indigenous peoples are discussed in section 6.9 of this Report.

## 6.8.2 POTENTIAL PROJECT EFFECTS AND PROPOSED MITIGATIONS IN THE APPLICATION

### *6.8.2.1 Existing Conditions*

Kitimat and the surrounding area in which Cedar LNG would be located are situated on the Douglas Channel. The area has seen decades of industrial development given the deep and sheltered harbour and access to global markets. Kitimat experienced a significant population surge in the 1950s when the province selected it as the location of one of the world's largest aluminum smelters. The area has since seen a decline in residents as the population fluctuates with cycles of local industrial development and changes in government resource policies.

#### *POPULATION HEALTH*

Cedar LNG would be situated in the Northwest Health Service Delivery Area (NWHSDA), which is a part of Northern Health. It includes the following communities that are within the LAA and RAA for the infrastructure and services VC and the employment and economy VC: District of Kitimat, the City of Terrace, Haisla Nation (Kitamaat Village), Kitselas First Nation, and Kitsumkalum First Nation. Northern Health describes the population in northwestern British Columbia as having poorer health outcomes than other health authorities due to vulnerabilities to chronic diseases and the challenges to attaining a good health status (SDH). This is also due to the remoteness of many communities in the region. Challenges and vulnerabilities to chronic diseases and health challenges are influenced by factors such as: vast distances between communities; small or underequipped service centers; the harsher climate; remoteness and isolation; potentially limited social, educational and employment opportunities; poorer transportation systems; and unstable housing and food costs.

The Northern Health region has the lowest life expectancy of the five health regions in British Columbia and is several years lower than the provincial average for both males and females. The Northern Health region also has the highest rate of premature mortality and potentially avoidable mortality of all the health regions. These types of deaths are often related to risk behaviors such as alcohol abuse, tobacco abuse, dangerous driving, or inadequacy in

prevention or access to prevention programs. Some of these individual behaviors are often a result from social inequities and intergenerational trauma. Males and females in the NWHSDA had a statistically higher percentage of self-reported obesity than the province average and had significantly higher percentages of self-reported smoking and heavy drinking. Sexually transmitted infection (STI) rates in the NWHSDA are lower than the provincial average and other health service delivery areas in the Northern Health region.

The NWHSDA experienced some of the highest rates of COVID-19 in the province with several outbreaks reported in various industrial project sites in the area. Communities in the RAA have voiced concerns regarding a decrease in mental health status associated with industrial development in the region, while suicide rates in the Northern Health region remain some of the highest in BC. Men aged 35 to 39 years old have the highest suicide rate among Northern BC residents.

**Summary of Population Health in the Northern Health Region**

- Poorer health outcomes overall compared to urban areas
- Lowest life expectancy in BC
- Highest rate of premature mortality in BC
- Lower STI rates than provincial average
- High rates of COVID-19
- Highest suicide rates in BC

### *SOCIO-ECONOMIC STATUS*

Educational attainment is recognized as an important SDH. Higher education is linked with better employment, higher incomes, and job security . In both the LAA and RAA Indigenous populations have lower rates of any form of post-secondary education as compared to the provincial average. Spare capacity exists in schools in both the RAA and LAA. Education plays an important role in determining health status of an individual, but is more likely to be linked to income, employment, and career success than it is to an individual having a greater store of personal knowledge. With higher levels of educational attainment, individuals have access to less hazardous jobs, and reduce their risks associated with workplace injuries. In addition, their education attainment provides more access to employment with job security, retirement plans, and health insurance that is not covered by government health programs.

Employment provides individuals with economic opportunities which can influence individual and family health. However, the working environment can also significantly impact physical and mental health through type of work and working conditions. In the Application, Cedar noted that regional employment trends show that unemployment rates were higher and more variable in the region than across the province but have followed a decreasing trend since 2011. A sudden increase in unemployment in 2020 is largely attributed to the COVID-19 pandemic.

The Province of British Columbia's Labour Market Outlook for 2019 to 2029 forecasts that employment demand in the region will increase with approximately 9,900 jobs created by 2029.

Income is a significant contributor to health and health inequalities. While Canadians have seen an overall increase in personal income, the poverty rate has not decreased proportionally, and inequalities have worsened. In 2015, reported average employment incomes for individuals were lower in the LAA and RAA than provincial averages.

Where someone lives is important, as both natural and built environments can have impacts on health. Although affordability is an issue in the LAA and RAA, the percentage of households spending 30 percent or more of their income on shelter was below the average percentage for BC. Haisla has several initiatives in place to address housing issues for community members living on and off-reserve. Both Terrace and Kitimat have experienced a recent upward trend in housing prices, with decreasing supply. The demand for social housing in the area also remains high accompanied by a significant shortage in supply. As of August 2020, 76 BC Housing affiliated social housing applications in the Greater Terrace Area remained on the waitlist, including: 34 families, 17 residents with disabilities, and 17 seniors. However, the demand for social housing is much greater than what is reported by BC Housing waitlists. LNG Canada reported a peak of 1,550 non-local temporary workers living in camp accommodations in Kitimat in 2019 and a peak of 2,427 in 2020. Non-resident temporary workforces and worker relocation can create adverse effects on housing, particularly if camp accommodations are not available or the workforce exceeds availability.

Northern Health has noted that health care is generally at capacity across the Northern Health region and that Northern Health is resourced to provide services to the resident population only. Increases in emergency room patient visits from outside of the health service delivery area were correlated with an increase in the number of non-resident workers in Kitimat according to LNG Canada.

Early childhood education and development are pivotal to a child's growth and development. A poor start to life often leads to problems that can impact health and lead to long-term problems. Concerns regarding the lack of space in daycares in the LAA have been expressed by individuals living in Kitimat and Kitamaat Village. Demand for licenced childcare spots exceeds availability in Kitimat, and childcare centers are operating below capacity due to a shortage of early childcare educators. Access to childcare may also increase labour market participation and removes barriers to employment for underrepresented groups, including Indigenous peoples, women, visible minorities, and persons with disabilities, leading to higher socio-economic status.

Healthy eating requires being 'food secure' (i.e., having physical and economic access to sufficient, safe and nutritious foods to meet the needs of a healthy and active life). Individuals who are food insecure are at an increased risk of chronic conditions and have greater difficulty

managing their diseases. In 2011/2012 the NWHSDA had the highest reported rate of food insecurity in BC.

**Summary of Socio-Economic Status in Northern Region**

- Lower attainment of post-secondary education than provincial average
- Unemployment rate on par with provincial average
- Lower reported average employment incomes than provincial average
- Upward trend in housing prices with low supply
- High demand for social housing and low supply
- At-capacity health care availability
- Demand for childcare exceeds availability
- Highest rate of food insecurity in British Columbia (2011-2012)

#### *6.8.2.2 Pathway of Effects*

Cedar LNG has the potential to affect SDH and impact human and community well-being through the following pathways:

- Impacts to culture and identity;
- Demand for early childhood education services and infrastructure;
- Demand for education infrastructure and services;
- Project employment, expenditures and working conditions;
- Project impacts on food security;
- Differing project interactions on gender and other distinct subpopulations;
- Demand for health care services;
- Project employment and expenditure impacts on incomes and income inequity;
- Demand on housing and accommodation;
- Non-resident workforce impacts on social cohesion and connectedness; and
- Non-resident workforce impacts on community safety and crime.

These pathways may affect human and community well-being by having adverse effects to mental well-being, physical well-being and social and cultural well-being as described below.

Adverse effects to mental well-being

- Uncertainties related to potential accidents and malfunctions, including marine spills;
- Effects of relocation and shift work on cultural engagement; and
- Population change and migration.

Adverse effects to physical well-being:

- Risks to the safety of marine harvesters;
- Food insecurity from changes to the quantity or quality of country foods, or impeded access to traditional territories, including marine areas;
- Risks to the safety of Indigenous women and girls from an influx of temporary workers;
- Effects related to a decrease in housing availability from population changes, resulting in overcrowding, conflict, stress levels and transmission of infectious disease;
- Increased disposable income, coupled with a non-local temporary workforce, leading to increase in use of drugs and alcohol, and rates of sexually transmitted infections; and
- Potential increase in cost of living, resulting in food security and health status of low-income individuals and households.

Adverse effects to social and cultural well-being:

- Impeded access to traditional lands, waters and resources that are important for sustenance, social and ceremonial purposes; and
- Disruption in cultural practices and a loss of balance and control over individuals' lives.

The Application also considered the potential for Cedar LNG to affect subgroups within local populations differently. Certain subgroups may be more vulnerable to adverse effects while

others may be better positioned to realize positive effects. These various differential effects are highlighted in this section. A variety of factors contribute to differential effects including but not limited to: gender, age, employment status, education level, geography and/or ethnicity. It is important to consider how such factors may overlap or intersect to produce unique or layered experiences and effects for individuals or groups of people.

#### *6.8.2.3 Potential Project Effects*

**Cedar LNG may impact Indigenous culture and identity:**

Cedar LNG may interact with the rights of Indigenous peoples and may impact the exercise of Aboriginal rights and title. These effects may be both positive (due to the economic and social benefits of the Project) and negative. Subsequently, this may affect Indigenous interests related to consumption and harvest, the use and integrity of sacred and culturally important sites and landscape features, and aspects of traditional Indigenous governance. These effects may impact the culture and identity of nearby Indigenous nations. The assessment found no exposure pathway related to country foods from project emissions or subsequent changes in sediment, soil, and biota (see section 5.12: Human Health). Access to land is closely intertwined to Indigenous health as it provides not only physical but emotional and spiritual sustenance, and it is therefore an important SDH. Traditional ties to the natural environment are generally acknowledged as a major resource for the superior health enjoyed by Indigenous peoples prior to European contact. Contamination and restricting access to wildlife, fish, vegetation, and water has forced Indigenous peoples further from the natural environments that once sustained community health.[77] Increased marine shipping may adversely impact the ability to access fishing areas and negatively impact SDH.

**Cedar LNG may adversely impact Food Security in the area**

Food security and food sovereignty have also suffered due to the decline of important cultural practices within Indigenous nations. These effects are discussed further in section 6.9 and Part C.

**Shift work and influx of non-resident project workers may impact some SDH:**

Movement and/or influx of non-resident project workers and their families into the local communities may strain health services which are already facing difficulties and resource constraints. The region continues to struggle with poor health outcomes in comparison to the rest of the province and high rates of premature mortality. Shift work of project workers may also result in changes of self-reported health status associated with increased stress and feelings of poorer health as well as premature mortality associated with changes in lifestyle. Project-related shift work may also increase disposable incomes for both local and non-local workers leading to changes in health behaviors, access to more and higher quality food, better housing as well as potential increased incidences of STIs. Project activities may affect

[77] https://www.ccnsa-nccah.ca/docs/determinants/RPT-HealthInequalities-Reading-Wien-EN.pdf

enjoyment and connectedness to the outdoors for land and marine resource users, which may impact mental health and adversely impact Kitimat's community goal of "enhancing sense of place". Women in the area have noted concerns about personal safety, particularly in relation to large influxes of men in the town associated with work camps, impacting their sense of safety and community cohesion[78].

**Population growth may strain educational and childcare infrastructure but promote further education:**

Demand for childcare services may be affected by population growth, both temporary and/or permanent, associated with the Project's workforce. Demand for childcare exceeds current availability and increased demand will further strain the system. This will disproportionately affect women, particularly those that have lower-incomes and rely on or need childcare services. Demand for education infrastructure and services may also increase. Employment requirements from the Project may promote the further pursuit of education and have a positive effect on educational attainment in the region, if the region has the capacity to realize this positive effect.

**Changes in income and influx of non-resident workers may impact local economy and housing availability:**

Employment from the Project may have positive effects on employment rates in the region by:

- Increase in household income as a result of direct, indirect and induced employment that has the potential to alleviate stress and anxiety among the underemployed and improve mental health;
- Potential increased levels of educational attainment through skills training that may improve socio-economic well-being;
- Financial autonomy and independence of some women through employment that may improve social and physical well-being;
- Increased financial revenue for infrastructure and services;
- Increase in monetary income through wage employment contributes to obtaining appropriate housing and adequate food; and
- Employment of community members may contribute to individual and collective benefits, such as self-esteem, confidence and pride and the ability to learn about industry, economics, and politics.

[78] The Wellbeing Experiences of Women in the Haisla Nation and the district of Kitimat (May 2018). Available here: https://haisla.ca/wp-content/uploads/2018/06/With-Logo-FinalKitimatHaislaCVI-ReportMay-24-2018.pdf

Employment from the Project may however intensify income inequalities and lead to both wage and price inflation which may affect cost of living for local residents. Higher incomes may exacerbate already high housing prices while supply remains low, crowding out lower income earners in the area who may have difficulty accessing social housing. In addition, project related non-resident workforce may increase demand for accommodations affecting inventory levels and increasing rent rates.

**Cedar LNG may provide economic opportunities to Haisla and the Kitimat community**

As a Haisla majority-owned and Indigenous-led project, Cedar LNG has the potential to provide direct, indirect, and induced employment not only to Kitimat and regional communities, but to Haisla and other Indigenous group members as well. Haisla have noted that industrial development in the area has occurred on their land for decades, many times at the expense of the environment and without their consent or inclusion. Haisla view Cedar LNG as an opportunity to take ownership of industrial development on their lands and use revenues to support local social, educational, and health programs. Economic and social benefits are the primary positive effect of Cedar LNG.

To enhance positive economic and social effects, Cedar plans to prioritize, promote and increase employment and procurement opportunities for Indigenous and local community members. This also would include hiring underrepresented groups such as: Haisla Nation members, Indigenous persons, and women.

#### *6.8.2.4 Mitigation Measures Proposed in the Application*

Mitigation and enhancement measures for SDH are focused on: reducing adverse effects from population change; enhancing positive effects and reducing adverse effects from employment and income generated from the Project; reducing effects on access to the natural environment; and reducing health effects associated with air quality and noise emissions from Cedar LNG.

***EDUCATION, EMPLOYMENT, HOUSING, HEALTH, AND COMMUNITY SAFETY MITIGATION MEASURES***

- Work with Haisla employment department, local and regional Indigenous employment centers, educational facilities, and communities to increase opportunities for Indigenous and local community members to obtain training to participate in the Project;
- Implement a local hire policy during construction and operation;
- Implement a gender equity and diversity policy that focuses on hiring distinct subpopulations that are identified by gender, indigeneity, and other underrepresented populations;
- Discuss procurement opportunities with local, regional, and Indigenous economic development departments and organizations;
- Prioritize local and regional businesses;

- Development and implementation of an accommodation policy that includes measures to ensure that accommodation for contractor construction personnel residing outside the local assessment area for infrastructure and services (as defined in Section 7.11 of the Application) is exclusively within existing work camps or other temporary accommodations and does not include rental of local housing;
- Use of local workforce accommodation centers for non-resident workers to reduce adverse effects on local accommodation capacity during construction;
- Implement a local hire and procurement policy and promote training opportunities where feasible;
- Provide on-site first aid stations, medical room(s) with beds and certified first-aid staff and dedicated communication devices for requesting outside emergency aid to limit demand on local health services during construction and operation;
- Implement a drug and alcohol policy;
- Implement a code of ethics and respectful workplace policy and provide cultural awareness training for all workers;
- Engage with communities and develop and implement a community feedback tool or process to address community concerns and complaints;
- Offer an Employee and Family Assistance Program to staff that includes counselling services;
- Review relevant Northern Health guidance including guidance on injury prevention and management, communicable disease management and health promotion;
- Maintain a database of local workers and businesses to share information with as the Project advances, including hiring and contracting;
- Host local community information sessions to share details about what kinds of jobs are available and the training required; and
- Prepare and implement health and medical services plan.

During Application Review, Cedar also proposed a Follow-up Program under the IAA for GBA Plus, which is described further below.

#### *BIOPHYSICAL MITIGATION MEASURES*

As described in Section 5.1: Air Quality, Section 5.2: Acoustics and Section 5.12: Human Health.

### 6.8.3 COMMENTS RECEIVED DURING APPLICATION REVIEW

Based on a review of the Application and with feedback from the Working Group, Indigenous nations, and the public, the following issues related to the assessment of Effects to Human and Community Well-Being for Cedar LNG were identified:

- Education;
- Childcare;
- Differential effects to under-represented groups;
- Food insecurity; and,
- Risks to the safety of Indigenous women and girls.

#### *6.8.3.1 Education*

The District of Kitimat noted that employment opportunities may draw prospective students away from pursuing further education. This may have implications for both the community and post-secondary education attainment levels. In response, Cedar stated it would only hire workers that are 19 years or younger if they have completed high school or have an appropriate equivalent. The EAO agrees with Cedar's conclusion that employment from the Project may result in low-level positive effects on educational attainment which in turn may have positive effects on health status. The EAO has proposed that the SEMP (Condition 14) include the requirement that Cedar provide on the job training and apprenticeship to support positive educational and employment outcomes.

#### *6.8.3.2 Childcare*

Parents in the Northern Health region find childcare to be unaffordable and there is a shortage of qualified early childhood educators in the area. These barriers are likely worse for low-income parents and single mothers. Shift work and childcare do not often align, a concern that has been raised by the community before. COVID-19 has also exacerbated these challenges.

Cedar noted that there would be low demand on childcare from potential project workers; however, reviewers noted that this assertion was unsubstantiated. ESDC also noted that Cedar has not proposed mitigations to childcare costs and access which may dissuade families from seeking employment with the Project. Given that Cedar is not able to predict how many workers will relocate with families to the LAA, overburdened childcare facilities may experience further stress as a result of the Project. The EAO notes the potential for knock-on effects on childcare exists should a large portion of the workforce be non-residents that move into the community and bring children with them. The EAO notes that it has proposed a federal Mitigation Measure and a socioeconomic management plan (SEMP) that would include the requirement that Cedar development and implement an accommodation policy that includes measures to ensure that Local accommodation for contractor construction personnel is exclusively within existing work camps or other temporary accommodations and does not include rental of local housing. The EAO is of the view that this would reduce the likelihood of construction contractors bringing children to the community during construction. Given the maximum workforce during operations is 100 FTE, the EAO is of the view that potential effects of the Project on childcare would be low.

#### *6.8.3.3 Differential Effects to Underrepresented Groups*

The District of Kitimat, Gitga'at, Northern Health, Health Canada, Employment and Social

Development Canada and Women, and Gender Equality Canada were of the view that information in the Application on GBA Plus and vulnerable groups was inadequate. It was recommended that greater consideration of GBA Plus be given in the assessment of the employment and economy, infrastructure and services, and human heath VCs and additional details were requested on:

- Potential effects on visible minorities, recent immigrants, youths and persons with disabilities;
- Collections and inclusion of primary data, both quantitative and qualitative, (rather than only secondary data) from vulnerable groups;
- Disaggregation of data to determine effects on Indigenous populations (such as for suicide rates);
- Consideration of the recommendations from the Inquiry on Missing and Murdered Indigenous Women and Girls; and
- Consideration of the effect of wage, equity, employment and inclusion of genders other than male/female.

In response to these concerns, Cedar provided a memo which identified where GBA Plus was considered throughout the Application. In completion of the GBA Plus assessment Cedar noted it undertook the following analysis:

- Considered subpopulations that may be disproportionally affected by Cedar LNG;
- Scoped and identified sensitive subpopulations and identity factors, completed disaggregated data to describe existing conditions for sensitive subpopulations;
- Included qualitative data to describe sensitive subpopulations and barriers and issues for sensitive subpopulations;
- Assessed Cedar LNG residual and cumulative effects on sensitive subpopulations;
- Described disproportionate effects, with consideration of specific mitigation and enhancement measures to address residual adverse and positive effects; and
- Considered follow-up strategies if relevant to sensitive sub-populations.

Cedar stated that the factors selected for GBA Plus analysis and assessment of differential effects to be considered under each effect path were informed through a wide range of data sources, including consultation and engagement, publicly available data sources including government databases, government publications, grey literature, and reports prepared for other EAs of nearby projects. Cedar is of the view that baseline data presented for employment and economy allow for a thorough assessment of potential effects that are appropriate to the size of the Project and the magnitude of potential effects. In addition to the factors Cedar selected for GBA Plus analysis were indicators for employment and economy include sex, Indigeneity, income and education. Cedar determined that, in particular, females and more specifically Indigenous females were identified as comprising vulnerable populations requiring disaggregated assessment. While the potential effects and underrepresentation regarding

visible minorities, recent immigrants, age, other genders and person with disabilities are not included in the Application, Cedar has proposed a suite of mitigation and enhancement measures aimed at increasing the equitable distribution of project benefits across all subpopulations, regardless of gender or identity factor, while reducing the magnitude of adverse effects on these populations.

Based on the concerns raised by the Working Group, the EAO recommends Mitigation Measures under the IAA for GBA Plus. These would include:

- Develop and implement a gender equity and diversity program that focuses on hiring Haisla Nation members, local and Indigenous persons, and women to increase project employment among underrepresented populations and consideration of the baseline labour force participation status of under-represented groups in Kitimat and the region;
- Develop and implement a drug and alcohol policy; and
- Develop and implement workplace violence, harassment, bullying and discrimination processes.

The Mitigation Measures and plan should incorporate community engagement and be developed in consultation with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, Metlakatla, Northern Health, the District of Kitimat and, the Regional District of Kitimat Stikine, and the City of Terrace. The EAO also a Follow-up Program for GBA Plus and a condition requiring Cedar to develop a SEMP that would incorporate policies and training pertaining to workplace code of ethics, cultural sensitivity, drug and alcohol use, respectful workplace, and workplace violence (including gender-based violence) and gender equity and diversity employment measures and practices..

## 6.8.4 CONCLUSIONS

### *6.8.4.1 Proposed Provincial Conditions and Federal Mitigation Measures*

Based on mitigations proposed in the Application, issues raised during Application review, the EAO's effects assessment, and the analysis and information contained in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[79], the EAO proposes the following provincial conditions:

- Community feedback process (Condition 11);
- Health and medical services plan (Condition 13); and
- Socioeconomic management plan (Condition 14).

[79] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

The EAO recommends the following Mitigation Measures under the IAA for Human and Community Well-Being:

- Community feedback process, as described in the proposed federal Mitigation Measures for air quality (section 5.1);
- Measures to promote local hiring, as described in the proposed federal Mitigation Measures for employment and economy (section 5.7);
- A code of ethics and respectful workplace policy and provide cultural awareness training for all workers, as described in the proposed federal Mitigation Measures for infrastructure and services (section 5.10);
- A gender equity and diversity policy that focuses on hiring Haisla Nation members, local and Indigenous persons, and women to increase project employment among underrepresented populations and consideration of the baseline labour force participation status of under-represented groups in Kitimat and the region;
- A drug and alcohol policy;
- Workplace violence, harassment, bullying and discrimination processes that promote a safe and respectful environment and contains gender appropriate and gender- and sexuality- specific policies and processes which promote a safe, respectful and inclusive environment for all employees, including women and sexual minorities, and includes consideration of Indigenous women and girls and Calls to Justice 13.1 to 13.5 addressed to the extractive and development industries within the Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls; and
- Mitigation Measures for employment and economy and human health as described in sections 5.7 and 5.12.

In addition, the EAO also proposes a Follow-up Program under the IAA for GBA Plus, which would include:

- Review any new disaggregated data that become available for Kitimat and the region where workforce would be hired from (such as using Census 2021 data, once available) to support development of the gender equity and diversity policy; and
- Report out on the results of the gender equity and diversity policy including voluntarily provided data on workforce hired by identity factors (such as gender, Indigenous Peoples, LGBTQ2+, (dis)abled people, newcomers/Immigrants etc.) and job type during construction and the first five years of operation.

#### *6.8.4.2 Consideration of Indigenous Knowledge*

The EAO considered Indigenous Knowledge, where available, in the assessment of GHG emissions.

Cedar noted that Indigenous perspectives regarding SDH were considered in the Application, some of which were drawn from the First Nations Health Authority's (FNHA) *First Nations Perspective on Health and Wellness* webpage. The mental, emotional, physical, and spiritual health of Indigenous people have been disproportionally affected over the last few centuries. The FNHA aims to support Indigenous people in British Columbia to: "achieve and enjoy the highest level of health and wellness by offering continuous support and resources on their respective health and wellness journeys, honoring the unique traditions and cultures of each group, and championing Indigenous health and wellness within the FNHA organization and with all of their partners". Each Indigenous community has their own unique and culturally specific practices and perspectives for assessing health and addressing the health of their members.

Indigenous people continue to experience challenges with the Canadian health system and health services today due to the ongoing impacts of colonialism, remoteness factors, jurisdictional barriers and gaps, and non-integration of health systems and health providers. Indigenous concepts of health and well-being include balancing mind, body, spirit, and emotion and living a good life in harmony, reciprocity and relationships with other human beings and the natural world (National Collaborating Centre for Indigenous Health, 2019).

During the EA, Gitga'at and Haisla provided comments on the assessment of human and community well-being. The information provided by Gitga'at is summarized above in section 6.8.3 or discussed in the nation-specific sections in Part C of this Report. In addition, Haisla commented that the income generated by Cedar LNG will be invested in the Haisla community. Haisla has already seen the results when they participate in industrial development and have had many achievements including the construction of a new health center in the community, the construction of apartment complex and townhouses condos and many other community supports. Community supports such as the outreach worker for urban off reserve areas have also been implemented to add to the mental health supports already offered by the Health Centre. Key ways in which the EAO took Indigenous Knowledge into account in the assessment of effects on human and community well-being included:

- Incorporating feedback received into the proposed mitigation measures for GBA Plus.

#### *6.8.4.3 EAO Conclusions on Residual Effects*

Residual effects on human and community well-being within federal jurisdiction, including the health, social or economic conditions of the Indigenous peoples of Canada are discussed in Section 6.9: Requirements of the *Impact Assessment Act*.

Cedar maintains that the number of non-local employees who may require childcare would likely be small and the additional demands they may impose on daycare and preschool infrastructure and services will be correspondingly low. While the EAO concurs with this conclusion, the EAO also notes that lack of demand for childcare from non-local workers could

potentially be a systemic issue, or in other words, prospective workers are dissuaded from applying due to a lack of childcare services in the area. Women in the area have noted that the absence of childcare options has been a significant employment barrier and contributes to work related stress and impacts to mental health. There is also a high degree of uncertainty with regards to the number of families relocating to the LAA because of the Project. A sudden influx of temporary residents may stress an already overloaded childcare system.

Concerns were raised by the Working Group that the Project may not benefit groups that are under-represented in the regional labour force (such as Indigenous people, women, youths and minorities). Positive effects are anticipated to be unevenly distributed, with non-Indigenous males expected to realize a disproportionate share of project employment. Employment provides individuals with economic opportunities which can influence individual and family health however long hours and stressful working environments can also significantly impact physical and mental health through type of work and working conditions. The gender equity and diversity employment plan, proposed as a provincial condition (within the SEMP) and a federal Mitigation Measure may manage these uneven distributions to an extent but do not address the root causes of employment inequity which are beyond the scope of this assessment. Women in particular may be excluded due to factors such as lack of access to childcare, safety risks and fear of the male dominated nature of the workforce.

Income is a significant contributor to health and health inequalities and educational attainment is recognized as a critical SDH. Project-related direct, indirect, and induced employment and local spending is expected to have positive effects in the area which will have positive effects on the income SDH and may lead to access of better food and housing. Increases in disposable income for shift-workers may however impact individual behavior and lead to increased drug and alcohol abuse and/or increased incidences of STI's. Employment requirements from the Project may promote the further pursuit of education and have a positive effect on educational attainment in the region but may also encourage prospective employees to defer post-secondary education.

Rising cost of housing in the area has been a concern to the local population. Cedar notes that there will be a relatively small non-resident workforce, the construction workforce is needed over a short period, and Cedar would use existing worker accommodation centers to reduce impacts to the local housing market.

The Northern Health region struggles with both the highest rates of premature mortality and lowest life expectancy in BC. COVID-19 has exacerbated the fragility of the healthcare system as the health authority only has capacity to serve the current number of residents. Cedar maintains that due to the small number of non-resident workers, the direct level of impact of Cedar LNG on local health services would be low.

The erosion of culture, identity, sense of place, and language can adversely impact mental health and well-being. Access to land is closely intertwined to Indigenous health as it provides

not only physical but emotional and spiritual sustenance, and it is therefore an important component to SDH. The effects of the Project to Indigenous interests are discussed in Part C.

At the same time, Cedar LNG will provide Haisla with an opportunity to take ownership of industrial development on their lands and use revenues to support local social, educational, and health programs. Economic and social benefits are expected to be positive effects of Cedar LNG to both Haisla and the region.

After considering the information provided by Cedar in the Application, the views of the Working Group and the public, the proposed provincial conditions and federal mitigation measures, the EAO concludes that there would be a moderate magnitude of effects on human and community well-being, with effects being both positive and adverse. The EAO is satisfied that adverse effects on these factors would be appropriately mitigated and minimized to the extent possible for the Project.

# 6.9 REQUIREMENTS OF THE IMPACT ASSESSMENT ACT

## 6.9.1 OVERVIEW

This chapter describes and summarizes how the effects to be addressed under the IAA have been considered and assessed by the EAO. Table 47 and Table 48 provide a full list of locations within this Report related to the applicable assessment of effects required under the IAA. A number of these effects are assessed in Part B where they are related to a VC. Other assessment matters that are particular to the IAA that are not specifically addressed elsewhere in the report are assessed in this chapter, including:

- A change to the environment that would occur on federal lands, in a province other than the one where the physical activity or the designated project is being carried out, or outside Canada, as required under Section 2(b) of the IAA;
- Current use of lands and resources for traditional purposes and cultural heritage, as required under Section 2(c);
- Any change occurring in Canada to the health, social or economic conditions of the Indigenous peoples of Canada, as required under Section 2(d);
- The extent to which the designated project contributes to sustainability; and
- The extent to which the project helps or hinders Canada's ability to meet its environmental obligations and commitments in respect of climate change.

Under the IAA, the extent of significance for residual effects within federal jurisdiction must be assessed. This assessment provided below in Table 47 is based on the EAO's assessment of residual effects in Part B and the additional analysis conducted in this section. Section 22 factors for which an extent of significance conclusion is not explicitly required appear in Table 48.

Under the IAA, the assessment must specify the extent to which adverse effects that are direct or incidental are significant. Cedar LNG is not expected to result in any effects that are directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out of the Project (as defined as "direct or incidental effects" in Section 2 of the IAA). As a result, direct or incidental effects are not included in the tables below, nor assigned an extent of significance.

**Table 47: Location in the EAO's Assessment Report of the assessment of effects within Federal Jurisdiction required under the Impact Assessment Act.**

| Federal Requirement | Report Location | Extent of Significance under the IAA |
|---|---|---|
| Effects within Federal Jurisdiction (as defined in Section 2 of the IAA) | | |
| (a) a change to the following components of the environment that are within the legislative authority of Parliament: | | |
| (i) fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act* | Freshwater Fish, Section 5.5<br>Marine Resources, Section 5.6 | Low |
| (ii) aquatic species, as defined in subsection 2(1) of the Species at Risk Act | Freshwater Fish, Section 5.5<br>Marine Resources, Section 5.6 | Low |
| (iii) migratory birds, as defined in subsection 2(1) of the *Migratory Birds Convention Act*, 1994 | Wildlife, Section 5.4 | Low |
| (b) a change to the environment that would occur: | | |
| (i) on federal lands | Requirements of the IAA, Section 6.9 | Low |
| (ii) in a province other than the one where the physical activity or the designated project is being carried out | Greenhouse Gas Emissions, Section 6.4; Requirements of the IAA, Section 6.9 | Negligible |
| (iii) outside Canada | Greenhouse Gas Emissions, Section 6.4; Requirements of the IAA, Section 6.9 | Negligible |
| (c) with respect to the Indigenous peoples of Canada, an impact—occurring in Canada and resulting from any change to the environment—on: | | |
| (i) physical and cultural heritage | Physical heritage – Heritage, Section 5.11<br>Cultural heritage - Requirements of the IAA, Section 6.9 | Low |
| (ii) the current use of lands and resources for traditional purposes | Requirements of the IAA, Section 6.9 | Low |

| Federal Requirement | Report Location | Extent of Significance under the IAA |
|---|---|---|
| (iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance | Physical heritage – Heritage, Section 5.11 | Negligible |
| (d) any change occurring in Canada to the health, social or economic conditions of the Indigenous peoples of Canada | Requirements of the IAA, Section 6.9 | Low |
| (e) any change to a health, social or economic matter that is within the legislative authority of Parliament that is set out in Schedule 3 (effects within federal jurisdiction) | N/A - there are no other health, social or economic matters set out in Schedule 3 to the *Impact Assessment Act* (Components of the Environment and Health, Social or Economic Matters) | N/A |

**Table 48: Location in the EAO's Assessment Report of the assessment of effects required under the Impact Assessment Act (Section 22(1)).**

| Federal Requirement | Report Location |
|---|---|
| 22 (1) The impact assessment of a designated project, whether it is conducted by THE AGENCY or a review panel, must take into account the following factors | |
| (a) the changes to the environment or to health, social or economic conditions and the positive and negative consequences of these changes that are likely to be caused by the carrying out of the designated project, including | |
| (i) the effects of malfunctions or accidents that may occur in connection with the designated project | Malfunctions and Accidents, Section 6.1 |
| (ii) any cumulative effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out | Within each VC Section: Sections 5.1 to 5.12 |
| (iii) the result of any interaction between those effects | Within each VC Section: Sections 5.1 to 5.12 |
| (b) mitigation measures that are technically and economically feasible and that would mitigate any adverse effects of the designated project | Within each VC Section: Sections 5.1 to 5.12 |
| (c) the impact that the designated project may have on any Indigenous group and any adverse impact that the designated project may have on the rights of the Indigenous peoples of Canada recognized and affirmed by Section 35 of the Constitution Act, 1982 | Part C, Sections 7.1 to 7.9 |
| (d) the purpose of and need for the designated project | Part A, Section 2.3.1 |
| (e) alternative means of carrying out the designated project that are technically and economically feasible, including through the use of best available technologies, and the effects of those means | Alternative Means, Section 6.5 |
| (f) any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project | Part A, Section 2.3.2 |
| (g) Indigenous knowledge provided with respect to the designated project | Assessment of VCs: Sections 5.1 to 5.12 of the report<br>Assessment of VCs : Sections 5.1 to 5.12 of the report |
| (h) the extent to which the designated project contributes to sustainability | Requirements of the IAA, Section 6.9 |
| (i) the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change | Requirements of the IAA, Section 6.9 |
| (j) any change to the designated project that may be caused by the environment | Potential Changes to the Project that may be caused by the Environment, Section 6.3 |

| | |
|---|---|
| (k) the requirements of the follow-up program in respect of the designated project | Within each VC Section: Sections 5.1 to 5.12;<br>Part C, Sections 7.1 to 7.9 |
| (l) considerations related to Indigenous cultures raised with respect to the designated project | Part C, Sections 7.1 to 7.9 |
| (m) community knowledge provided with respect to the designated project | Community knowledge regarding potential environmental, health, social and economic effects received from parties (such as Kitimat, Terrace, Regional District of Kitimat-Stikine, non-governmental organizations and Northern Health) is described in the applicable Sections (including Section 5.1 to 5.12 Section 6.1 to 6.9) of this Report. Additional details on public consultation undertaken and comments received are provided in Part A, Section 4.4. Particular areas of community interest included health services, infrastructure, air quality and GHG emissions. |
| (n) comments received from the public | Part A, Section 4.5<br>Comments related to GHGs and Air Quality were also described within Sections 5.1 and 6.4, respectively |
| (o) comments from a jurisdiction that are received in the course of consultations conducted under Section 21 | Comments from Federal authorities, Indigenous nations, and other members of the Working Group are captured in the report within each section. |
| (p) any relevant assessment referred to in Section 92, 93 or 95 | Strategic Assessment of Climate Change and Requirements of the IAA, discussed in Section 6.4: GHGs; no other relevant regional or strategic assessments |
| (q) any assessment of the effects of the designated project that is conducted by or on behalf of an Indigenous governing body and that is provided with respect to the designated project | The final version of Part C will be updated to include Gitxaała, Kitselas, Lax Kw'alaams and Metlakatla's collaborative assessments with the EAO |
| (r) any study or plan that is conducted or prepared by a jurisdiction—or an Indigenous governing body not referred to in paragraph (f) or (g) of | N/A- none additional |

| | |
|---|---|
| the definition jurisdiction in Section 2—that is in respect of a region related to the designated project and that has been provided with respect to the project | |
| (s) the intersection of sex and gender with other identity factors | Within Infrastructure and Services, Section 5.10, Employment and Economy, Section 5.7, Human and Community Well-Being, Section 6.8 |
| (t) any other matter relevant to the impact assessment that the Agency requires to be taken into account | The Agency did not identify any matters relevant to the assessment that are not identified in the final AIR and addressed in the Application. |

### 6.9.2 FEDERAL LANDS

Cedar LNG is located in northwest B.C. on the Douglas Channel in the District of Kitimat and does not occur on federal lands, and there are no direct physical impacts such as vegetation clearing, and grading that would not occur on federal lands.
Indigenous reserve lands are the federal lands in proximity to the Facility Area and the Marine Shipping Route. The VCs with the potential to interact with federal lands are air quality, acoustics (facility operation and shipping), vegetation resources, and freshwater fish. The LAA and RAA of the air quality and acoustics VCs and the RAA for vegetation resources (changes to health and diversity due to air emissions) overlap with federal lands . For the freshwater fish VC, only the RAA for changes in water quality due to nutrient deposition overlaps with federal lands.

Indigenous reserve lands in proximity to the Facility Area may be affected by air emissions, sounds emissions and nutrient deposition. Indigenous reserve lands in proximity to the Marine Shipping Route may be potentially affected by air and sound emissions from LNG carriers and tugboats.

Below are the EAO's conclusions regarding the potential residual effects to federal lands for each VC.

**Table 49: Air Quality Project Residual Effects Extending onto Federal Lands**

| Potential Effect | Project Phase and Component | Residual Effects | Affected Federal Lands |
|---|---|---|---|
| Increases in concentrations of ambient pollutants | Facility – Operations | **Direction and Magnitude:** Adverse and Low<br>**Extent**: Local<br>**Duration:** Long term<br>**Reversibility:** Reversible<br>**Frequency:** Frequent/Regular<br>**Affected Populations:** Disproportionate effects would be more acutely experienced by Haisla Nation members that reside or use reserves in close proximity to the Facility Area, as well as sensitive populations including individuals that are more susceptible to COPC exposure due to physiology (such as newborns, children, pregnant or breastfeeding women and elderly people), health status (such as immune-compromised persons, persons suffering from heart disease, respiratory conditions or allergies), behaviour (such as amount of time spent outdoors), and lifestyle (such as smoking, Body Mass Index ([BMI)] and exercise status). | Kitamaat 2 (Kitamaat Village)<br>Henderson's Ranch 11<br>Walth 3<br>Bees 6<br>Kitamaat 1<br>Jugwees 5<br>Kitasa 7<br>(Facility affected federal lands) |

| | | | |
|---|---|---|---|
| | | **Likelihood**: High likelihood of effects to air quality during operations.<br>**Consequence**: Minor consequence based on the low magnitude extending throughout the LAA.<br>**Risk:** Based on the high likelihood (operations) and minor consequence of residual effects to air quality the EAO determined that there would be a moderate level of risk during construction and operations and low during decommissioning.<br>**Uncertainty:** Moderate | |
| | Shipping – Operations | **Direction and Magnitude:** Adverse and Low<br>**Extent:** Regional<br>**Duration:** Long Term<br>**Reversibility:** Reversible<br>**Frequency:** Frequent/Regular<br>**Affected Population:** Disproportionate (effects experienced more acutely by Indigenous nation members that reside or use reserves in close proximity to the Marine Shipping Route).<br>**Likelihood:** High likelihood of effects to air quality during operations.<br>**Consequence:** Minor consequence based on the low magnitude extending throughout the marine shipping LAA.<br>**Risk:** Based on the high likelihood and minor consequence of residual effects to air quality the EAO determined that there would be a low level of risk.<br>**Uncertainty:** High | Kitamaat 2 (Kitamaat Village)<br>Henderson's Ranch 11<br>Walth 3<br>Bees 6<br>Kitamaat 1<br>Jugwees 5<br>Kitasa 7<br>Kuaste 8<br>Tosehka 12<br>Kitkahta 1<br>Gill Island 2<br>Quaal 3 and 3a<br>Kulkayu 4 and 4a (Hartley Bay)<br>Gribble Island 10<br>Turtle Point 12<br>Lachkul-Jeets 6<br>Kunhunoan 13<br>Kitsemenlagan 19 and 19a<br>Tsimlairen 15<br>Clowel 13<br>Citeyats 9<br>Kooryet 12<br>Keecha 11<br>Kitlawaoo 10<br>Dolphin Island 1<br>Keswar 16<br>Keyarka 17<br>Avery Island 92<br>Squaderee 91<br>Rushton Island 90<br>(Marine Shipping Route affected federal lands) |

**Table 50: Acoustic Project Residual Effects Extending onto Federal Lands**

| Potential Effect | Project Phase and Component | Residual effects | Affected Federal Lands |
|---|---|---|---|
| Increased noise levels causing nuisance, annoyance, and sleep disturbance to people, as well as displacement and sensory disturbance to wildlife. | Facility – Construction and Operations | **Direction and Magnitude:** Low<br>**Extent**: Local/Regional<br>**Duration:** Long-term<br>**Reversibility:** Reversible<br>**Frequency:** Regular frequency. The pass by event of a LNG carrier will occur approximately once every 3 days. This disturbance could be a potential contributor of noise experienced by a person at a single location for several minutes.<br>**Affected Populations:** Disproportionate (the potential effect will be disproportionately experienced by Haisla Nation members that reside or use reserves in close proximity to the Facility Area).<br>**Likelihood:** High likelihood of acoustic effects during construction and operations.<br>**Consequence:** Moderate consequence based on the low magnitude extending throughout the RAA.<br>**Risk**: Based on the high likelihood and moderate consequence of residual effects to the acoustic environment, it was determined that there would be a moderate level of risk.<br>**Uncertainty:** Moderate | Facility affected federal lands - see Table 49 |
| | Shipping – Operations | **Direction and Magnitude:** Low<br>**Extent:** Local/Regional<br>**Duration:** Long-term<br>**Reversibility:** Reversible<br>**Frequency:** Regular<br>**Affected Population:** Disproportionate (the potential effect will disproportionately be experienced by Indigenous nation members that reside in reserve lands or undertake traditional activities along the Marine Shipping Route.)<br>**Likelihood**: High likelihood of acoustic effects during construction and operations.<br>**Consequence:** Moderate consequence based on the low magnitude extending throughout the RAA.<br>**Risk:** Based on the high likelihood and moderate consequence of residual effects to acoustic it was determined that there would be a moderate level of risk.<br>**Uncertainty:** Moderate | Marine Shipping Route federal lands - see Table 49 |

**Table 51: Vegetation Resources Project Residual Effects Extending onto Federal Lands**

| Potential Effect | Project Phase and Component | Residual effects | Affected Federal Lands |
|---|---|---|---|
| Change in native vegetation health and diversity due to air emissions | Facility – Operations | **Direction and Magnitude:** Adverse and Low<br>**Extent:** Local<br>**Duration:** Permanent<br>**Reversibility:** Partially reversible<br>**Frequency:** Continuous<br>**Likelihood:** Medium to high<br>**Consequence:** Although measurable changes in plants and ecological communities of interest, wetland functions and native vegetation health and diversity due to air emissions are predicted from existing conditions, the regional extent of these parameters is sufficient to sustain the affected species and communities without active management. Therefore, the consequence is considered minor.<br>**Risk:** Based on the medium to high likelihood and minor consequence of residual effects on vegetation resources, the risk level would be low.<br>**Uncertainty:** Low | Facility affected federal lands - see Table 49 |

**Table 52: Freshwater Fish Project Residual Effects Extending onto Federal Lands**

| Potential Effect | Project Phase and Component | Residual effects | Affected Federal Lands |
|---|---|---|---|
| Change in surface water quality | Facility – Operations | **Direction and Magnitude:** Adverse and low<br>**Extent:** Local<br>**Duration:** Medium term<br>**Reversibility:** Reversible<br>**Frequency:** Infrequent<br>**Likelihood:** Low likelihood of water quality effects based on the prevailing wind directions and locations of reserve lands.<br>**Consequence:** Moderate consequence.<br>**Risk:** Based on the Low likelihood and moderate consequence of residual effects to freshwater fish habitat and health it was determined that there would be a low level of risk.<br>**Uncertainty:** Low | Facility affected federal lands - see Table 49 |

With the implementation of the proposed mitigation measures, the EAO concludes that the Project is not expected to have significant adverse effects to air quality, acoustics, vegetation

resources and freshwater fish. The EAO is, therefore, of the view that these effects on federal lands have been adequately mitigated and the extent of significance is low.

### 6.9.3 OTHER PROVINCES

The Cedar LNG site is approximately 560 km due west of the B.C.-Alberta border. This distance is beyond the range where effects of Cedar LNG would be expected to extend, with the exception of GHGs. An analysis of the effects of GHG emissions from Cedar LNG is provided in Section 6.4: Greenhouse Gas Emissions. In addition, section 6.4, justifies how, based on the analysis of the key considerations outlined in the Strategic Assessment of Climate Change, in addition to the advice provided by the Agency and ECCC in their GHG Analysis[80], the EAO concluded that Cedar LNG was not likely to cause significant adverse effects from GHG emissions. As a result, the EAO predicts the extent of significance of Cedar LNG on a change to the environment in other provinces is negligible.

### 6.9.4 OUTSIDE CANADA

The Canada-USA boarder is approximately 150 km north of Kitimat. Potential effects are not predicted to extend outside of Canada, with the exception of the effects from GHG emissions. An analysis of the effects of GHG emissions from Cedar LNG is provided in Section 6.4: Greenhouse Gas Emissions. As described in Section 6.4, based on the analysis of the key considerations outlined in the Strategic Assessment of Climate Change, in addition to the advice provided by the Agency and ECCC in their GHG Analysis, the EAO concluded that Cedar LNG was not likely to cause significant adverse effects from GHG emissions. With respect to global GHG emissions, Cedar stated the assumption that Cedar LNG would support global decarbonization through displacement of higher emitting fuel sources (e.g., coal) and shorter shipping distances than competitors to Asia-Pacific markets, as the global demand increases. Cedar stated that these factors would make Cedar LNG one of the lowest carbon-intensity LNG facilities worldwide. As a result, the EAO predicts the extent of significance of Cedar LNG to the environment outside of Canada is negligible.

### 6.9.5 INDIGENOUS PEOPLES' PHYSICAL AND CULTURAL HERITAGE AND CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

***CHANGES TO CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES - IAA***

[80] Available on EPIC here: https://www.projects.eao.gov.bc.ca/api/public/document/631b8d7117bc0a0022a18053/download/ECCC_Cedar%20LNG_GHGs_2Sept2022.pdf

***2(C)(II)***

This section assesses the potential effects of Cedar LNG on current use of lands and resources by Indigenous people for traditional purposes. In the assessment of current use, the EAO considered the effects of Cedar LNG on aspects that support the practice of traditional activities in the preferred locations and ways of Indigenous peoples: access, resource quantity and quality, and the sensory environment (for example: noise, ambient light and visual quality). Traditional activities considered include fishing and marine harvesting, hunting, trapping and plant gathering. Effects on Indigenous Interests are assessed for each individual Indigenous group in Part C of this Report.

#### *6.9.5.1 Fishing and Marine Harvesting*

Maintaining traditional practices of fishing and marine harvesting by Indigenous people is dependent on access to waters and shorelines where there are marine resources remaining in sufficient numbers and that are safe for human consumption. The sensory environment can also negatively change the quality of the fishing and marine harvesting experience, and increase perceived safety risks.

*Access to Waters and Resources for Traditional Fishing and Marine Harvesting*

The marine area that would be developed for the marine terminal is located near Kitimat, B.C. on the Kitimat Arm of the Douglas Channel. During construction, operations and decommissioning, the marine infrastructure and associated activities would impede access in the safety zone, which has been proposed to encompass a 500-m buffer around the marine terminal.

LNG carriers during operations and Cedar-based marine traffic during construction and decommissioning along the Marine Shipping Route from the marine terminal to the Triple Island Pilot Boarding Station has the potential to result in interference with marine navigation. Cedar has projected a total of 50 LNG vessels arriving at the marine terminal annually, which would result in approximately two vessels transiting the Marine Shipping Route (to and from the Project) weekly. The effects from the presence of vessels have the potential to reduce access to fishing and shoreline harvesting and the resulting vessel's wake and wash could result in limitations or alteration of access to location, opportunities or preferred harvesting methods. Cedar estimated that a transiting LNG carrier would be present in the vicinity of a single fisher or marine user for 30 minutes; however, should it be assumed that a full day of fishing or harvesting was lost (because users opted to stay home on transiting days), this would occur approximately two days per week.

Proposed EAC conditions and recommended federal Mitigation Measures, as proposed in Section 5.9: Marine Use, relevant to effects on access to waters and resources for traditional fishing and marine harvesting include:

- Community feedback process to receive, address, and report on community concerns from the Project (provincial Condition 11 and a federal Mitigation Measure);
- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation Measure);
- Establish a safety zone around the marine terminal during operation using signage (federal Mitigation Measure); and
- Marine Use Follow-Up Program (federal Mitigation Measure).

See Section 5.9 for a complete list of key measures and further details. The EAO notes that communication procedures are not mitigation for effects on Indigenous users as a result of having to adjust their activities because of LNG vessel traffic and concerns for their safety.

Magnitude for a change in navigation for small vessels is considered low during all phases and would continuously affect marine navigation and marine use with up to two weekly LNG carrier vessel transits (one vessel arriving and one vessel departing) during operations (see Section 5.9 of this Report on marine use).

The EAO expects Indigenous nations would be able to maintain the ability to navigate in the waters surrounding the marine terminal and along the shipping routes to access fishing and marine harvesting sites; however, interactions with an LNG carrier will result in Indigenous marine users experiencing a loss of marine harvesting time (delays in travelling to or from harvesting sites) and a reduced quality of experience as a result.

*Quality and Quantity of Resources for Traditional Fishing and Marine Harvesting*

With respect to fish and marine mammals (primarily seals and sea lions) harvested by Indigenous nations, the marine terminal during construction (such as underwater noise) and vessel traffic along the Marine Shipping Route during operation could result in changes to water quality, behaviour of marine organisms, and increase in risks of injury or mortality to marine organisms, thereby reducing their quality and quantity. In addition, a potential malfunction or accident could result in negative effects to the quality and/or quantity of freshwater and marine resources.

EAC conditions and federal Mitigation Measures, as proposed in Section 5.6: Marine Resources, would avoid or reduce effects on quantity and quality of resources for traditional fishing and marine harvesting. Key measures include:

- Use erosion and sediment control best practices to manage surface water and avoid sedimentation of nearshore marine area during construction;
- Stormwater runoff water quality will meet total suspended solids (TSS) levels within guidelines established within the Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993) and these discharges will not cause the receiving environment to exceed B.C. Water Quality ;

- Mitigation measures for under water noise if a small craft jetty is built; and
- A Follow-up Program for marine resources.

See section 5.6 for further details on key measures for marine resources and section 6.1 for mitigation measures for malfunctions and accidents.

With respect to fish and fish habitat, the EAO concludes that Cedar LNG-related effects would be of moderate magnitude, local in extent, long-term in duration for marine and medium-term for freshwater, and would be irreversible for fish in the marine environment following completion of construction and reversible for fish in the freshwater environment. Effects were not predicted to fish bearing streams and the Project is not predicted to result in harmful alteration, disruption, or destruction (HADD) of fish habitat in the marine environment (see Section 5.6 of this Report on marine resources and Section 5.5 on freshwater fish).

With respect to marine mammals, the EAO concludes that Cedar LNG-related effects to marine mammals (through noise and vessel strike pathways) would be of moderate magnitude, local in extent, long term in duration and partially reversible (see Section 5.6 of this Report on marine resources).

With respect to marine food quality, the EAO concludes that Cedar LNG would not have a measurable impact on chemical concentrations in country foods as this was not an operable pathway for transmission and therefore did not require further assessment (see Section 5.12 of this Report on human health).

Any loss in harvesting would have a disproportionate effect on Indigenous people who heavily rely on marine resources for consumption and other purposes including spiritual and economic.

The EAO expects that while minor effects to the quality and quantity marine resources (fish and marine mammals) may result due to Cedar LNG, changes in the quality or quantity of marine resources would not limit Indigenous people in their harvesting practices in the marine terminal area and Marine Shipping Route but may have a disproportionate effect on Indigenous people who rely on marine resources.

*Sensory Environment for Fishing and Marine Harvesting Experiences*

Within the marine terminal area, changes in noise would be from construction and operation of the FLNG facility, transmission line and marine terminal, as well as the visiting LNG vessels. The change in noise would be most substantially experienced by Kitamaat Village due to its location directly across Douglas Channel; however, noise is expected to meet both OGC guidelines and Health Canada guidance. The effects to air quality from the marine terminal area would be experienced within 100 m to 1 km of the FLNG facility, depending on the parameter and direction. This would have a very small contribution to the cumulative sulfur dioxide concentrations that extend approximately 15 km south and 20 km north of the nearby Rio Tinto aluminum smelter (which is the primary source of these emissions). Based on these effects,

Cedar LNG would not result in a significant alteration to Indigenous harvesting experience in both the marine terminal area and Marine Shipping Route due to changes in air quality and noise.

For marine shipping effects, air quality effects would occur in the Marine Shipping Route (up to 1.5 km on either side of the ship) during operations, are well below applicable air quality objectives, and would only be present when an LNG vessel was in the area. Noise effects are predicted to dissipate to levels below background within approximately 1.6 km of the LNG vessel and would only be present when an LNG vessel was in the area. Approximately one vessel is estimated to be in transit (going both to/from) the marine terminal every 7 to 10 days.

EAC conditions and federal Mitigation Measures, as proposed in Section 5.1: Air Quality, Section 5.2: Acoustics, and Section 5.9: Marine Use would avoid or reduce effects on the sensory environment. Key measures include:

- Community feedback process to receive, address, and report on community concerns from the Project, including related to air quality and acoustics (provincial Condition 11 and a federal Mitigation Measure);
- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation Measure); and
- Marine Use Follow-Up Program (federal Mitigation Measure).

See Sections 5.1, 5.2 and 5.9 for a complete list and description of mitigation measures.

Cedar LNG-related acoustic effects around the Facility Area and Marine Shipping Route would be of low magnitude, local and regional in extent, long term in duration and reversible. With mitigation, it is anticipated that there will be a negligible to minor effect to fishing and marine harvesting experiences (see Section 5.2 of this Report on acoustics and Part C) with Indigenous people living and using the area along the Marine Shipping Route being disproportionately affected.

The Cedar LNG-related effects due to air quality around the Facility Area and Marine Shipping Route would be of low magnitude, local in extent, long-term in duration and reversible. With mitigation, it is anticipated that there will be a negligible to minor effect to fishing and marine harvesting experiences (see Section 5.1 of this Report on air quality and Part C) with Indigenous people living and using the area along the Marine Shipping Route being disproportionately affected. The increase in marine vessel traffic within the Marine Shipping Route may result in a loss or alteration of preferred harvesting methods, locations or opportunities; an altered harvesting experience from an increase in vessel traffic, wake waves, and sensory disturbances; and may lead to an alteration of subsistence-based livelihoods and food security with a possible decrease in traditional food supply for Indigenous people. Indigenous users would be able to continue to practice their activities in an increasingly industrial landscape.

#### 6.9.5.2 Traditional Hunting, Trapping and Traditional Use Plant Gathering

*Access to Lands and Resources for Traditional Hunting, Trapping and Traditional Use Plant Gathering*

Cedar LNG is comprised of the Facility Area (approximately 88 ha) and the transmission line right-of-way (approximately 32.5 ha). Because the Facility Area is located on fee simple land that is already privately owned, there would be no change in access with the Project. Minor changes in access could result because of the development of the transmission line and the increase in population associated with the Project, and therefore an increase in people using the land.

The following EAC condition and federal Mitigation Measure, as proposed in Section 5.8: Land and Resource Use would avoid or reduce effects on access to lands and resources:

- Develop and implement a program to restrict non-local contractor workforce personnel from engaging in recreational hunting, fishing or ATV or snowmobile use during off time hours.

The EAO considers the likelihood of residual effects to access to lands and resources to be minor with the implementation of mitigation measures.

*Quantity and Quality of Resources for Traditional Hunting, Trapping and Traditional Use Plant Gathering*

Cedar LNG would result in the change to habitat for terrestrial wildlife and vegetation through direct removal or alteration of vegetation due to site preparation, clearing and construction of land-based infrastructure. Indirect effects (such as noise) during these activities (construction phase) are expected to cause wildlife to avoid or have reduced use to otherwise suitable habitat near the Project.

Cedar LNG would also result in alteration or impediment of wildlife movement from physical barriers, sensory disturbance or vegetation removal associated with both construction and operation, including construction activities and permanent Project components. The mortality risk to the wildlife species would be due to physical destruction of habitat features (nests, dens, etc.), lighting, linear features leading to increased human/predator access, vehicle-wildlife collisions and wildlife-human conflict.

EAC conditions and federal Mitigation Measures, as proposed in Part B of this Report, Section 5.3: Vegetation Resources, Section 5.4: Wildlife, would address potential effects on quantity and quality of resources for traditional hunting, trapping and traditional use plant gathering. Key mitigations measures include:

- CEMP (Condition 9) including measures for wildlife and vegetation monitoring, reporting and mitigation;

- Erosion and sediment control best practices to manage surface water and avoid sedimentation in sensitive vegetation communities;
- Reducing wetland impacts in final project design; and
- Follow-up Programs for wildlife and wetlands.

See Sections 5.3 and 5.4 for a complete list of key mitigation measures.

Cedar LNG may affect Indigenous nations' ability to harvest wildlife and traditional use plants through changes to harvested abundance, availability, and population diversity. The EAO concludes that Cedar LNG-related effects to terrestrial wildlife around the Facility Area would be of low to moderate magnitude, local and regional in extent, long-term to permanent in duration and partially reversible to irreversible (see Section 5.4 of this Report on wildlife). For terrestrial hunting and trapping and traditional use plant gathering it would be of a low to moderate magnitude, local in extent, long-term to permanent in duration and reversible upon decommissioning and minor impacts (see Section 5.8 of this Report on land and resource use and Part C). The EAO concludes that Project-related effects to terrestrial plants around the Facility Area would be of low magnitude, local in extent, permanent in duration and partially reversible. With mitigation, it is anticipated that there will be minor impacts on traditional plant gathering (see Section 5.3 of this Report on vegetation resources and Part C). The EAO considers the likelihood of residual effects to the quantity and quality of resources for hunting, trapping and plant gathering to be minor with the implementation of mitigation measures.

*Sensory Environment for Traditional Hunting, Trapping and Traditional Use Plant Gathering*

Cedar LNG may alter harvesting visual and acoustic quality experience while out hunting, trapping and gathering. This change to the sensory environment would be from the increase in Cedar LNG-related traffic, presence of the FLNG facility and noise from construction and operation of the FLNG facility.

EAC conditions and federal Mitigation Measures, as proposed in Section 5.1: Air Quality and Section 5.2: Acoustics would avoid or reduce effects on the sensory environment. Key measures include:

- Community feedback process to receive, address, and report on community concerns from the Project (provincial Condition 11 and a federal Mitigation Measure);
- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation measure); and
- Air quality and acoustics Follow-up Programs.

See Sections 5.1, 5.2 and 5.9 for a complete list and description of mitigation measures.

The EAO concludes that Cedar LNG-related acoustic effects around the Facility Area would be of low magnitude, local and regional in extent, long term in duration and reversible. With

mitigation, it is anticipated that there will be a minor impact to traditional hunting, trapping and traditional use plant gathering experience (see Section 5.2 of this Report on acoustics).

The Cedar LNG-related effects due to air quality around the Facility Area would be of low magnitude, local in extent, long-term in duration and reversible. With mitigation, it is anticipated that there will be a minor impact on traditional hunting, trapping and traditional use plant gathering experience (see Section 5.1 of this Report on air quality and Part C).

The EAO has identified that Cedar LNG would alter visual and acoustic quality while hunting, trapping and traditional use plant gathering to a more industrial landscape, and that noise and light levels would increase from the Project. Although this change to the sensory environment would contribute to the degraded the experience of Indigenous users in the vicinity of Cedar LNG, Indigenous users would be able to continue to practice their activities in the modified landscape.

The direct and indirect alteration and loss of wildlife habitat and vegetation in the Project Area and Marine Terminal Area may result in a loss or alteration of preferred harvesting methods, locations or opportunities; an altered harvesting experience from sensory disturbances; and may lead to an alteration of subsistence-based livelihoods and food security with a possible decrease in traditional food supply for Indigenous people.

#### *6.9.5.3 Cumulative Effects*

Development within the Kitimat area over the past century has incrementally alienated Indigenous nations from the use of lands and resources for traditional purposes and has placed additional pressure on the remaining undeveloped areas for traditional uses. Construction and operation of reasonably foreseeable projects could result in the reduction of additional lands and marine areas available for harvesting.

The EAO has determined that the impacts of existing and reasonably foreseeable projects and activities will overlap cumulatively with Cedar LNG on marine navigation and marine harvesting and interfere with access to sites and activities. The EAO understands that Indigenous nations' ability for use and enjoyment of land for the current use of land and resources for traditional purposes has decreased over time. Cedar LNG's cumulative increase in marine traffic would likely increase the frequency of residual adverse effects to marine navigation and marine harvesting.

#### *6.9.5.4 EAO's Overall Conclusion on Current Use of Land And Resources for Traditional Purposes*

In determining conclusions on Cedar LNG impacts to Indigenous peoples on current use of land and resources for traditional purposes, the EAO considers the collective impact from the identified residual effects on the current use of lands and resources for traditional purposes on Indigenous nations, specifically in the context of the historic and cultural importance of the Project area to Indigenous peoples.

In consideration that there would be minor access restrictions in the Transmission Line Corridor and negative effects to Indigenous nations from vessels along the Marine Shipping Route, and that over the past century Indigenous nations have experienced an incremental decline in access to the use of land and resources for traditional purposes in the marine terminal RAA and marine shipping RAA, the EAO concludes that with the implementation of mitigation measures there will be a minor impact to Indigenous members on current use of land and resources for traditional purposes.

***CHANGES CULTURAL HERITAGE – IAA 2(C)(I)***

The Heritage LAA and RAA are located exclusively within Haisla Nation traditional territory. The Application noted that construction activities within the Heritage LAA attributable to the Project may prevent or reduce Haisla Nation access to heritage sites located within the Heritage LAA and RAA, with the potential to result in loss or alteration of use or access to sacred and cultural sites, loss or alteration of ability to share traditional knowledge at cultural sites and reduced quality of experience for Haisla Nation.

Indigenous nations currently have access to various sites that are used for spiritual and cultural activities along the Marine Shipping Route, which have the potential to experience effects from the Project. These sites continue to be accessed by both land and water by different Indigenous nations.
Part C of this Report includes further discussion of physical and cultural heritage for Lax Kw'alaams, Metlakatla, Gitxaała, Kitselas, Kitsumkalum, Gitga'at, Haisla, Haida and Metis Nation British Columbia.

***Disrupted or Restricted Access***

The Facility Area would occupy approximately 88 ha of land and submerged land, restricting access to lands and resources, and the transmission line corridor would occupy 32.5 ha of land. However, the Facility Area is located on Haisla-owned fee simple land, portions of the transmission corridor will be on fee simple land owned by Haisla and others, and the portion of the transmission line corridor on Crown land could still be accessed by land users following construction. The marine portion of the Facility Area, and Marine Shipping Route, would also overlap areas used by small vessels, which could potentially disrupt Indigenous peoples' access to cultural heritage sites. Wakes from marine shipping could also result in the loss or alteration of the use or access to cultural heritage sites.

Federal Mitigation Measures and EAC conditions, as proposed in Part B of this Report, would address the disruptions or restrictions to access:

- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation measure), as described below in Section regarding marine use.

The EAO has identified that Cedar LNG would disrupt or restrict access to sites of cultural and spiritual significance via land and disrupt access to sites via the water with approximately two vessel transits a week along the Marine Shipping Route. . Disproportionate effects may be experienced by Indigenous people harvesting or using the terrestrial or marine environment. Based on the access to the Facility Area and the frequency of vessels in transit, access is considered to be low magnitude, local to regional in extent, long-term in duration, reversible and regular. Indigenous people using the areas in close proximity to the facility and along the Marine Shipping Route will disproportionately experience these effects.

***Sensory Disturbance***

Sensory disturbance, such as impacts to the visual and acoustic environment, could impact Indigenous peoples' cultural and spiritual experience of the area. Specifically, the Project may alter the use and integrity of sacred and culturally important landscape features due to both the FLNG Facility and LNG vessels along the Marine Shipping Route. LNG carriers during operations and Cedar LNG-based marine traffic during construction and decommissioning along the Marine Shipping Route, will temporarily affect the visual quality in the area. These effects to the visual environment could impact Indigenous peoples' experience of the area.

Furthermore, the Application found that sound levels are expected to increase, and would occur in an area extending 3 km out from the FLNG Facility, extending also to Kitamaat Village. During construction and operations, noise levels are expected to be above the existing sound level and will be perceptible in Kitamaat Village. Despite the increase in noise levels, they are not expected to exceed Health Canada's recommended daytime and nighttime thresholds. Based on the frequency of vessels in transit, the noise effects from LNG vessels are considered to be low magnitude, local to regional in extent, long-term in duration, reversible and regular. Indigenous people living and using the areas in closer proximity to the facility and along the Marine Shipping Route will disproportionately experience these effects.

The conditions and mitigation measures proposed to address the sensory environment include the following:

- Marine Transportation Communication Report (Condition 12) and marine transportation plan (federal Mitigation Measure), which will include communicating project activities that may affect Indigenous fishers, a shipping schedule notification process and grievance process for Indigenous marine users who have lost fishing gear; and
- Design lighting for the Project consistent with the OGC Light Control Best Practices Guideline.

***Cumulative Effects***

The EAO also recognizes the regional significance of Cedar LNG. Given the historical losses of access and resources in the region, cumulative effects on Indigenous cultural heritage are anticipated with past, present or reasonably foreseeable projects.

***EAO's Conclusions***

Cedar LNG could result in Indigenous nations experiencing disrupted and restricted access, degraded visual quality and increased Project-related noise during construction and operations and LNG vessels during operations could impact Indigenous peoples' cultural experience.

### 6.9.6 HEALTH, SOCIAL OR ECONOMIC CONDITIONS OF THE INDIGENOUS PEOPLES OF CANADA

The IAA requires that effects within federal jurisdiction be considered. These include the following effects:

- 2(d) any change occurring in Canada to the health, social or economic conditions of the Indigenous peoples of Canada.

In relation to this effect, Cedar identified the following potential health and socio-economic components:

- Culture and identity;
- Early childhood education;
- Education;
- Employment and working conditions;
- Food security;
- Gender;
- Health care services;
- Income;
- Housing;
- Social inclusion and connectedness;
- Community safety and crime;
- Access to public lands for recreational and traditional uses;
- Noise;
- Air quality;
- Quality of country foods;
- Health status;
- Personal health practices; and
- Mental health.

Indigenous nations identified the following additional health and socio-economic components:

- Safety and security of Indigenous women, girls and gender-diverse people;
- Access to sacred and culturally important sites, including for harvesting; and
- Ability to participate in traditional use activities and cultural practices to sustain traditional harvesting practices, culture, and cultural identity.

Following consideration of the potential effects, the EAO focused its assessment on effects on health and socio-economic conditions on Indigenous peoples by the Project on the following VCs and factors:

- Air quality, including increase in CACs leading to health effects;
- Acoustic, including increase in noise levels;
- Marine use, including access to public lands for recreational and traditional uses;
- Land and resource use, including access to public lands for recreational and traditional uses;
- Employment and economy, including income, cost of living and education;
- Infrastructure and services, including housing, health and social services, crime and community safety; and
- Human and community well-being.

#### *6.9.6.1 Air Quality (Health)*

Cedar LNG has the potential to impact human health of Indigenous peoples from impacts to air quality. Further details on the health effects from air quality are assessed in Section 5.12 of this Report.

EAC conditions and federal Mitigation Measures, as proposed in Section 5.1: Air Quality, would mitigate the effects of air quality on Indigenous people. Key measures include:

- Construction Environmental Management Plan, including air quality management (provincial Condition 9);
- Community feedback process to receive, address, and report on community concerns from the Project, including related to air quality (provincial Condition 11 and a federal Mitigation Measure);
- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation measure), as described below in Section regarding marine use; and
- Air quality Follow-up Program.

See Section 5.1 for a complete list of key mitigation measures.

Residual human health effects as a result of CACs were not identified within the Facility Area with only small increases for CACs predicted. With respect to human health effects from air

quality along the Marine Shipping Route, the magnitude for adverse health effects related to an increase in CACs is considered to be low, based on the increase over baseline levels. The extent of effects would be limited to the Marine Shipping Route and would occur over the operation phase of the Project (see Section 5.12 of this Report for human health).

#### *6.9.6.2 Acoustic (Health)*

The Application found that sound levels are expected to increase and would occur in Kitamaat Village, people living within 3 km of the shipping route and Indigenous land users engaged in traditional use practices. During construction and operations noise levels are expected to be above existing sound levels but would remain less than the applicable Health Canada guidelines for Project-related noise. Noise levels along the Marine Shipping Route will be below these Health Canada guidelines for sleep disturbance.

EAC conditions and Mitigation Measures, as proposed in Section 5.2: Acoustics, would mitigate the effects of acoustics on Indigenous people. Key measures include:

- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation measure), as described below in Section 6.9.6.3 regarding marine use;
- Community feedback process, as described above; and
- Advance notification to residences (within 3 km of activities) of planned high-disturbance noise-causing activities at the Facility Area (federal Mitigation Measure).

See Section 5.2 for a complete list of key mitigation measures.

Residual effects as a result of noise were identified within the Facility Area and Marine Shipping Route. With respect to effects from noise from the Facility Area and along the Marine Shipping Route, the magnitude for adverse effects is considered to be low. The extent of effects would be local and regional, with these effects occurring during all phases for the Facility Area and only during operations for the Marine Shipping Route. Acoustic effects could disproportionately affect Indigenous peoples as Indigenous communities are close to the Facility Area and Marine Shipping Route.

#### *6.9.6.3 Marine Use (Social and Economic)*

Cedar LNG will increase the number of vessels transiting the Marine Shipping Route by approximately 2 vessel transits per week. This increase in vessels has the potential to result in loss or alteration of preferred harvesting methods, locations, access and time. In addition, an economic effect may be felt from the potential reduction in the ability to trade as a result of these effects. Wake effects could have potential impacts on marine fisheries and harvesting activities.

EAC conditions and federal Mitigation Measures, as proposed in Section 5.9: Marine Use, would mitigate the marine use effects on Indigenous people:

- Community feedback process to receive, address, and report on community concerns from the Project (provincial Condition 11 and a federal Mitigation Measure);
- Marine transportation communication report (provincial Condition 12) and marine transportation plan (federal Mitigation Measure); and
- A Follow-up Program on marine use (focused on wake effects).

Residual effects on marine use were identified for both marine navigation and marine fisheries. However, the residual effects to navigation were considered low based on the infrequent vessel movement. Indigenous people could experience disproportionate effects to access to fishing, marine use and shoreline harvesting using the area along the Marine Shipping Route.

#### *6.9.6.4 Land and Resource Use (Social and Economic)*

The Application noted that land and resource use in relation to Indigenous people has the potential to result in disturbance and nuisance effects (such as noise or visual/light), reduction in wildlife harvesting from both disturbance (such as noise or visual/light) and resource use/activities (such as guiding/hunting and trapping).

EAC conditions and federal Mitigation Measures, as proposed in Section 5.8: Land and Resource Use would mitigate land and resource effects on Indigenous people:

- Development of a CEMP, which will include air quality management (provincial Condition 9);
- Community feedback process to receive, address, and report on community concerns from the Project (provincial Condition 11 and a federal Mitigation Measure);
- Develop and implement a program to restrict non-local contractor workforce personnel from engaging in recreational hunting, fishing or ATV or snowmobile use during off time hours in the Land and Resource Use local assessment area (within provincial Condition 14).

Residual effects as a result of land and resource use were identified for private property, tenured land and resource use, and non-tenured land and resource use. However, these residual effects were considered low with respect to changes to properties and land uses based on the Project size and location, while residual effects were considered moderate for those resulting from a visual and lighting perspective.

#### *6.9.6.5 Employment and Economy (Economic)*

The economy related to the Indigenous people includes local employment, training and education opportunities and financial support, as well as access to, and security of, the traditional food and resources (marine and terrestrial). For some Indigenous people, the economic industry combines harvesting, sharing and trading traditional food and medicines and wage-based employment such as marine, service, industrial and ecotourism services.

The Application stated that, despite the mitigation measures that have been proposed, there will likely remain a disproportionate effect with a higher level of both males and non-Indigenous peoples employed as a result of the Project compared to females and Indigenous peoples.

EAC conditions and IAA Mitigation Measures, as proposed in Section 5.7: Employment and Economy and Section 6.8: Human and Community Well-Being, would also mitigate the employment and economy effects on Indigenous people. Key measures include:

- Socioeconomic management plan (provincial Condition 14) which will require hiring and training measures that prioritize local hiring and procurement as well as provision of on-the-job training and apprenticeships;
- Inform local residents and Indigenous nations of job and procurement opportunities during all project phases;
- Identify potential shortages of workers with specific skill requirements and training, and work with the Haisla employment department, local and regional Indigenous employment centers, local and regional training and education facilities, and communities to increase opportunities for Indigenous and local community members to obtain training required for project participation; and
- A gender equity and diversity policy that focuses on hiring Haisla Nation members, local and Indigenous peoples, and women to increase project employment among underrepresented populations and consideration of the baseline labour force participation status of under-represented groups in Kitimat and the region.

See Sections 5.7 and 6.8 for a complete list of key mitigation measures.

There is predicted a net positive residual effect as a result of Cedar LNG to regional employment, regional business and regional economy. The magnitude of these residual effects were all considered to be moderate. There is the potential for benefits to accrue disproportionately to males and non-Indigenous people; however, there are mitigation measures aimed to increase opportunities for all Indigenous peoples, including women.

(See Section 5.7: Employment and Economy and Section 6.8: Human and Community Well-Being for further information).

#### *6.9.6.6 Infrastructure and Services*

Indigenous people's infrastructure and services include regional health services, Indigenous health centres, Indigenous police services, provincial education services and Indigenous nations' daycares.

The Application stated that all of these components of infrastructure and services have the potential to be impacted by Cedar LNG. The transportation and accommodations will be impacted primarily during construction when the highest volume of non-regional workers will

be present and daily transportation (70-130 vehicle movements per day) to and from the existing workcamps in the District of Kitimat to the Project will occur.

Despite the existing workcamps in the District of Kitimat, the number of local housing units may be affected during construction and operation and Indigenous nations are one of the subpopulations that are at risk of being disproportionately affected.

EAC conditions and federal Mitigation Measures, as proposed in Section 5.10, would mitigate the infrastructure and services effects on Indigenous people. Key measures include:

- Community feedback process (provincial Condition 11); and
- Infrastructure and services Follow-up Program.

See Section 5.10 for a complete list.

The magnitude for adverse effects on infrastructure and services is considered to be moderate and the extent of effects would be regional. While the effects would be present throughout the life of Cedar LNG, they will be the greatest during construction. There is the potential for effects to be disproportionately experienced by Indigenous peoples experiencing a higher magnitude than the remaining local population.

(See Section 5.10 of this Report on Infrastructure and Services for further information).

#### *6.9.6.7 Health and Well-Being*

The effects of Cedar LNG on Indigenous people's health and well-being that are associated with the Project were identified in the assessment as being directly influenced by the environmental, social, political, economic and cultural context of the region.

Health and well-being (mental and physical) may be affected by loss of culture and identity as a result of increase vessel traffic and type, wake effects and sensory disturbance, and changes related to consumption and harvesting, including access and quality/quantity of resources, as well as effects to human health from effects on air quality.

Positive effects may result from regional gains in employment and income (Section 5.7: Employment and Economy), but positive effects may be unevenly distributed and not benefit groups that are under-represented, including Indigenous peoples (Section 6.8: Summary of Effects to Human and Community Well-Being);

EAC conditions and IAA Mitigation Measures, as described in Section 6.8: Human and Community Well-Being would mitigate the health and well-being effects on Indigenous people:

- Marine Transportation Communication Report (Condition 12) which will notify Indigenous nations of project activities and LNG vessel shipping schedule as well as establish a grievance process for Indigenous marine users experiencing loss of fishing gear and marine transportation plan (federal Mitigation Measure);

- Health and Medical Services Plan (Condition 13) which will include measures to reduce effects to the regional healthcare facilities and system;
- Provide information to local and Indigenous employment agencies and economic development organizations to help them plan for increased demand for labour;
- Provide on-the-job training programs and apprenticeship opportunities;
- Implement procurement policies and practices to provide opportunities to local businesses and contractors; and
- Consider opportunities over the life of Cedar LNG to enable Haisla and Indigenous, local and regional businesses and contractors to have repeated or ongoing contracts.

See Sections 5.7 and 6.8 for further details.

Cedar LNG is anticipated to result in a moderate negative impact and a moderate positive impact on Indigenous health and well-being. There is the potential for adverse effects to be disproportionately experienced by Indigenous peoples than the local population.

#### *6.9.6.8 Cumulative Effects*

Cumulative effects on the health and socio-economic conditions of Indigenous peoples are expected for Cedar LNG, when taking into consideration anticipated residual effects of other past, present and predicted projects, similar to Cedar LNG's which could adversely affect Indigenous peoples.

#### *6.9.6.9 EAO's Conclusions*

In determining conclusions on Project impacts to Indigenous peoples, the EAO considered the collective impact from the identified residual effects on Indigenous health and socio-economic conditions.

The EAO has proposed the EAC conditions and Mitigation Measures noted in the subsections above to mitigate impacts on Indigenous people's health and socio-economic conditions.

### 6.9.7 CEDAR LNG'S CONTRIBUTIONS TO SUSTAINABILITY

#### *6.9.7.1 Introduction*

This section assesses the extent to which Cedar LNG contributes to sustainability. The extent to which a designated project contributes to sustainability is one of the five factors in the public interest decision and is the first purpose of the IAA.[81] Under the IAA, sustainability is "the ability to protect the environment, contribute to the social and economic well-being of the people of Canada and preserve their health in a manner that benefits present and future generations". Considering Cedar LNG's contribution to sustainability helps to provide a holistic understanding

[81] See Guidance: Considering the Extent to which a Project Contributes to Sustainability.

of Cedar LNG's potential positive and adverse effects, the interactions between these effects, and their long-term consequences. This section relies on the integrated approach outlined in the Agency's https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/guidance-considering-extent-project-contributes-sustainability.htmlGuidance: Considering the Extent to which a Project Contributes to Sustainability.

#### 6.9.7.1.1 Valued Components Carried Forward into the Sustainability Assessment

The EAO's sustainability assessment considered values, issues and perceptions of risk as described by the Working Group, including Indigenous nations potentially affected by Cedar LNG, to identify VCs that should be carried forward into the sustainability assessment.

The VCs carried forward were those identified by Indigenous nations and Cedar as important to sustainability:

- Marine resources;
- Freshwater fish and fish habitat;
- Wildlife resources (includes migratory birds);
- Vegetation resources;
- Air and acoustic quality;
- Current use of lands and resources for traditional purposes;
- Health and well-being of present and future generations;
- Socio-economic and cultural conditions; and
- Self-governance.

Table  in Annex A provides a rationale for the selection of these VCs and potential effects. Potential effects to VCs were considered holistically in the sustainability assessment to avoid prioritizing one effect or VC above others.

### *6.9.7.2 Temporal Boundaries*

Temporal boundaries for effects to VCs are outlined in VC chapters. For effects to future generations, Cedar considered 25 years as representative of a single generation as established by EAs conducted for comparable projects on the North Coast and based on Cedar's understanding that Indigenous knowledge and associated customs, traditions, practices or locales may be displaced from collective memory if the transfer of knowledge or the ability to engage in traditional practices is disrupted beyond a single generation.

This concept of temporal boundaries as noted by Indigenous nations throughout the assessment acknowledges an expanded timeframe that recognizes that Indigenous peoples have been in their territories since time immemorial and must preserve their environment for all generations to come. Cedar notes this "deep-time knowledge" and connection to traditional

territories, cultural practices, customs, languages, wisdom and laws across generations, since time immemorial.[82]

#### 6.9.7.2.1 Sustainability Principles

The EAO's assessment characterized effects to VCs in relation to the sustainability principles for all phases of Cedar LNG (e.g., construction, operations and decommissioning, including post-project legacy effects) and takes into account Cedar's sustainability assessment[83].

Table 53 summarizes how the sustainability principles were applied by the EAO and key considerations for the assessment. Table 54 outlines benefits and costs to current and future generations.

**Table** 53: Applying the sustainability principles

| Principle | Informed By | Relevant Sections | Considerations |
|---|---|---|---|
| Principle 1: Consider the interconnectedness and interdependence of human-ecological systems<br><br>The assessment considered changes to system components, function and connectivity that could affect health, social, economic and cultural conditions | Indigenous knowledge, secondary sources and engagement with Indigenous nations | Section 5.3 - Vegetation Resources<br>Section 5.4 - Wildlife<br>Section 5.5 - Freshwater Fish<br>Section 5.6 - Marine Resources<br>Section 5.7 - Employment and Economy<br>Section 5.12 - Human Health<br>Section 6.7 – Effects on Current and Future Generations<br>Section 6.8 - Human and Community Well-being<br>Section 6.9 - Requirements of the IAA<br>Section 7 - Part C | Effects to marine resources, freshwater fish, vegetation resources and wildlife resources (including migratory birds) and their ecosystems that could affect cultural and material connections to land and waters, including self-governance<br><br>Effects to the health and well-being of present and future generations through increased economic opportunities and wage employment<br><br>Effects to socio-economic conditions through an influx of male workforce<br><br>Cumulative effects |
| Principle 2: Consider the well-being of present and future generations<br><br>The assessment considered how Cedar LNG's effects on community well-being could change | Indigenous knowledge and community knowledge<br><br>Perspectives of Indigenous nations and local communities | Section 5.7 - Employment and Economy<br>Section 6.2 – Consistency with Land Use Plans<br>Section 6.8 - Human and Community Well-being<br>Section 6.7 – Effects on Current and Future Generations<br>Section 7 - Part C | Elements of well-being:<br>- use of and access to sacred and culturally important sites;<br>- ability to participate in traditional land-use activities;<br>- health of lands, waters and resources;<br>- social cohesion;<br>- food security; |

[82] See Indigenous Nations Perspective on Health and Wellness (fnha.ca) as cited by Cedar LNG in its Application.

[83] See Cedar LNG Project - Contributions to Sustainability under the Impact Assessment Act (gov.bc.ca).

| | | | |
|---|---|---|---|
| over time, and how future generations could be affected beyond the lifecycle of Cedar LNG. | | Effects to Indigenous Interests<br><br>Indigenous nations Comprehensive Community and Community Land Use Plans described in Section 6.2 – Consistency with Land Use Plans | - access to adequate housing; and<br>- spiritual, mental and physical health<br><br>Effects to future generations and changes over time (see Table 3)<br><br>Climate change mitigation |
| Principle 3: Consider the positive effects and reduce adverse effects of a designated project<br><br>The assessment considered whether Cedar LNG's positive effects would be maximized and adverse effects reduced to ensure lasting contributions to present and future generations | Indigenous knowledge<br><br>Evidence-based mitigation measures<br><br>Whether Cedar considered demographics, population stability, gender, race, and intergenerational equity | Section 5.7 - Employment and Economy<br>Section 6.7 – Effects on Current and Future Generations<br>Section 6.8 - Human and Community Well-being<br>Section 7 - Part C Effects to Indigenous Interests | Maximizing positive effects:<br>- Cedar LNG to prioritize employment and procurement opportunities<br>- Maximize benefits for Haisla and under-represented groups<br><br>Reducing adverse effects:<br>- Risks to the health and safety of women and gender-diverse peoples<br>- Socio-economic and income disparities<br>- Food insecurity<br>Mitigation measures will reduce effects, but some residual risks to health and social conditions may remain |
| Principle 4: Apply the precautionary principle and consider uncertainty and risk of irreversible harm | Gaps in knowledge with respect to uncertainty of the outcomes of mitigation measures<br><br>Understanding of key issues<br><br>Steps taken to address the gaps identified<br><br>Precautionary approach in cases where there may be risk of irreversible harm<br><br>Indigenous knowledge including documents shared by Indigenous | Section 7 – Part C – Effects to Indigenous nations | Priority community health and safety risks:<br>- Effects to housing<br>- Effects to land and displacement from traditional territories<br>- Accidents and malfunctions<br>- Food insecurity<br>- Safety of Indigenous women and girls<br>- Perpetuation of historical trauma and policies that add to cultural trauma and dislocation from culture. |

| | | | |
|---|---|---|---|
| | nations and secondary sources including: Gitxaala Nation's Community Health and Socio-Economic Risk Report | | |

**Table 54: Benefits and costs to the well-being of present and future generations**

| Benefits to Well-Being of Present And Future Generations | Costs To Well-Being of Present And Future Generations |
|---|---|
| 40 years of employment, procurement and government revenue benefits to local and regional economy | Cedar LNG's benefits partially offset by costs to Indigenous nations' traditional economy and traditional practices (effects to food security; risks to transfer of Indigenous knowledge; cumulative effects) |
| Cedar LNG aligns with federal, provincial, regional and Indigenous initiatives and strategies for sustainable development / education and skills training | Income disparity, employment inequity and barriers to employment opportunities may only be partially addressed by Cedar LNG |
| Wage employment, social services/programs and a strong economy may help communities to manage the cost of living and enhance material and social well-being, and contribute to obtaining adequate housing and food<br><br>Potential increased levels of educational attainment through skills training may improve socio-economic well-being and contribute to individual and collective benefits, such as self-esteem, and the ability to learn about industry and economics | Impact inequity and socio-economic disparities from increased reliance on commercial as opposed to traditional subsistence foods, due to real or perceived contamination or reduced availability of country foods, particularly from the marine environment<br><br>Increased pressure on existing local and regional infrastructure and services<br><br>Adverse social effects to subgroups through increased workforce of outsiders, including effects to the price of goods, culture and language transmission; potential racism and violence; alcohol and substance abuse; sexual violence<br><br>Risks to the health and safety of Indigenous women, girls and gender-diverse peoples as a result of an influx of predominantly male temporary workforce |
| Interests of future generations are supported by the transition to more sustainable and desirable future energy options (links to s. 63 (e) environmental obligations and climate change commitments). | Uncertainty of health, social and cultural well-being outcomes for present and future generations from impeded access to sacred and culturally important sites (including marine harvesting sites), and disruption of social and family cohesion and connection to land and waters |

#### *6.9.7.3 Project Alternatives Through a Sustainability Lens*

The sustainability assessment under the IAA requires that project alternatives are considered in light of their contributions to sustainability. Cedar considered three project alternatives: the no project alternative, additional export methods of liquefied natural gas from Canada (by pipeline or by an LNG export facility) or Haisla seeking an equity position in another LNG export project in the Kitimat area. Neither the second nor third alternatives were considered by Cedar to align

with Haisla's Comprehensive Community Plan goals, which are tied to the health, well-being and sustainability of Haisla. Both project alternatives could also necessitate pursuing project development outside of Haisla's traditional territory, which is not consistent with Haisla's approach to economic development.

The EAO's sustainability assessment determined that in lieu of a "no project" alternative, Cedar LNG would provide the best sustainability gains to current and future generations when compared to Cedar LNG alternatives of another LNG project or other export methods in the region. Although Cedar LNG's potential effects to health, social and cultural conditions may be experienced disproportionately by subgroups and across generations, with project benefits such as employment unevenly distributed, this would also be the case with the two project alternatives. In addition, the two project alternatives could represent additional costs to future generations in the form of potentially higher GHG emissions and health and social effects.

#### *6.9.7.4 The Extent to Which the Project Contributes to Sustainability*

The EAO's sustainability assessment considered the project-specific context, including key issues of importance to Indigenous nations and subgroups, and how the sustainability principles were applied. The following are key considerations in determining the extent to which Cedar LNG would contribute to sustainability:

- **Positive effects to current and future generations from increased economic opportunities** would contribute to the health and well-being of communities, including financial autonomy of households, and improved infrastructure and services. However, these positive effects would be unevenly distributed.
- **Positive effects by supporting self-governance and self-determination for Haisla** as the majority owner of Cedar LNG, advancing reconciliation.
- **Positive effects by supporting the transition to more sustainable and desirable future energy options** and would therefore serve the interests of future generations.
- **Adverse effects to cultural and material connections to land and water** for current and future generations could pose risks to food security, the transfer of Indigenous knowledge and the mental health and well-being of Indigenous nations.
- **Adverse effects to socio-economic conditions and Indigenous governance** could occur through loss or alteration of preferred harvesting methods, locations or opportunities, and alteration or reduction of subsistence-based livelihoods and trade networks.
- **Adverse effects to social and family cohesion, and the health and safety of Indigenous women, girls, gender-diverse peoples and subgroups** may be associated with an influx of a majority male workforce and changes in social structures.

The EAO considered that mitigation and enhancement measures will reduce potential employment inequities during and beyond the life of Cedar LNG, although some uncertainty remains regarding mitigating adverse effects to the health and safety of Indigenous women, girls and gender-diverse people, food insecurity and disrupted cultural connectivity.

Cedar concluded that the extent to which Cedar LNG contributes to sustainability is moderate to high. Cedar stated that Cedar LNG is likely to result in opportunities for positive contributions to sustainability for Haisla, surrounding Indigenous nations and local communities. The risk of adverse effects or irreversible harm to both the biophysical environment and the human environment was considered by Cedar to be low to moderate. Based on the long-term downward trend in well-paying employment opportunities in Kitimat, the jobs and other contributions to sustainability provided by Cedar LNG would support present and future generations for the community in Kitimat. Cedar stated that this is particularly evident for Haisla, as the lead partner in Cedar LNG. The enhancement of these benefits would depend on the effectiveness of future decisions and actions to maximize positive effects and/or to mitigate adverse effects. As part of its commitment to reducing adverse effects on local communities, Cedar stated that it intends to implement a community feedback process.

The EAO's sustainability assessment considered that adverse effects to the health, social and economic conditions of surrounding Indigenous nations would partially offset the high positive contributions to sustainability for Haisla anticipated by Cedar LNG.

#### *6.9.7.5 Analysis and Conclusion*

The EAO considered Cedar's assessment and conclusion, and Cedar's additional sustainability analysis focusing on Cedar LNG's likelihood to result in both opportunities for positive contributions to sustainability and risk of adverse effects based on advice, including from the Agency. The EAO is of the view that the extent to which Cedar LNG would contribute to sustainability would be moderate.

Cedar LNG would involve a loss of "use" values associated with adverse effects to marine ecosystems and the ability to harvest these resources. It would also involve a loss of "existence" values, which are values that Indigenous nations and local communities place on resources and attributes, not because of their expected human use, but because of their environmental, cultural and social significance for present and future generations. Cedar LNG would, however, provide economic benefits to Haisla and to other Indigenous nations and communities, would support self-governance and self-determination for Haisla as the majority owner of Cedar LNG, and would support the transition to more sustainable and desirable future energy options, globally and domestically. Contributions to sustainability are therefore expected for present and future generations, but depend on the effectiveness of future decisions and actions to enhance positive effects (employment and income opportunities) and to mitigate adverse effects (effects to health and social conditions; effects to cultural continuity and food security; and cumulative effects). Cedar LNG must ensure continuous progress towards sustainability through its follow-up and monitoring programs.

### 6.9.8 CONSIDERING ENVIRONMENTAL OBLIGATIONS AND COMMITMENTS IN RESPECT OF CLIMATE CHANGE

This section assesses the extent to which the potential effects of Cedar LNG may hinder or contribute to Canada's ability to meet its environmental obligations and its climate change commitments. The extent to which a designated project may hinder or contribute to Canada's ability to meet these commitments is one of the five factors in the federal public interest decision. The section draws on the GHG emissions presented in section 6.4 and considers Cedar LNG's net GHG emissions, its proposed mitigation measures and the potential effects of the Project on carbon sinks in the context of Canada's environmental obligations and climate change commitments (see list below). It also considers the Project's effects to species at risk and migratory birds (see Section 5.4: Wildlife) and to marine fish and invertebrates, marine mammals, and the marine environment (see Section 5.6: Marine Resources). The project's contributions to sustainability with respect to these factors are assessed further in Cedar LNG's Contributions to Sustainability (section 6.9.7) above.

The assessment has considered Canada's environmental obligations and climate change commitments that are relevant to the effects of the Project. The term "environmental obligations" refers to Canada's obligations in domestic and international law in relation to protecting the natural environment. In international law, legally binding international instruments (e.g., conventions) to which Canada is a party can create environmental obligations. "Commitments in respect of climate change" are set out in legally binding and non-binding domestic and international instruments.[84]

Identification of relevant obligations and commitments took into consideration the specific context of the Project, including:

- The location of Cedar LNG (that is, that the Project will be developed on fee simple land owned by Haisla Nation and also involves the marine environment);
- The potential emissions and discharges from the Project (e.g., GHG emissions and discharges to marine waters); and
- Components of the environment (such as, VCs such as species at risk and migratory birds), including potential effects to these components.

The assessment considered all Indigenous knowledge provided in relation to these factors (see throughout this Report and under "Wildlife", "Migratory Birds", "Marine Resources" and "Cedar LNG's Contributions to Sustainability").

[84] For more information, see Policy Context: Considering Environmental Obligations and Commitments in Respect of Climate Change under the Impact Assessment Act - Canada.ca.

#### 6.9.8.1 Environmental Obligations

The following environmental obligations were identified as directly relevant to the assessment as a result of biodiversity effects stemming from changes to terrestrial[85] and marine environments, as well as effects to species at risk and migratory birds (VCs identified during the project's scoping and assessment phases):

- *Convention on Biological Diversity* (CBD), implemented through Canada's supporting national frameworks: *Canadian Biodiversity Strategy*, *Canada's Biodiversity Outcomes Framework* and current *Biodiversity Goals and Targets for Canada*:
- The CBD is an international legally-binding treaty with three main goals: conservation of biodiversity; sustainable use of biodiversity; and the fair and equitable sharing of the benefits arising from the use of genetic diversity. It encourages actions that will lead to a sustainable future. The conservation of biodiversity is a common concern of humankind. The CBD covers biodiversity at all levels: ecosystems, species and genetic resources.
- Legislation that supports the implementation of Canada's biodiversity commitments: *Species at Risk Act* (2002) and *the Canada Wildlife Act* (1985):
- The *Species at Risk Act* (2002) provides for the legal protection of wildlife species to prevent wildlife species from becoming extinct and to secure the necessary actions for their recovery.
- The *Canada Wildlife Act* allow for the creation, management and protection of wildlife areas for wildlife research activities, or for conservation or interpretation of wildlife. The purpose of wildlife areas is to preserve habitats that are critical to migratory birds and other wildlife species, particularly those at risk.
- *Recovery Strategies and Action Plans* developed under the *Species at Risk Act* (2002) for all species at risk potentially affected by the project:
- A Recovery Strategy is a planning document that identifies what needs to be done to stop or reverse the decline of a species. An Action Plan identifies the measures to take to implement the Recovery Strategy for a threatened, endangered or extirpated species.
- *Convention for the Protection of Migratory Birds in the United States and Canada*, as implemented in part through the *Migratory Birds Convention Act* (1994) and supporting guidance on conservation objectives arising from *Bird Conservation Region Strategies*:
- The Convention is an international agreement with the objective to protect migratory birds, their eggs, and their nests. The requirements of the Convention have legislated components embedded in *the Migratory Birds Convention Act*, 1994*, Migratory Birds*

[85] It is acknowledged that the project is being developed on fee simple land owned by Haisla Nation and that the terrestrial environment is on fee simple land. Where the environmental obligations listed do not extend to the terrestrial environment (i.e., the Convention on Biological Diversity), they must still be considered for the marine environment.

*Regulations* and *Migratory Bird Sanctuary Regulations*. Elements of the Convention are also implemented via the *North American Waterfowl Management Plan* and the *Declaration of Intent for the Conservation of North American Birds and their Habitat.*

Cedar LNG's project site falls outside of a designated Wetland of International Importance; therefore, the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (the Ramsar Convention) was considered not to apply.

Species at risk and migratory birds that were identified during the assessment and that are protected or supported under *the Convention on Biological Diversity*, the *Migratory Birds Convention Act*, the *Species at Risk Act* (2002) and *Recovery Strategies and Action Plans* include 45 migratory bird species within the old or young forest songbird communities and 168 migratory bird species within the project area (see "Wildlife" and "Migratory Birds" for more detail).

Fifteen bird species of conservation concern, three mammal species of conservation concern and two amphibians of conservation concern as listed under the *Species at Risk Act* (2002) were identified as likely to occur within the marine terminal and marine shipping regional assessment areas (see  in "Wildlife"). Those that are threatened or endangered include:

- Common nighthawk;
- marbled murrelet;
- northern goshawk;
- western screech-owl;
- black swift (*endangered*);
- olive-sided flycatcher;
- barn swallow; and
- little brown myotis (*endangered*).

Recovery strategies have been prepared for common nighthawk, marbled murrelet, northern goshawk, olive-sided flycatcher, and little brown myotis. The project site falls outside the identified critical habitat of the northern goshawk and the little brown myotis, as outlined in their Recovery Strategies. The Project falls within the geographic area for the Recovery Strategy for the marbled murrelet, as prepared by ECCC. Cedar LNG's Facility Area and transmission line corridor overlap with four location polygons that may contain terrestrial (nesting) critical habitat for the marbled murrelet. Construction and clearing are also anticipated to reduce effective marbled murrelet summer breeding habitat within the marine terminal LAA by 23.8 ha. However, Cedar LNG noted that the short term (i.e., 2002–2032) recovery objective identified in the Recovery Strategy for marbled murrelet is the retention of at least 68% of suitable nesting habitat for marbled murrelet within the Central Mainland Coast Conservation Region, with 2002 levels as the baseline. In 2011, there was an excess of 40.5% (89,451 ha) above the 68% target. Cedar LNG's direct effect on area identified as a geographic location

polygon would represent 0.007% of the 40.5% excess. Critical habitats for the remaining species listed above have not been identified in Canada.

Marine fish habitat within the marine terminal LAA/RAA includes marine riparian habitat, intertidal habitat, subtidal habitat (foreshore), estuaries and salt marshes, and kelp and eelgrass beds. The marine terminal and marine shipping LAA/RAAs also overlap with important DFO areas for oolichan, tanner crab, and cloud sponge. Habitat use within the marine terminal LAA is species and season specific. There are five species of Pacific salmon and steelhead that spawn in the Kitimat River watershed and have unique migration and spawning timings. In marine waters of the Kitimat Arm, salmon are observed year-round, with seasonal influxes during adult inbound and smolt outbound migrations.

Nine marine fish and invertebrate species at risk, and nine marine mammal species at risk as listed under the *Species at Risk Act* (2002) were identified as likely to occur within the marine terminal and marine shipping regional assessment areas (see Table 18 and Table 19 in "Marine Resources"). Those that are threatened or endangered include:

- Northern abalone;
- Fin whale;
- Northern resident killer whale; and
- Bigg's (transient) killer whale.

Recovery strategies have been prepared for northern abalone, fin whale, northern resident killer whale, and Bigg's (transient) killer whale. Two species of special concern also have recovery strategies: the North Pacific humpback whale and the sea otter. The Project site falls outside the identified critical habitat where identified for the species listed with the exception of the north Pacific humpback whale. Marine shipping activities associated with the Project overlap with the Gil Island critical habitat for the North Pacific humpback whale.

The extent to which the Project contributes positively to key social-ecological systems that maintain human health, human livelihoods and biodiversity in light of climate change is considered in Section 6.9.7: Cedar LNG's Contributions to Sustainability.

#### *6.9.8.2 CANADA'S CLIMATE CHANGE COMMITMENTS*

An analysis of the direct effects of Cedar LNG's GHG emissions is provided within Section 6.4 – Greenhouse Gas Emissions. In addition to the analysis of the direct effects from Cedar LNG's GHG emissions, there is a requirement under the IAA for the assessment of the climate change impacts of a project as one of the five factors considered in the public interest decision, as follows:

> 22(1)(i) the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change.

Below is a listing of Canada's current climate change commitments relevant to Cedar LNG, and an analysis of the potential effects of Cedar LNG on Canada's ability to meet each of the respective commitments:

- *Canada's 2030 Emissions Reduction Plan* (requiring 40-45% emissions reductions below 2005 levels by 2030): Cedar LNG will hinder Canada's ability to meet this commitment to a negligible extent. Under this plan, Canada must reduce its emissions to 443 Mt $CO_2e$ (representing the 40% reduction from the 2005 baseline, as provided by ECCC in their GHG Analysis[86]). Cedar LNG emissions in 2030 are projected to be 246 kt $CO_2e$, which represents 0.06% of the 443 Mt $CO_2e$.

*Canadian Net Zero Emissions Accountability Act* (requires five-year emissions targets to demonstrate how Canada will reach net-zero by 2050): Cedar LNG will hinder Canada's ability to meet this commitment to a negligible extent in the shorter term, however the implementation of Cedar's net-zero plan by 2050 (provided in its Application to meet the requirements of the Strategic Assessment of Climate Change) should ensure that the Project aligns with Canada's longer term commitments in respect of climate change.

In addition to the commitments listed above, in April 2022 the Government of Canada signaled its intent to develop guidance that will require proponents of new oil and gas projects subject to the IAA to demonstrate that they will have "best-in-class" low-emissions performance. Cedar LNG was not requested to assess how the project demonstrates best-in-class emissions performance as the guidance was not available at the time of assessment. A draft of the best-in-class guidance for public comment is expected to be published in fall 2022. However, based on the information provided by Cedar in its Best Available Technologies/Best Environmental Practices determination within the Application (Appendix 8B – SACC Technical Report), Cedar LNG's estimated GHG emission intensity of 0.08 t CO2e per t LNG produced is lower than most existing LNG facilities. As outlined in the advice provided by ECCC in their GHG Analysis, Cedar LNG is likely to be one of the lowest emissions intensity producers of LNG globally, largely because of its reliance on renewable electricity from the BC Hydro grid.

In addition to Canada's climate change commitments, there is consideration under the IAA given to the potential impacts of Cedar LNG on global GHG emissions. Cedar LNG could support global decarbonisation and the transition to a more sustainable energy future through the displacement of higher emitting fuel sources (e.g. - coal), and via shorter shipping distances as compared to those associated with competitors to Asia-Pacific markets.

#### *6.9.8.3 EAO'S CONCLUSIONS*

Based on the analysis presented above, the Agency advised the EAO that Cedar LNG would only hinder Canada's ability to meet its environmental obligations to a negligible extent. Based on

[86] Available on EPIC here: https://www.projects.eao.gov.bc.ca/api/public/document/631b8d7117bc0a0022a18053/download/ECCC_Cedar%20LNG_GHGs_2Sept2022.pdf

the analysis of the considerations listed above, the EAO is of the opinion that Cedar LNG may hinder Canada's ability to meet shorter term commitments in respect of climate change to a negligible extent; however, the implementation of Cedar's net-zero plan by 2050 should ensure that the Project aligns with Canada's longer term commitments in respect of climate change. This conclusion also takes into account the implementation of key mitigation measures and conditions as outlined in Chapter 6.4 – Greenhouse Gas Emissions.

## ANNEX A

**Table 55: Valued components carried forward into the sustainability assessment**

| Valued Component | Selection Rationale | Potential Effects |
|---|---|---|
| Marine resources | • Key indicator of marine ecosystem health; includes species at risk as defined in the *Species at Risk Act* (SARA)<br>• Important resource for Indigenous food, social and ceremonial purposes (food security and the sustainability of traditional livelihoods)<br>• Key biological component of marine areas important for traditional Indigenous activities (fishing and harvesting), cultural way of life and place-based rights, including the ability to pass on oral histories and traditional knowledge to future generations | • Changes to behaviour of fish or marine mammals caused by sensory disturbances<br>• Health, or injury or mortality risk for marine fish and marine mammals of cultural and socio-economic importance to Indigenous nations<br>• Marine fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*<br>• Marine aquatic species as defined in SARA<br>• Changes to marine resources from marine shipping activities<br>• Alteration of important ecosystems and marine resource habitats due to impacts of LNG carrier wakes, with associated adverse effects to marine mammals and fish<br>• Food security from changes to the quantity or quality of marine resources<br>• Changes to quality and quantity of marine resources, real or perceived (e.g., change in species abundance and distribution; contamination from accidents) |
| Freshwater fish and fish habitat | • Fish species and fish habitat that are of importance to Indigenous culture, and to traditional and economic activities and values<br>• Indicator of long-term productive capacity of freshwater habitats for fish and other aquatic species<br>• | • Changes to fish habitat used for spawning, rearing, feeding or migration; harmful alteration, disruption, or destruction (HADD) of fish habitat under Section 35 of the *Fisheries Act* is not predicted<br>• Surface water quality<br>• Changes to fish health, or injury or mortality risk for freshwater fish of cultural and socio-economic importance to Indigenous nations<br>• Changes to status of food security for Indigenous nations |
| Wildlife resources (includes migratory birds) | • Species of conservation concern as defined in the SARA<br>• Species of Indigenous cultural and economic use (includes mammals, migratory birds under section 2(a)(iii) of the IAA, non-migratory birds and amphibians)<br>• | • Habitat (direct and indirect), movement and mortality risk for wildlife (terrestrial wildlife and marine birds)<br>• Changes to the quality and quantity of country foods and harvesting experience<br>• Changes to status of food security from changes to the quantity or quality of wildlife resources<br>• Changes to the quality and quantity of country foods, real or perceived (e.g., change in species abundance and distribution; contamination from accidents) |

| | | |
|---|---|---|
| Vegetation resources | • Important resource for Indigenous food security and the sustainability of traditional livelihoods through the gathering of country foods for subsistence or medicinal purposes<br>• Indicator species and components of wildlife areas of socio-economic and cultural importance to Indigenous nations<br>• | • Changes to the abundance of plant species of importance to Indigenous nations<br>• Changes to the abundance or condition of ecological communities of importance to Indigenous nations<br>• Changes to native vegetation health and diversity due to air emissions<br>• Changes to vegetation quantity and quality that may result in reduced habitat functionality for wildlife |
| Air and acoustic quality | • Indicator of human and wildlife health and well-being<br>• | • Changes in concentrations of ambient air pollutants, including emissions from marine vessels along shipping routes<br>• Changes in noise levels causing nuisance, annoyance and sleep disturbance to Indigenous nations and local communities, as well as displacement and sensory disturbance to wildlife |
| Current use of lands and resources for traditional purposes | • Section 22(1)(c) and (l) factors to consider in impact assessments under the IAA and related to sustainability<br>• Cultural, traditional and economic activities and values of Indigenous nations identified as of importance to sustainability (including Indigenous rights to hunt, fish and gather, connection to the land, interconnectedness with marine and terrestrial ecosystems, and long-term well-being) | • Loss or alteration of preferred harvesting methods, locations or opportunities (e.g., alteration to the cultural component of harvesting; interference with fishing equipment; contamination of marine or terrestrial environment and resources)<br>• Impeded access to traditional lands and resources, particularly the ability to access traditional marine harvesting sites by small vessels safely without the risks posed by increased marine traffic and associated wake<br>• Alteration or reduction of subsistence-based livelihoods and trade networks<br>• Changes to Indigenous peoples' use of traditional areas due to changes in sensory experience (including changes to noise, light and visual conditions) and safety or perceived safety concerns<br>• Cumulative effects to lands, waters and resources for traditional purposes, food security and the ability to sustainably continue traditional practices such as fishing, harvesting, hunting, gathering, teaching and spiritual practices (includes loss of, or alteration to, lands and water)<br>• Cumulative loss of territory and ability to exercise rights, with associated impacts on governance, the preservation of cultural identity, effects to social cohesion and connection to the land and water, and effects to the ability to transfer knowledge through generations |
| Health and well-being of present and future generations | • Sustainability principle and a factor to be considered in impact assessments under section 22(1)(h) of the IAA | • Changes to long-term physical health due to changes in air and acoustic quality, changes in marine and terrestrial environments (contamination of water and soils) and reduced quality and quantity country foods and medicinal plants exposed to contaminants in the water, air or soil, or |

| | | |
|---|---|---|
| | • Physical, spiritual and mental health and well-being of present and future generations identified by Indigenous nations as integral to sustainability assessment | as bioaccumulation of contaminants in the environment (food security)<br>• Gender-specific health risks (e.g., health and safety risks of Indigenous women, girls and gender-diverse peoples linked to an influx of male workforce and changes in social structures)<br>• Effects to mental health and well-being through loss of cultural identity and connectivity, customs and ceremonies, continuity of traditions, cohesion of family groups and social organization, use and transmission of knowledge, and quality of spiritual and physical experience when practising Indigenous rights (these effects are directly linked to the ability to safely access traditional territories and important cultural sites or harvesting areas)<br>• Cumulative effects on the mental health, well-being, culture and physical conditions of Indigenous nations due to permanent alteration and loss of traditional landscapes and ecosystems |
| Socio-economic and cultural conditions | • Factor to be considered in impact assessment under section 22(1)(a) of the IAA related to sustainability<br>• Economic and employment benefits, and potential impact inequities and socio-economic disparities were identified by Indigenous nations as an important component of the sustainability assessment | • Positive effects to household incomes and well-being through employment, including financial autonomy and independence of some women, and improvement of social well-being and access to housing and food security for some households<br>• Potential increased levels of educational attainment<br>• Changes to traditional economies and potential barriers to employment<br>• Changes to access, ownership and use of local resources (e.g., change in land tenure)<br>• Changes to core housing needs through influx of workers<br>• Indigenous peoples' increased reliance on commercial foods as opposed to traditional subsistence foods due to real or perceived contamination and health risks or through reduced availability of country foods<br>• Changes to the price of goods, culture and language transmission, racism and violence and alcohol and substance abuse<br>• Gender disparities and cultural constraints in employment with the introduction of transient male populations, affecting the long-term well-being of Indigenous women, girls, gender-diverse peoples and subgroups such as the disabled, Elders and youth<br>• Changes to population composition, density and growth, ethnic identity, family structure and dependency ratio<br>• Changes to existing local and regional services, such as accommodation, recreation, waste disposal, police, fire fighting, ambulance and healthcare services, as well as education and daycare |
| Self-governance | • An inherent right of Indigenous self-government guaranteed in section 35 of the *Constitution Act*, 1982, | • Changes to health, well-being and socio-economic and cultural conditions of Indigenous nations directly related to loss of self-governance |

| | | |
|---|---|---|
| | and identified as a valued component integral to sustainability by Indigenous nations<br>• Linked to factors to be considered in impact assessment under section 22(1)(a) and (c) of the IAA | • Changes in the ability of Indigenous self-governance systems to make decisions regarding land and marine use, including access and use of harvesting areas<br>• Increase in large vessel movements along marine shipping routes preventing Indigenous nations from accessing fishing or shoreline harvesting sites, affecting food, social and ceremonial purposes and governance systems<br>• Changes may be further disproportionately distributed as effects may be experienced only by subpopulations that hold hereditary rights to harvest, fish and manage at discrete areas (i.e., house territories) overlapping or in the vicinity of the marine shipping areas<br>• Changes to infrastructure, services, accommodation and transportation linked to diminished self-determination<br>• Changes in regional employment, business and economy that prevent self-governance<br>• Changes to the ability to transfer Indigenous knowledge, linked to the perpetuation of Indigenous governance systems<br>• Changes to sense of place, cultural identity, social cohesion and connection to land and water important to self-governance<br>• Displacement from preferred locations for current use and traditional activities directly related to loss of self-governance structures |

# 7.0 PART C - EFFECTS TO INDIGENOUS INTERESTS

*Note: The EAO and Indigenous nations are currently collaborating on writing their individual nation sections and so are not included in this Report. The final version of this Report will be updated to include an assessment of effects to each of these Indigenous nations.*

## 7.1 OVERVIEW

### 7.1.1 INDIGENOUS INTERESTS

The Government of B.C. has a constitutional duty to consult and, if appropriate, accommodate Indigenous nations where they have asserted or established Aboriginal rights and title, as recognized and affirmed by Section 35 of the *Constitution Act*, 1982 ("Section 35 Rights"), that may be adversely impacted by provincial government decisions. In addition to this, consistent with the Notice of Substitution Approval[87], B.C. conducted consultation with Indigenous groups identified by the Agency for consultation and provided the Agency the opportunity to participate in consultation.

In the past, the provincial EA process focused primarily on effects to Section 35 rights that the courts and/or treaties have generally addressed to date: (typically) hunting, fishing, trapping, and gathering rights, as well as title. For Cedar LNG, the EA considered an assessment of effects to Indigenous interests in the broader sense, which includes any interests related to an Indigenous nation as well as their Section 35 Rights (collectively, "Indigenous Interests").

The EAO notes that an EA is not a rights-determination process. Key objectives of an EA are to assess potential effects of proposed projects on Indigenous Interests, and to identify measures to avoid, mitigate or otherwise appropriately address adverse effects.

### 7.1.2 DEPTH OF CONSULTATION

The following section discusses the procedural elements of Indigenous engagement activities undertaken by the EAO and Cedar with Indigenous nations.

On December 13, 2019, the EAO issued a Section 11 Order which specified the consultation activities that both the EAO and Cedar would undertake with Indigenous nations and Métis

[87] Notice of Substitution Approval available at: https://www.projects.eao.gov.bc.ca/api/public/document/5e585defa0087300223bfd68/download/Cedar%20LNG_Federal%20Response%20to%20Request%20for%20Substitution%20Approval%20Under%20the%20Impact%20Assessment%20Act_2020 -01-24.pdf

Nation British Columbia (collectively, Indigenous Groups) for Cedar LNG. The EAO considered comments received from Indigenous nations on the draft Section 11 Order.

Indigenous nations listed in Schedule B of the Section 11 Order (alphabetically) to be consulted on the Project include:

- Gitga'at First Nation (Gitga'at)
- Gitxaała Nation (Gitxaała)
- Haisla Nation (Haisla)
- Kitselas First Nation (Kitselas)
- Kitsumkalum First Nation (Kitsumkalum)
- Lax Kw'alaams Band (Lax Kw'alaams)
- Metlakatla First Nation (Metlakatla)

Indigenous nations listed in Schedule C of the Section 11 Order to be consulted on Project-related marine shipping include:

- Haida Nation (Haida), as represented by the Council of the Haida Nation (CHN).

As the Cedar LNG EA was completed as a substituted assessment for the Impact Assessment Agency of Canada (the "Agency") potential effects on the Métis Nation British Columbia (MNBC) were assessed as per Section 13 of the Section 11 Order.

#### *7.1.2.1 EAO-Led Engagement Activities*

EAO-led engagement with Indigenous nations included the following:

- Participation in the Working Group;
- Opportunities to seek to achieve consensus throughout the EA;
- Regular government-to-government calls between the EAO and each Indigenous nation;
- Opportunities to identify Indigenous Interests that may be adversely affected by Cedar LNG and to discuss potential measures to avoid, mitigate, address or otherwise accommodate potential adverse effects on Indigenous Interests, as appropriate;
- Opportunities to participate in issue/topic-specific Working Group sessions with the EAO;
- Opportunities to review and comment on key documents, including: the draft Project Description, draft Section 11 Order, draft AIR, Cedar's Application, supplemental materials and topic-specific memos, the EAO's draft Assessment Report (including Part C of the Assessment Report), the draft Project Description (PD), and draft Table of Conditions (TOC);
- Opportunity to collaboratively draft sections of the EAO's Assessment Report (Part C) within established timelines;
- Opportunity to submit a document outlining the Indigenous nation's views on the Assessment Report, PD and TOC to be included in the package of materials sent to decision makers when Cedar LNG is referred for decision;

- The EAO and the Agency provided Gitga'at, Gitxaała, Haisla, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla with grants/funding for participation in the pre-Application phase and the Agency also provided funding to the CHN and MNBC; and
- The EAO provided grants/funding for participation in the Application review phase to CHN, Gitga'at, Gitxaała, Haisla, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla on behalf of the Agency and itself, and to MNBC on behalf of the Agency.

#### *7.1.2.2 Consensus-Seeking*

Indigenous nations and the EAO worked together during the EA process with the goal of seeking to achieve consensus on key issues and documents in order to support Indigenous, provincial and federal decision-making. Approaches to consensus-seeking with the EAO varied across the Indigenous nations and, for some, included the identification of check-ins that aligned with key milestones in the EA process, and the development of a consensus tracking tool for documenting and communicating out issues resolution activities and outcomes.

#### *7.1.2.3 Proponent-Led Engagement Activities*

As part of the Section 11 Order, the EAO directed Cedar to undertake certain procedural aspects of consultation during the EA with Indigenous nations. The Section 11 Order also required Cedar to develop and share drafts of an Indigenous Consultation Plan and Indigenous Consultation Reports with Indigenous nations at prescribed milestones during the EA. These documents were reviewed by Indigenous nations and revised by Cedar based on input received from and concerns expressed by Indigenous nations prior to being submitted to the EAO. These documents enabled the EAO to:

- Understand Cedar's consultation plan and subsequent efforts and the perspectives of the Indigenous nations related to those efforts;
- Understand any issues and concerns identified by Indigenous nations to Cedar and how Cedar has made efforts to respond to or address these issues;
- Evaluate Cedar's consultation plan for subsequent consultation activities required with Indigenous nations during Application Review; and
- Direct Cedar to take additional measures to satisfy the EAO and/or Indigenous nation concerns/questions, when applicable.

Cedar engaged with Schedule B Indigenous nations to complete Indigenous Knowledge studies and other reports specific to Cedar LNG. Cedar received studies from the following Indigenous nations:

- Gitga'at prepared the Gitga'at First Nation Traditional Use and Occupancy Study for the Project: Final Report (2021) and the Gitga'at First Nation Community Well-being Risk Report for the Cedar LNG Project (2021);
- Gitxaała prepared the Draft Gitxaała Nation Use Study (2021), the Gitxaała Nation Valued Component Selection Document: Cedar LNG Liquefaction and Export Terminal (2020) and the Gitxaała Nation Socio-economic Information Report for the Cedar LNG Project (2022); and

- Kitsumkalum is currently preparing an Indigenous Land Use Study to assess the potential effects of Cedar LNG.

Cedar engaged directly with Indigenous nations throughout the Pre-Application and Application Review phases for the purposes of information sharing and issues resolution.

Cedar engaged with Indigenous nations according to their preferences. Examples of Cedar's engagement activities with Indigenous nations included:

- Providing regularly scheduled project updates, conference calls and meetings with Indigenous nation administrative staff, consultants, elders, and other parties as requested by the Indigenous nation leadership or technical staff;
- Conducting community meetings, open houses and workshops where requested;
- Providing printed and digital materials to be shared with community members where requested;
- Facilitating opportunities to participate in collecting baseline information, as well as review and input into the information; and
- Maintaining a website with Project information and contact information for how to request in-person meetings.

Cedar recognized that each Indigenous nation is best positioned to identify and engage with their memberships, and Cedar attempted to reflect those nation-specific efforts within the Application.

### 7.1.3 ASSESSMENT METHODS

Cedar's Application assessed a combination of the following effects that varied on a nation-by-nation basis:

- Consumption and harvest;
- Use and integrity of sacred and culturally important sites or landscape features;
- Access and travel;
- Aspects of Indigenous governance (including consideration of socio-economic impacts);
- Cultural identity; and
- Aboriginal rights and title.

The EAO worked with those Indigenous nations that expressed an interest in doing their own assessment to draft and organize their own section of this Report. These nation-led assessments were based on their nation-specific Indigenous Interests using the information provided by Cedar in its Application and each Indigenous nation's own Indigenous knowledge. The EAO and Indigenous nations worked together iteratively regarding assessment methods and reviews during Pre-Application and Application Review. The sections that the EAO drafted

for Indigenous nations were shared with those Indigenous nations to work together on a final version of this Report. All of the assessments were based on their nation-specific Indigenous Interests using the information provided by Cedar in its Application and each Indigenous nation's own Indigenous Knowledge.

For all Indigenous nations potentially affected by Cedar LNG, the assessment of potential effects of Cedar LNG are on the asserted or established Aboriginal rights and title, as recognized and affirmed by Section 35 of the *Constitution Act, 1982* as well as on any broader interests related to an Indigenous nation (collectively, "Indigenous Interests"). Further details on the assessment of effects to Indigenous Interests for each Indigenous nation is listed below, and additional information is provided in the nation-specific sections of this Report:

- The EAO drafted the Gitga'at, Haisla, Kitsumkalum and Haida sections with opportunities for iterative review and input by the Indigenous nations;
- The EAO drafted the MNBC section;
- Gitxaała drafted its own section structured around Gitxaała VCs and the information provided in Cedar's Application with review and input by the EAO;
- Kitselas drafted its own section using Kitselas' Values and methods for characterizing effects with iterative review and input by the EAO; and
- Lax Kw'alaams and Metlakatla co-drafted a single assessment with Indigenous Interests identified through their experiences with other EAs in Coast Tsimshian traditional territories, consistent with the United Nations Declaration on the Rights of Indigenous Peoples, and the Indigenous Interests identified in Cedar's Application, followed by review and input by the EAO.

These individual Indigenous nation assessments will be included in the final assessment report.

Details on proposed EAC conditions and recommended federal Mitigation Measures and Follow Up Programs relevant to Indigenous Interests are identified in the Potential Effects on Aboriginal Interests section of this Report. In addition, Cedar will be required to obtain various federal permits, approvals and authorizations. Details on these authorizations are available in the Joint Permitting / Regulatory Coordination Plan and the Regulatory Coordination Tracking Table[88].

### 7.1.4 REGIONAL CONTEXT AND EFFECTS OF CONCERN

Each of the Indigenous nations have been affected by industrial development and physical activities in the region which have already resulted in cumulative effects on Indigenous Interests. The North Coast is the location of several other industrial projects (as described in section 2.2.4 of Part A) which are relevant to the assessment of Cedar LNG. These projects have

[88] Available on the Cedar LNG page on EPIC: https://www.projects.eao.gov.bc.ca/p/5d64644c2f3e4f00223e81c0/project-details

or will contribute to the existing conditions for the Marine Shipping Route, or the Facility Area, and thereby, affect Indigenous Interests. These effects on Indigenous Interests include effects on the marine environment from marine shipping and socio-economic effects due to increase in industrial and large-scale projects and indirect effects from these projects, such as potential increase in transient workers, strain on healthcare system, and a reduction in housing availability. The regional context varies on a nation-by-nation basis. Federal initiatives are being planned or are underway that strive to address the broader cumulative effects concerns in the marine environment that have been raised by Indigenous nations. These are described in section 3.1 of Part A.

Part B of this Report describes comments received by Indigenous nations on VCs and other assessment matters. Common topics of interest to Indigenous nations, in addition to regional cumulative effects, included effects of marine shipping on the biophysical environment (such as effects on air quality, the acoustic environment and marine resources). Malfunctions and accidents and the effects of marine shipping on marine harvesting, use and other traditional activities were also of key interest to many Indigenous nations. The linkages between the effects assessed in Part B and on Indigenous Interests are described below.

### 7.1.5 POTENTIAL EFFECTS ON ABORIGINAL INTERESTS

The purpose of this section is to describe the current context and summarize the main potential effects on Aboriginal Interests for the Indigenous nations whose asserted traditional territory overlaps with the Project and is not intended to generalize effects. The EAO and Indigenous nations are currently collaborating on their individual assessments, which will replace the following generalized assessment.

#### *7.1.5.1 Harvesting Rights*

Indigenous nations whose traditional territory overlaps with the Facility Area, the Marine Terminal Area and/or the Marine Shipping Route may have their harvesting rights impacted by Cedar LNG.

Indigenous nations harvest a variety of culturally important fish species from the marine waters of their traditional territory. These include herring, oolichan, salmon, cod, halibut, cuttlefish, bullhead, flounder, skate, rockfish and Pacific herring and herring eggs. The only marine mammal still harvested is seals. Indigenous nations harvest in the intertidal zone for shellfish and other invertebrates, seaweed and kelp.

With respect to terrestrial harvesting, Indigenous nations harvest many species of vegetation for food, medicines, weaving and construction. The terrestrial environment also provides Indigenous nations with large mammals such as black and grizzly bears, moose, deer, mountain goats, wolves and wolverines for food and subsistence purposes. Smaller mammals, including beavers, porcupines, marmots, martens, fisher, otter, mink, weasels and muskrats, along with waterfowl, are hunted and trapped for subsistence. Plants harvested include blueberries, black

currant, gooseberries, soapberries, crabapples, and high-bush cranberries. Seagull eggs are collected, and other bird species are hunted for feathers and material for tool and jewelry production.

#### 7.1.5.1.1 Potential Project Effects

The EAO identified the following effects to VCs in Part B, following the application of mitigation measures, that could potentially impact Indigenous nation's harvesting rights:

- Wake waves generated by LNG carriers and escort tugs were identified as posing a safety risk to fishers, shoreline harvesters and other Indigenous nations' marine uses, or resulting in displacement in marine and shoreline harvesting activities (Section 5.9: Marine Use);
- Effects from increase in marine shipping may affect marine fisheries, Indigenous vessel transit and other uses as a result of reduced fishing and other marine use opportunities, interference with access to fishing or marine use areas, and a reduced quality of experience due to increase in marine shipping along the Marine Shipping Route and noise, light and aesthetic effects of LNG vessels (Section 5.9: Marine Use; Section 5.2: Acoustics);
- Impacts on marine fish health and mortality from adverse effects on water quality due to Project activities during construction (that is, marine pile installation), operations (that is, liquefaction of natural gas) and decommissioning (that is, dismantling of marine infrastructure) (Section 5.6: Marine Resources);
- Effects on marine mammals and fish during all Project phases due to underwater noise and artificial light are expected to affect marine mammals and fish during construction, operation, and decommissioning activities (Section 5.6: Marine Resources);
- Injury or mortality to marine organisms is expected during all Project phases from burial or crushing of organisms during construction of the FLNG facility and seawater intake and outfall pipes, as well as injury or mortality to marine mammals by vessel strikes (Section 5.6: Marine Resources);
- Potential loss of containment of LNG from FLNG Facility, spills of hazardous materials, emergency FLNG shutdown, fire or explosion, LNG carrier grounding or collision or allisions and FLNG allision resulting in possible effects to air quality, acoustics, wildlife, marine resources and marine use (Section 6.1: Malfunctions and Accidents);
- Potential loss of containment of LNG from FLNG Facility, spills of hazardous materials, emergency FLNG shutdown, fire or explosion, LNG carrier grounding or collision or allisions and FLNG allision resulting in possible effects to air quality, acoustics, wildlife, marine resources and marine use (Section 6.1: Malfunctions and Accidents);
- Direct and indirect loss of habitat will result from Project activities during construction (such as site preparation and clearing, alteration of shoreline and intertidal habitat), operation (such as indirect loss or alteration of habitat effectiveness through sensory disturbance and traffic), and decommissioning (that is, removal of the FLNG facility and onshore infrastructure) (Section 5.4: Wildlife);
- The movement of some wildlife species may be affected by the barrier imposed by the fence surrounding the Facility Area (Section 5.4: Wildlife);

- Increase in mortality risk for wildlife due to increase in vehicle traffic (collisions) and vegetation clearing (human access for hunting and trapping) (Section 5.4: Wildlife);
- Loss of traditional use plants from Facility Area footprint and potential increase in invasive plant species (Section 5.3: Vegetation Resources);
- Reduction in forest communities (including old growth) and wetlands from Facility Area (Section 5.3: Vegetation Resources);
- Increase from baseline concentrations in the vegetated area that will result in exceedances of sulphur dioxide, acid deposition and nitrogen deposition (Section 5.3: Vegetation Resources);
- Freshwater quality negatively affected from increase in total suspended solids in streams during construction and sulphur and nitrogen compounds in lake areas and streams from emissions during operation (Section 5.5: Freshwater Fish);
- Alteration of freshwater fish habitat from riparian clearing, which would result in increased total suspended solids (soil erosion) and changes in fish cover/shading (Section 5.5: Freshwater Fish); and
- Decrease in freshwater fish health and increase in mortality due to the alteration of habitat and water quality (Section 5.5: Freshwater Fish).

Considering the EAO's conclusions on residual effects to these VCs and other assessment matters, and the information provided in the Application from Cedar regarding potential effects to Indigenous nations, the EAO identified the following potential effects to Indigenous nation's harvesting rights due to Cedar LNG during construction, operations and decommissioning including:

- **Methods, locations and opportunities:** The increased marine vessel traffic within the Marine Shipping Route and Marine Terminal Area, project activities and physical works within the Marine Terminal Area, and potential for accidents and malfunctions in the Marine Terminal Area and Marine Shipping Route, may result in loss or alteration of preferred harvesting methods, locations to harvest fish and marine resources, as well as wildlife, during seasonal rounds;
- **Time**: Time may be lost when harvesting, including when harvesting for Elders and/or redistribution to other Indigenous nation members from the increase in marine vessel traffic in the Marine Shipping Route and project activities/physical works within the Marine Terminal Area, and potential for interference with Indigenous nation members fishing, hunting and gathering;
- **Access**: Access to preferred shoreline harvesting sites, hunting sites, fishing sites, trapping sites and gathering sites may be lost or altered from an increase in marine vessel traffic, change in types of vessels, project activities/physical works and accidents and malfunctions in the Marine Terminal Area and Marine Shipping Route;
- **Experience**: Harvesting experiences may be altered from an increase in vessel traffic and type, wake waves, sensory disturbance along the Marine Shipping Route and Facility Area, and associated change in noise and light and air quality and air quality; and

- **Subsistence-based livelihoods and trade:** Alteration of both subsistence-based livelihoods and trade relationships with neighbouring Indigenous nations may occur from disruption of marine bird movement due to marine vessel traffic, change in marine mammal and fish behaviour and increased risk of marine fish, marine bird, and marine mammal mortality due to potentially fatal strikes with marine vessels, change in wildlife habitat, vegetation and freshwater fish habitat from the project activities/physical works and displacement of marine users due to an increase in vessel traffic and type and wake waves within the Marine Shipping Route and potential for accidents and malfunctions.

#### 7.1.5.1.2 Mitigation Measures

The Application includes a summary of relevant mitigation measures identified that Cedar has proposed in response to potential Cedar LNG-related effects on harvesting rights. These include the following:

- Cedar will continue to work with Indigenous nations to develop a shared understanding of how Cedar LNG may affect their Indigenous interests;
- Cedar is committed to working with Indigenous nations to explore opportunities to further mitigate adverse effects to harvesting rights; and
- Cedar will, with consultation with Indigenous nations and members, establish an LNG carrier shipping schedule notification process for Indigenous nations with traditional territories overlapping the shipping route to contribute to a reduction of adverse effects (such as avoidance, displacement and lost time) due to safety concerns (such as wake waves), inconvenience (such as pulling fishing gear), or reduced enjoyment (such as sensory disturbance).

**Provincial Conditions and Federal Mitigation Measures**

The following proposed provincial conditions and federal Mitigation Measures would mitigate potential effects on harvesting rights:

- CEMP (Condition 9), which includes a requirement for air quality and noise management, a wildlife management plan, water quality monitoring and mitigation measures, invasive plant management measures and pre-construction surveys for traditional use plants;
    - The CEMP must include measures for wildlife monitoring, reporting and mitigation that include measures to avoid or reduce loss or alteration of wildlife habitat, injury or mortality and reduce human-wildlife contact;
    - If a small craft jetty is built, the CEMP must include an Underwater Noise Monitoring and Management Plan which will include the migration and monitoring for protection of marine mammals and fish during pile driving;
    - The CEMP must include measures for mitigating effects on vegetation and wetlands including invasive species management;
- Marine transportation communication report (Condition 12) and marine transportation

plan (federal Mitigation Measure), which will include communication of project activities that may affect Indigenous nation's fishers, a shipping schedule notification process and grievance process for Indigenous nation's marine users who have lost fishing gear;

- During the year before operation and for the first three years of operation of the FLNG facility, Cedar will undertake noise monitoring at four receptor locations and identify any implementable corrective actions;
- Establish marine communication procedures, which includes an LNG carrier shipping schedule notification process, reporting process to report on concerns related to LNG carrier interference with marine use and methods for regular communication on operation activities with Indigenous nations;
- Prior to operations, Cedar will determine if new publicly available information on characteristics of wake from marine shipping activities, or new mitigation measures to reduce wake effects on Indigenous traditional harvesting activities is available;
- Design lighting for the Project consistent with the OGC Light Control Best Practices Guideline;
- Locate water intakes on or near the bottom of the FLNG barge and situated away from the shoreline, above the seabed to mitigate injury or mortality of juvenile fish associated with entrainment and impingement (operation);
- Reduce risk of accidents and malfunctions by equipping the FLNG Facility with a process safety system, implement a maintenance program that includes regular inspections and maintenance of the FLNG equipment and infrastructure, implement programs to ensure staff are trained to ensure safety and appropriate response to incidents, implement an emergency management program for operations, participate, as relevant, in the development of shipping-related spill response plans and facilitate the involvement of Indigenous nations in the development of these shipping-related spill response plans, where appropriate, and share information with Indigenous nations on any Cedar LNG carrier incident that results in a release of cargo or fuel to the environment;
- Advanced notification to residences (within 3 km of activities) of planned high-disturbance noise-causing activities at the Facility Area and along the transmission line;
- Fitting gas or diesel engine exhausts with noise mufflers and turn off equipment when not in use to minimize idling;
- Regular maintenance of machinery and equipment to ensure noise emissions are within range set by manufacturer;
- Consider all noise ratings of construction and operation equipment in the procurement process;
- Design Cedar LNG lighting to reduce risk of injury or mortality and change in movement of marine and migratory birds;
- Include mitigation measures for freshwater fish including mitigation to reduce sediment and runoff into watercourses, limit riparian clearing, ensure watercourse crossing structures follow the DFO's Fish-Stream Crossing Guidebook;
- If requested by Haisla, incorporate traditional use plants into reclamation planning for temporary construction areas on Crown land; and

- Develop and implement a wetlands compensation plan with Haisla if required under federal ECCC guidance.

In addition, as marine shipping is a federally regulated activity, Cedar LNG-related shipping will need to meet requirements which include usage of escort tugs, proposed route restrictions, safe operating distances between marine craft and safe speeds.

**Cumulative Effects**

Potential cumulative effects on both marine navigation and marine fisheries may occur along the shipping route from the interaction of vessels with overlapping routes (such as Rio Tinto Terminal A Extension, LNG Canada Export Terminal or MK Bay Marina) and current/future projects with marine works in Kitimat Harbour or increasing shipping traffic interfering with access to sites or activities (for example, fishing, shoreline harvesting or recreational uses), respectively. Cedar LNG will contribute up to 50 LNG carriers (approximately 2.2 percent to the total large vessel traffic predicted for the region if all past, present, and future projects and physical activities proceed). Cedar LNG and its associated safety zone will occupy approximately 16.6 percent of the channel width at the head of Kitimat Arm.

The additional increase in large vessel movements within the Marine Shipping RAA from these potential cumulative effects that is attributable to Cedar LNG with the potential to prevent or reduce access to fishing or shoreline harvesting sites, would result in a disproportionate effect to Indigenous nation's members based on nations' usage of the marine environment and resources for food, social, ceremonial, economic, subsistence and trade purposes.

Potential cumulative effects on terrestrial harvesting may occur within the wildlife and vegetation LAA/RAA based on interaction with projects (such as Rio Tinto Aluminum Smelter, Coastal GasLink Pipeline or Pacific Northern Gas Pipeline) and activities (such as forestry or rail) in the area. Cedar LNG will negatively impact Indigenous nations' harvesting rights with a risk to wildlife and negative effect on vegetation and freshwater fish habitat (such as watercourses).

Cumulative effects related to wildlife may occur from Cedar LNG compounding on three primary impacts on wildlife that have occurred from other regional Project: the increase in local population (for example, risk of mortality or injury from traffic and increasing hunting during construction and operations); change in habitat during construction; and risk of mortality or injury (such as clearing or traffic). Similar cumulative effects related to vegetation may occur due to clearing for the Marine Terminal Area and transmission line, as well as changes to chemical composition in the soil. Freshwater fish may experience cumulative effects due to riparian habitat being altered along fish-bearing watercourses and minor acidification of a small lake that are or will be affected by other projects.

**Conclusion**

The EAO notes that it continues to engage government to government with individual Indigenous nations on the assessment of Cedar LNG effects to Indigenous Interests including seeking consensus on conclusions.

#### *7.1.5.2 USE AND INTEGRITY OF SACRED AND CULTURALLY IMPORTANT SITES AND LANDSCAPE FEATURES*

In the Facility Area and along the Marine Shipping Route, there are landscape features that have been identified by Indigenous people as having an associated name often ascribing the nature of past land use or cultural practice by past and contemporary peoples at that location and include both tangible and intangible aspects of cultural heritage on the landscape. These places are important to the cultural identity, sense of place and sense of attachment that Indigenous nation members have with a place and the relationship people share with the lands and waters of their traditional territory and is often expressed through the connection and dissemination of knowledge on the land.

##### 7.1.5.2.1 Potential Project Effects

The EAO identified the following effects to VCs in Part B, following the application of mitigation measures, that could potentially impact Indigenous nations' use and integrity of sacred and culturally important sites and landscape features:

- Effects on use of sacred and cultural important sites and landscape features from elevated noise along the Marine Shipping Route due to increases in marine shipment traffic and air horns as well as effects to air quality (Section 5.2: Acoustics; Section 5.1: Air Quality)
- Wake waves generated by LNG carriers and escort tugs were identified as having the potential to result in impact to use and integrity of sacred and culturally important sites and landscape features based on the increase in risk to Indigenous nations' marine users (Section 5.9: Marine Use);
- Effects from increase in marine shipping along the Marine Shipping Route are anticipated to interfere with vessel passage during all Project phases in a small proportion of navigable waters (Section 5.9: Marine Use);
- Potential loss of containment of LNG from the FLNG Facility, spills of hazardous materials, emergency FLNG shutdown, fire or explosion, LNG carrier grounding or collision or allisions and FLNG allision resulting in effects to air quality, acoustics, marine use, human health and heritage (Section 6.1: Malfunctions and Accidents);
- Direct and indirect loss of habitat will result from Project activities during construction (t, site preparation and clearing, alteration of shoreline and intertidal habitat), operation (i.e., indirect loss or alteration of habitat effectiveness through sensory disturbance and traffic), and decommissioning (i.e., removal of the FLNG facility and onshore infrastructure) (Section 5.4: Wildlife);
- Loss of marine and shoreline habitat (Section 5.6: Marine Resources);
- Loss of traditional use plants from Facility Area footprint and potential increase in

invasive plant species (Section 5.3: Vegetation Resources); and
- Reduction in forest communities (including old growth) and wetlands from Facility Area (Section 5.3: Vegetation Resources).

Considering the EAO's conclusions on effects to these VCs and other assessment matters, and the information provided in the Application from Cedar regarding potential effects to Indigenous nations, the EAO identified the following potential impacts to use and integrity of sacred and culturally important sites and landscape features due to Cedar LNG during construction, operations and decommissioning including:

- **Access and use**: Loss or alteration of use or access to sacred and culturally important sites and landscape features due to increased marine vessel traffic in the Marine Shipping Area, including associated wake waves and sensory disturbances, and construction in the Marine Terminal Area and Facility Area and linear components (such as the transmission line), as well as the potential for accidents and malfunctions;
- **Traditional knowledge**: Loss or alteration of ability to share traditional knowledge at sacred and culturally important sites and landscape features due to increased marine vessel traffic within the Marine Shipping Route, including associated wake waves, sensory disturbances, and construction in the Marine Terminal Area and Facility Area and linear components (such as the transmission line), as well as the change in air quality and potential for accidents and malfunctions; and
- **Experience**: Reduced quality of experience at sacred and culturally important sites and landscape features as a result of sensory disturbance due to increased marine vessel traffic within the Marine Shipping Route, including associated wake waves and sensory disturbances, and construction of the marine terminal and linear components (such as the transmission line), and change in air quality.

#### 7.1.5.2.2 Mitigation Measures

The Application includes a summary of relevant mitigation measures Cedar has proposed in response to potential effects on use and integrity of sacred and culturally important sites and landscape features. These include the following:

- Cedar will implement a Worker Code of Conduct and provide cultural awareness training for all workers that includes local and cross-cultural awareness;
- Cedar will develop avoidance and/or mitigation strategies in collaboration with the Indigenous nations for any known heritage sites affected by Cedar LNG;
- Cedar commits to fulfilling all requirements for field assessment and mitigation required for Cedar LNG under the *Heritage Conservation Act* and *Land Act*, as well the implementation of the CEMP and chance find procedure;
- Cedar will avoid, where feasible, known heritage sites when siting project infrastructure, which may involve archaeological monitoring during construction;
- If avoidance of heritage sites is not feasible, Cedar will consult with Haisla and any additional mitigation measures determined through consultation will be implemented;
- LNG carriers will maintain a safe operating distance from other marine craft to reduce

potential for interaction between vessels; and
- Regular communication with Indigenous nation's marine users to provide advance notice of marine shipping activities.

**Provincial Conditions and Federal Mitigation Measures**

The following proposed provincial conditions and federal Mitigation Measures would mitigate potential effects on use and integrity of sacred and culturally important sites and landscape features:

- CEMP (Condition 9), which includes the requirement for a chance find procedure for heritage resources, as well as a wildlife and vegetation management plans;
- If requested by Haisla, traditional use plants will be incorporated into reclamation planning for temporary construction areas on Crown land;
- Marine transportation communication report (Condition 12) and marine transportation plan (federal Mitigation Measure), which will include regular communication of project activities that may affect marine use and establish an LNG carrier shipping schedule notification process;
- Cedar will participate, as relevant, in the development of shipping-related spill response plans and facilitate the involvement of Indigenous nations in the development of these shipping-related spill response plans, where appropriate;
- Cedar will share information with Indigenous nations on any Cedar LNG carrier incident that results in a release of cargo or fuel to the environment; and
- Prior to operations, Cedar will determine if new publicly available information on characteristics of wake from marine shipping activities, or new mitigation measures to reduce wake effects is available.

**Cumulative Effects**

The potential cumulative effects resulting from Cedar LNG on the use and integrity of sacred and culturally important sites and landscape features include those described in section 7.1.5.1.

The cumulative effects from Cedar LNG on the use and integrity of sacred and culturally important sites and landscape features may be alleviated by the mitigation measures described in section 7.1.5.2.

**Conclusion**

The EAO notes that it continues to engage government to government with individual Indigenous nations on the assessment of Cedar LNG effects to Indigenous Interests including seeking consensus on conclusions.

#### *7.1.5.3 Indigenous Governance*

Indigenous governance are complex patterns and practices that have been developed over millennia. These patterns and practices include distinct social and political organization that

governs the ownership, access, or right to specific territories, as well as the management and protection of these areas.

#### 7.1.5.3.1 Potential Project Effects

The EAO identified the following effects to VCs in Part B, following the application of mitigation measures, that could potentially impact Indigenous nation's Indigenous governance:

- Effects from increase in marine shipping along the Marine Shipping Route are anticipated to interfere with vessel passage during all Project phases in a small proportion of navigable waters (Section 5.9: Marine Use);
- Changes in the ability to make decisions regarding land use may occur due to changes in private property and tenured land use (Section 5.8: Land and Resource Use); and
- Positive effects to regional employment with regional gains in employment and income that are moderate in magnitude given the workforce estimates (Section 5.7: Employment and Economy).

Considering the EAO's conclusions on residual effects to these VCs and other assessment matters, and the information provided in the Application from Cedar regarding potential effects to Indigenous nations, the EAO identified the following potential effects to Indigenous governance due to Cedar LNG during construction, operations and decommissioning:

- **Decision making:** Changes in Indigenous nations' ability to make decisions regarding marine use may occur due to increased marine vessel traffic along the Marine Shipping Route. Positive effects on decision making are anticipated because the Project is a Haisla-led partnership with Pembina Pipeline Corporation. The Project would also provide career opportunities for current Haisla youth and community members and investments in social, health, and educational programs, which would have the potential to empower future generations;
- **Resource access and usage:** The change in private property and tenured land use during construction and operation may result in direct loss or access to resources, as well as disruption to resource use activities (such as recreation, hunting or harvesting). The Project may also cause disturbances due to noise, visual effects and lights to private land owners and tenured users.
- **Employment and economy:** Positive effects may be experienced due to the creation of direct, indirect, and induced employment for Indigenous nation members and other residents of the region. Negative effects may be experienced due to inability for certain sub-populations to participate equitably in employment, as well as wage inflation, labour drawdown, increased operation costs for businesses, increased cost of living, and increased cost of housing and accommodations.

#### 7.1.5.3.2 Mitigation Measures

The Application includes a summary of relevant mitigation measures identified that Cedar has proposed in response to Cedar LNG-related potential effects on Indigenous governance. These include the following:

- Cedar will engage with and notify any affected property owners and holders of affected tenures on the location and timing of project activities;
- High-disturbance project-related construction activities will be limited to daytime hours only;
- Cedar will work with Indigenous nations to develop a shared understanding of how Cedar LNG may affect their interests including the development of the Marine Transportation Management Plan;
- Development of a Marine Transportation Management Plan (MTMP), in accordance with applicable federal and provincial legislation and regulations, to communicate Cedar LNG construction activities to other marine users with involvement of Indigenous nations;
- Cedar will continue to consult with Indigenous nations regarding economic opportunities to help reduce adverse effects on community equality and equity;
- Cedar will implement a local hire and procurement policy during construction and operation and promote training opportunities where feasible to limit an increase in demand on local infrastructure and services from non-locally resident workers and reduce adverse effects on social cohesion through a continuation of existing community equity and equality;
- Cedar will identify potential shortages of workers with specific skill requirements and training, and work with Indigenous nations to increase opportunities for Indigenous and local community members to obtain training required for project participation;
- Cedar will develop a contracting and procurement strategy that recognizes and acknowledges Indigenous businesses; and
- Cedar will notify Indigenous nations of employment and training opportunities related to Cedar LNG.

**Provincial Conditions and Federal Mitigation Measures**

The following proposed provincial conditions and federal Mitigation Measures would mitigate potential effects on use and integrity on Indigenous governance:

- Community feedback process (Condition 11), which will allow Indigenous nations to submit questions regarding the Project and review Cedar's report based on questions received;
- Socioeconomic management plan (Condition 14), which provide hiring and training measures including local hiring, job training and apprenticeships;
- Inform local residents and Indigenous nations of job and procurement opportunities during all project phases;
- Identify potential shortages of workers with specific skill requirements and training, and work with local and regional Indigenous employment centers, local and regional training and education facilities, and communities to increase opportunities for Indigenous and local community members to obtain training required for project participation;

- Provide information to local and Indigenous employment agencies and economic development organizations to help them plan for increased demand for labour;
- Provide on-the-job training programs and apprenticeship opportunities;
- Implement policies and practices to provide opportunities to local businesses and contractors;
- Consider opportunities over the life of Cedar LNG to enable Indigenous, local, and regional businesses and contractors to have repeated or ongoing contracts.

**Cumulative Effects**

- The cumulative effects resulting from Cedar LNG on harvesting rights (section 7.1.5.1) also apply to Indigenous governance. In addition, cumulative effects on infrastructure and services are anticipated to be experienced by Indigenous nations. A positive cumulative effect is expected to result in the availability of infrastructure and services based on the increase in local population during operations. However, a negative cumulative effect is expected due to reduction in housing availability.
- Cumulative effects from Cedar LNG may be alleviated by the mitigation measures proposed for harvesting rights (section 7.1.5.1) as they remain applicable to Indigenous governance, self-determination and territorial stewardship.

**Conclusion**

The EAO notes that it continues to engage government to government with individual Indigenous nations on the assessment of Cedar LNG effects to Indigenous Interests including seeking consensus on conclusions.

#### *7.1.5.4 Indigenous Health and Well-being*

Indigenous communities have unique histories and perspectives on community well-being, which are rooted in their deep-time knowledge and connection to their traditional territories, cultural practices, customs, languages, and laws. Over the last few centuries, multiple historic, social, and political events in Canada have resulted in disproportionately distributed effects on the mental, emotional, physical, and spiritual health of Indigenous peoples. Indigenous people continue to experience challenges with the Canadian health system and health services today.

##### 7.1.5.4.1 Potential Project Effects

The EAO identified the following effects to VCs in Part B, following the application of mitigation measures, that could potentially impact Indigenous nation's members health and well-being:

- Change in air quality and acoustics have the potential to negatively affect human health based on durations of exposure and proximity of marine vessels in the Marine Shipping Route (Section 5.12: Human Health);
- Potential negative effects on infrastructure, services, transportation and accommodation availability with the workforce of 500 during construction and 100 during operations (and their families) increasing demand on utilities, health care and

emergency services, policing, education, housing and temporary accommodations and local transportation infrastructure (Section 5.10: Infrastructure and Services);
- Positive effects to regional employment with regional gains in employment and income that are moderate in magnitude given the workforce estimates (Section 5.7: Employment and Economy);
    - Positive effects may be unevenly distributed and not benefit groups that are under-represented, including Indigenous peoples and women (Section 6.8: Summary of Effects to Human and Community Well-Being);
- Increase on local childcare demand (daycare and preschool infrastructure) with resulting increase in employment barriers and work-related stress and mental health effects on women in the area (Section 6.8: Summary of Effects to Human and Community Well-Being);
- Health and education inequities due to income levels (Section 6.8: Summary of Effects to Human and Community Well-Being);
- Increase in drug and alcohol above and increased incidences of STIs due to increase in disposable income (Section 6.8: Summary of Effects to Human and Community Well-Being);
- Rising cost of housing rentals and availability (Section 6.8: Summary of Effects to Human and Community Well-Being);
- Effects to mental health and well-being from erosion of culture, identity, sense of place and language (Section 6.8: Summary of Effects to Human and Community Well-Being); and
- LNG carrier grounding or collision or allisions and FLNG allision resulting in effects to air quality, acoustics, marine use, human health and infrastructure and services (Section 6.1: Malfunctions and Accidents).

Considering the EAO's conclusions on residual effects to these VCs and other assessment matters, and the information provided in the Application from Cedar regarding potential effects to Indigenous nations, the EAO noted that potential effects on Indigenous health and well-being could occur through all of the potential effects to the other Indigenous Interests. These potential effects include:

- **Human health:** Changes in human health (such as mental and physical) due to changes related to consumption and harvesting, including access and quality/quantity of resources, as well as effects to human health from effects on air quality. Changes in human health (such as mental and physical) due to outside stressors and loss of culture may occur through increased marine vessel traffic, associated sensory disturbances, changes in air quality, and potential for accidents and malfunctions, along the Marine Shipping Route;
- **Social Determinants of Health:** Positive effects through increase in economic benefits (including employment) that contribute to community well-being. Negative effects through changes in the social, health and culture effects that contribute to changes in human and community well-being (i.e., social determinants of health) of Indigenous nation members may occur due to effects of Cedar LNG on: culture, population growth,

education, governance, health (including food security, quality and cost of food, access to healthcare and holistic mental health supports), housing (including increased affordable housing), social stressors (including community safety); and

- **Infrastructure and services:** Changes in infrastructure, services, accommodation, and transportation may occur through increased demand from Project personnel (and their families) on utilities (such as water, sewer or waste infrastructure), health care and emergency services, policing services, educational services, housing and temporary accommodations, and local transportation infrastructure.

#### 7.1.5.4.2 Mitigation Measures

The Application includes a summary of relevant mitigation measures identified that Cedar has proposed in response to potential Cedar LNG-related effects on Indigenous health and well-being, these include:

- Cedar will, with consultation with Indigenous nations, establish an LNG carrier shipping schedule notification process for Indigenous nations with traditional territories overlapping the shipping route to contribute to a reduction of adverse effects (such as avoidance, displacement or lost time) due to safety concerns (such as wake waves), inconvenience (such as pulling fishing gear), or reduced enjoyment (such as sensory disturbance);
- Cedar will develop avoidance and/or mitigation strategies in collaboration with Haisla for any known heritage sites affected by Cedar LNG;
- LNG vessels will maintain safe operating distances from other marine craft;
- Cedar will develop a Marine Transportation Management Plan, in accordance with applicable federal and provincial legislation and regulations, to communicate Cedar LNG construction activities to other marine users with involvement of Indigenous nations;
- Cedar will implement a Worker Code of Conduct and provide cultural awareness training for all workers that includes local and cross-cultural awareness and will assist in reducing adverse behaviours of workers in local communities and limit demand on local police and emergency services; and
- Cedar will implement a Community Feedback Process that aims to provide open and transparent means for the community to seek information and raise concerns as well as have inquiries addressed in a timely manner during construction and operations; and
- Cedar will implement infrastructure and services and GBA Plus follow-up programs.

**Provincial Conditions and Federal Mitigation Measures**

The following proposed provincial conditions and federal Mitigation Measures would mitigate potential effects on use and integrity on Indigenous health and well-being:

- CEMP (Condition 9), which will include air quality management measures;
- Community Feedback Process (Condition 11), which will allow Indigenous nations to submit questions regarding the Project and review Cedar's report based on questions received;

- Health and Medical Services Plan (Condition 13), which will include a plan for addressing communicable diseases and reduce additional burden on local and regional healthcare system;
- Socioeconomic Management Plan (Condition 14), which will not permit worker to rent local housing, require training regarding drug and alcohol use, implement gender equity and diversity employment measures and implement mitigation measures for gender-based violence;
- Restrict recreational land use activities of non-resident workforce during off-time hours including no hunting, fishing, ATV or snowmobile use in the LAA;
- Develop and implement a code of ethics, respectful workplace policies and provide cultural awareness training for all workers to reduce demand on local police and emergency services (all Project phases);
- Provide an onsite first-aid station, medical room(s) with beds and certified first-aid staff and dedicated communications devices for requesting outside emergency aid to limit demand on local health services during construction and operation;
- Implement onsite security services and security gate at the Cedar LNG site to increase safety by reducing unauthorized access and crime, thereby reducing demand on Kitimat police services during construction and operation;
- Prepare and implement an emergency management program for operation to assist in avoidance / management of emergencies at the Cedar LNG site, thereby limiting demand on emergency services in the LAA for infrastructure and services as defined in Section 7.11 of the Application;
- Use local workforce accommodation centres or hotels to house non-local workers;
- Develop and implement a gender equity and diversity policy that focuses on hiring Haisla members, local and Indigenous persons, and women to increase project employment among underrepresented populations and consideration of the baseline labour force participation status of under-represented groups in Kitimat and the region (all Project phases);
- Develop and implement a drug and alcohol policy (all Project phases);
- Develop and implement workplace violence, harassment, bullying and discrimination processes that promote a safe and respectful environment and contains gender appropriate and gender- and sexuality- specific policies and processes which promote a safe, respectful and inclusive environment for all employees, including women and sexual minorities; Include consideration of Indigenous women and girls and calls to justice within the Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls;
- Inform local residents and Indigenous nations of job and procurement opportunities during all project phases;
- Identify potential shortages of workers with specific skill requirements and training, and work with the Indigenous nation's employment department, regional Indigenous employment centers, local and regional training and education facilities, and communities to increase opportunities for Indigenous members to obtain training required for project participation;

- Provide information to local and Indigenous employment agencies and economic development organizations to help them plan for increased demand for labour;
- Provide on-the-job training programs and apprenticeship opportunities;
- Implement procurement policies and practices to provide opportunities to local businesses and contractors;
- Consider opportunities over the life of Cedar LNG to enable Indigenous, local and regional businesses and contractors to have repeated or ongoing contracts; and
- Potential loss of containment of LNG from FLNG Facility, spills of hazardous materials, emergency FLNG shutdown, fire or explosion, LNG carrier grounding or collision or allisions and FLNG allision resulting in effects to air quality, acoustics, marine use, human health and infrastructure and services.

**Cumulative Effects**

The increase in local population associated with Cedar LNG workforces, in conjunction with other projects, has the potential for cumulative effects receiving support and education, access to recreation, access to healthcare and holistic mental health support, food security, increase in homelessness and decrease in access to lands and resources.

**Conclusion**

The EAO notes that it continues to engage government to government with individual Indigenous nations on the assessment of Cedar LNG effects to Indigenous Interests including seeking consensus on conclusions.

#### *7.1.5.5 Positive Effects of Cedar LNG*

Cedar LNG is a key element of Haisla's economic and social development strategy and will further advance reconciliation by allowing the Haisla to directly own and participate in a major industrial development in their territory. Cedar LNG is anticipated to be the first Indigenous-majority owned export facility in Canada, which will create jobs, contracting and other economic opportunities for Haisla, the local community, Indigenous nations, and the northwest region of British Columbia. In addition, income generated by Cedar LNG will be invested in the Haisla community.

Positive effects are anticipated within Terrace and Kitimat (such as infrastructure and services LAA, and the employment and economy LAA) through regional gains in employment and income and business, although it is anticipated that direct positive effects on many of the Indigenous nations will be limited. The Application states that Cedar is working directly with Indigenous nations to identify opportunities to realize potential benefits from the Project that can be used to both offset potential adverse effects and create positive effects for Indigenous nations.

## 7.2 MÉTIS NATION BRITISH COLUMBIA

### 7.2.1 COMMUNITY PROFILE

Métis people are one of three "Aboriginal peoples of Canada" within the meaning of S. 35 (2) of the *Constitution Act*, 1982. Métis people are descendants of unions between European men (explorers, fur traders and pioneers) and Aboriginal women that occurred in the eighteenth-century. Métis Nation British Columbia (MNBC) is the Métis governing body in B.C. that represents the interests of over 19,000 citizens in 40 Métis Chartered Communities from seven regions in the province. MNBC indicates that it also represents the interests of nearly 90,000 self-identified Métis people in B.C. Since 2003 when the Métis leadership ratified the Métis Nation BC *Constitution*, MNBC has developed laws, regulations, and policies for maintaining, protecting, and furthering the Indigenous Interests of Métis in B.C.

### 7.2.2 MÉTIS NATION BRITISH COLUMBIA'S INVOLVEMENT IN THE CONSULTATION PROCESS

The Agency sent a notification email to MNBC on September 19, 2019, about receiving an Initial Project Description for Cedar LNG, the forthcoming federal impact assessment decision and substitution decision. The EAO issued a Section 11 Order on December 13, 2019 which outlined the EAO's engagement approach with MNBC and stated that any consultation conducted by B.C. with Métis or organizations representing Métis within B.C. under a substituted assessment is understood to be conducted on behalf of the Government of Canada and should not be construed in any way as an acknowledgement by B.C. that it owes a duty of consultation or accommodation to Métis within B.C. under Section 35 of the *Constitution Act*, 1982.

Following the federal Minister of Environment and Climate Change Strategy's approval of B.C's substitution request for Cedar LNG on January 24, 2020 the EAO has engaged with MNBC as specified in Section 13 of the Section 11 Order for Cedar LNG. To date engagement included notification at the following milestones:

- On February 21, 2020, the EAO provided an update on the Cedar LNG EA, which included notification that the Agency determined that a federal impact assessment is required under the IAA and that the federal Minister of Environment and Climate Change Strategy approved B.C.'s substitution request for Cedar LNG.
- On November 16, 2021 the EAO notified MNBC that the final AIR was issued on November 15, 2021. The EAO advised MNBC of the anticipated Application Review period in winter 2022.
- On February 18, 2022 the EAO notified MNBC of the 45-day public comment period for the Cedar LNG Application.

Cedar engaged MNBC as follows:

- Virtual meeting to introduce Cedar LNG (April 3, 2021);
- Provided a copy of the draft Indigenous Consultation Plan for review and comment (March 24, 2021);
- Shared copies of the draft AIR and Valued Component Selection Memo for review and comment and notice of the public comment period on these documents (March 28, 2021);
- Shared drafts for feedback of the draft MNBC Interests Assessment (July 13, 2021 and November 3, 2021); and
- Provided notification of the public comment period on the Application (February 24, 2022).

Cedar's assessment of potential effects on MNBC's Indigenous Interests was informed by its engagement with MNBC. Further details on Cedar's engagement with MNBC is provided in the Application and Cedar's Indigenous Consultation Reports.

The EAO used the following sources in drafting the assessment of Cedar LNG effects on MNBC Indigenous Interests:

- Cedar's Application;
- Information submitted during Application Review;
- Conclusions from the assessment of Part B VCs in this Report;
- Cedar's Summary of Mitigation Measures Table; and
- Cedar's Indigenous Consultation Reports.

### 7.2.3 MÉTIS CONCERNS

MNBC advised Cedar that the Project is within an area that Métis rely on for sustenance, social, and ceremonial purposes, and indicated that there may be negative Project effects to rights and traditional land use.

MNBC reported to Cedar that interactions between shipping and harvesters is MNBC's primary interest in the Project. MNBC reported to Cedar that Métis families have specific harvesting areas that have been used by generations in the vicinity of the Project, actively harvesting culturally important fish species such as salmon, herring, oolichan, rockfish, and regional variants of trout and char species. Other species harvested by MNBC in the vicinity of the Project include marine mammals currently listed under the federal Species at Risk Act and provincial protections, as well as shorebirds, seabirds, and migratory waterfowl.

MNBC reported to Cedar that the region has been well studied for various natural resources, and that a holistic consideration of the cumulative effects of developments along and off the coast is a priority concern. The Application assessed the following MNBC Indigenous Interests:

- Harvesting;
- Sacred and culturally important sites and landscape features; and

- Governance.

#### *7.2.3.1 Changes in consumption and harvest*

Cedar noted that changes may result from loss or alteration of preferred harvesting methods, location or opportunities, loss or alteration of access to preferred harvesting locations, loss or alteration of harvested species, alterations to the harvesting experience, and alteration of subsistence-base livelihood and the ability to trade. The EAO's assessment of changes to current use of lands and resources for traditional purposes (section 6.9.5) discusses these effects and the EAO's proposed mitigation measures.

#### *7.2.3.2 Changes in the use and integrity of sacred and culturally important sites and landscape features*

Cedar described changes that may result from the loss or alteration of use or access to sacred and cultural sites, loss or alteration of ability to share traditional knowledge at sacred and cultural sites and reduced quality of experience as a result of sensory disturbance. The EAO's assessment of changes to cultural heritage, including via disrupted or restricted access, as well as sensory disturbance and proposed mitigation measures are described in section 6.9.5 of this Report.

#### *7.2.3.3 Changes that affect aspects of Métis Nation British Columbia governance, including socio-economic impacts of development and cost of living and unknown long-term physical health impacts*

Cedar noted that that there may be changes to aspects of Metis governance, including human health, due to outside stressors and loss of culture and changes in the ability to make decisions regarding land and marine use. The EAO's assessment of changes to health, social or economic conditions of the Indigenous Peoples of Canada, including via effects on health, economic and infrastructure and services and the EAO's proposed mitigations measures is described in section 6.9.6.

### 7.2.4 RECOMMENDATIONS

Cedar identified a high likelihood of residual adverse effects to MNBC's concerns. The EAO notes that the following EAC conditions and federal Mitigation Measures proposed in relation to effects on marine use, air quality, acoustics and infrastructure and services would mitigate potential effects on MNBC.

- Community feedback process to receive, address, and report on community concerns from the Project, including related to marine use (provincial Condition 11 and a federal Mitigation Measure);
- Marine transportation communication report and marine communication procedures (federal Mitigation Measure), which would include reporting mechanisms for marine

users to report on any concerns related to LNG carrier interference with marine use (provincial Condition 12);

- Federal Follow-up Program on Infrastructure and Services; and
- Proposed provincial Condition 14 for Socioeconomic Management Plan.

### 7.2.5 CONCLUSION

In section 6.9, the EAO concluded that, with the implementation of proposed EAC conditions and federal Mitigation Measures, the Project would not have significant adverse effects on the health and socio-economic conditions of Indigenous peoples or significant adverse effects on the current use of lands and resources for traditional purposes. The EAO considers that these conclusions apply to the concerns of MNBC as well and that the Project is expected to result in negligible impacts to MNBC's Indigenous Interests.

# PART D - CONCLUSIONS

Based on:

- Information contained in Cedar's Application, and supplemental information provided by Cedar, Indigenous nations and Working Group members during the Application review;
- Cedar and the EAO's consultation with Indigenous nations, federal, provincial, and local government agencies and the public;
- Comments received during the Cedar LNG EA made by Indigenous nations, federal, provincial and local government agencies as members of the EAO's Working Group, and Cedar's and the EAO's responses to those comments;
- Comments received during the Cedar LNG EA received during the public comment periods, and Cedar's responses to those issues;
- Issues raised by Indigenous nations regarding the potential effects of Cedar LNG to their Indigenous Interests, and Cedar's response and best effort to address those issues;
- Issues raised by Indigenous nations that were outside of the scope of the Cedar LNG EA, and the federal and provincial agencies' and Cedar's approaches to address those issues;
- The design of Cedar LNG as specified in the EAO's proposed Project Description (Schedule A of the EAC, if issued) which authorizes the Project components and activities that may occur;
- Mitigation measures identified in the EAO's proposed conditions (Schedule B of the EAC, if issued) to be implemented by Cedar during all phases of Cedar LNG; and
- The EAO's recommended Mitigation Measures under the IAA intended to inform federal conditions that would be implemented by Cedar during all phases.

The EAO is satisfied that:

- The EA process has adequately identified and assessed potential adverse environmental, economic, social, heritage and health effects of Cedar, having regard to the proposed conditions set out in the Table of Conditions (Schedule B to the EAC, if issued), and the recommended Mitigation Measures under the IAA;
- Cedar LNG would further advance reconciliation with Haisla because Haisla would directly own and participate in a major industrial development in their territory;
- Positive effects of the Project, including to Haisla and the regional economy, have been maximized to the extent possible;
- Potential accidents and malfunctions associated with Cedar have been adequately identified and assessed for this EA;

- Other assessment matters have been adequately assessed including: risks and uncertainties associated with effects, interactions between effects, the risks of malfunctions and accidents, disproportionate effects on distinct human populations, effects on biophysical factors that support ecosystem functions, effects on current and future generations, contributions to sustainability, consistency with land use plans, greenhouse gas emissions, alternative means for carrying out the project, and potential changes to the Project that may be caused by the environment;
- Consultation with agencies and the public has been adequately carried out;
- Issues identified by government agencies, and members of the public, which were within the scope of the EA, were adequately and reasonably addressed during Application Review; and
- Cedar would result in adverse residual or cumulative effects to environmental, social, heritage and health VCs, but with the application of mitigation measures and legally-binding conditions, these effects would not be significant.

The EAO also notes that consultation with Indigenous nations will be ongoing during the public comment period, including engagement on Part C, conditions, and recommended Mitigation Measures under the IAA. This work includes engagement on Indigenous nations' views on seriousness of effects, and further dialogue on the sufficiency of proposed mitigation and accommodation measures. The EAO continues efforts to seek consensus with Indigenous nations on the assessment of project effects to Indigenous Interests and proposed provincial conditions and federal Mitigation Measures under the IAA.

# APPENDIX 1 – THE EAO'S RECOMMENDED KEY MITIGATION MEASURES AND FOLLOW-UP PROGRAMS UNDER THE *IMPACT ASSESSMENT ACT* (IAA)

Please note that the recommended federal Mitigation Measures and Follow-Up Programs under the IAA inform the draft federal conditions. If Cedar LNG Project (Cedar LNG) is approved, the federal conditions would be legally binding on the Cedar LNG Partners LP (Cedar), whereas the recommended Mitigation Measures and Follow-Up Programs are not. Please see the Cedar LNG webpage on EPIC for the draft federal conditions.

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| Fish and fish habitat<br><br>Aquatic species, as defined in subsection 2(1) of the *Species at Risk Act* (SARA). | 2(a)(i)<br>2(a)(ii) | Freshwater Fish | 1. Implement mitigation measures to reduce sediment erosion and runoff into watercourses (all Project phases)<br>2. Stormwater runoff water quality will meet total suspended solids (TSS) levels within guidelines established within the Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993) and these discharges will not cause the receiving environment to exceed B.C. Water Quality guidelines for turbidity and TSS, considering both short-term and long-term exposures (all phases)<br>3. Limit riparian clearing to the extent necessary to meet Project safety and design and the necessary limits will be determined by a professional (construction)<br>4. Delineate clearing boundaries using flagging or electronic delineation prior to site preparation to keep clearing activities within the designated project footprint (construction)<br>5. Watercourse crossing structures will follow DFO's Interim Code of Practice: Temporary Steam Crossings (DFO 2020) and include mitigation measures in the Fish-stream Crossing Guidebook (FLNRO, ENV, and DFO 2012) where these standards are determined to be applicable by a professional (construction); where the Code of Practice is not applicable to the stream crossing, the crossing will be constructed in compliance with the *Fisheries Act.* |
| | | Marine Resources | 6. Establish and maintain designated equipment refueling areas and develop a spill response plan for construction to reduce potential fuel spills into the marine environment (construction)<br>7. Install piles in the intertidal zone for the FLNG facility strut mooring system at lower tides to avoid in-water pile installation or construct a cofferdam that allows piles to be installed in the dry (construction)<br>8. If the small craft jetty is required, use vibratory pile driving methods for the small craft jetty to the extent determined to be possible by a Qualified Professional, and where in-water impact pile driving is necessary, use an effective sound attenuation device (for example, bubble curtain around the full wetted length of the pile) to reduce sound pressure levels (construction)<br>9. If the Proponent opts to build a small craft jetty as part of the Designated Project, the Proponent shall manage underwater noise in a manner that avoids injury or mortality of fish and marine mammals. In doing so, the Proponent shall:<br>○ Conduct any in-water work required for the building of the jetty only between September 1 and February 15 of any year;<br>○ Use vibratory pile driving methods to install the piles required for the jetty, unless not technically feasible. Peak sound pressure levels must be maintained to below the fish mortality threshold of 207 dB re: 1 µPa 10 m from the pile during all pile driving. If impact pile driving methods are required, an effective sound attenuation device (for example, bubble curtain around the full wetted length of the pile) must be installed and functioning prior to and during impact pile driving to reduce and maintain peak sound pressure level to below 207 dB re: 1 µPa 10 m from the pile to avoid injury to or death of fish; |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | ○ Frequently inspect sound attenuation devices to confirm that they are functioning as intended;<br>○ Employ a soft start up procedure where the impact energy is gradually increased. The soft start procedure is to be employed anytime there is a break of 30 minutes or more in impact pile driving. If, during the soft start up, monitoring indicates that noise levels may exceed a peak sound pressure level of 207 dB re: 1 µPa 10 m from the pile, the work will be halted. The work will only resume after additional measures (e.g installing additional bubble curtains, etc.) are implemented to reduce hydroacoustic sound levels below threshold levels;<br>○ Conduct continuous hydroacoustic monitoring during pile driving to verify that underwater peak sound pressure levels do not exceed the 207 dB re: 1 µPa beyond 10 m from the pile to prevent injury or death of fish;<br>○ Monitor hydroacoustic sound levels from pile driving using a two hydrophone configuration (one hydrophone at the mid-point of the water column (for example, equal distance between the surface and substrate) and another hydrophone within 2 m of the substrate). The hydrophones should be located at 10 m from the source (i.e., pile) where possible. If safety issues or overlap with bubble curtain operation restrict the deployment of hydrophones at 10 m, the hydrophones will be placed at the nearest appropriate distance using professional judgement from the qualified professional performing this monitoring to extrapolate the peak sound pressure at 10 m;<br>○ Establish an underwater noise exclusion zone for pinnipeds prior to impact pile driving. Exclusion zones should be large enough that stop work procedures could be implemented prior to pinnipeds entering an area of potential harm. As such, the exclusion zone should be a minimum of 75 m distance from pile driving activities for pinnipeds. This exclusion zone will be verified with onsite hydroacoustic monitoring. If monitoring reveals that the threshold for injury of 190 dB is exceeded at the 75 m pinniped exclusion zone boundary, the exclusion zone radius must be increased to a new outer limit, where hydroacoustic monitoring demonstrates that the injury threshold is not exceeded;<br>○ Establish at minimum a 1000 m cetacean underwater noise exclusion zone (radius around the pile) prior to impact pile driving where sound levels are not to exceed 160 dBRMS re: 1µPa outside of the cetacean exclusion zone during impact pile driving. This exclusion zone will be verified with onsite hydroacoustic monitoring. If monitoring reveals that the threshold of 160 dB is exceeded at the cetacean exclusion zone boundary, the exclusion zone radius must be increased to a new outer limit, where hydroacoustic monitoring demonstrates that the 160 dB threshold is not exceeded;<br>○ Employ an experienced and qualified marine mammal observer(s) to monitor for cetaceans and pinnipeds within the respective cetacean and pinniped exclusion zones during pile driving. Monitoring must occur at least 30 minutes prior to the start of pile driving. If a cetacean or pinniped enters their respective exclusion zone, pile driving must be suspended until the individual has left the exclusion zone or has not been sighted for 30 minutes. Pile driving activities must be carried out when environmental conditions enable effective visual monitoring of the cetacean and pinniped exclusion zones;<br>○ Immediately halt pile driving activities if hydroacoustic monitoring indicates sound levels are in excess of the thresholds identified. Pile driving will only resume after adaptive management measures (for example, extending the pinniped and/or cetacean exclusion zones, installing additional bubble curtains, and similar) are implemented to reduce sound levels below threshold levels.<br>10. Design Project lighting to reduce risk of injury or mortality and change in movement for wildlife and marine resources considering the following measures (all phases):<br>○ Directional or shielded lighting to reduce the vertical or horizontal distribution of light<br>○ Adaptative and variable lighting regime measures (timers, dimmers, motion sensors), with consideration of red-shifted lighting<br>11. Locate water intakes on or near the bottom of the FLNG barge and situated away from the shoreline, to mitigate injury or mortality of juvenile fish associated with entrainment and impingement (operations) |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | 12. Conduct in-water work within the project-specific least risk work window of September 1 – February 15, if the small craft jetty is required (construction) and implement measures to avoid injury and/or death of fish as determined by a Qualified Professional (construction).<br>13. Utilize an inert gas generation system for purging LNG tanks that does not require discharge of liquid effluent to the marine environment (for example, nitrogen purging).<br>Freshwater fish mitigation (2) |
| | | | |
| Migratory birds | 2(a)(iii) | Wildlife – Migratory Birds | 14. Delineate clearing boundaries prior to site preparation to keep clearing activities within the designated Cedar LNG footprint. This may be via physical flagging or electronic delineation, where appropriate (construction)<br>15. Prior to clearing and/or construction, and as temporally applicable, clearly delineate and mark a buffer zone around identified protected nests of species of federal interest (construction)<br>16. Do not undertake tree clearing within the marbled murrelet effective habitat areas as estimated by Terrestrial Ecosystem Mapping (TEM) during the nesting period (April 1 to September 14) unless a ground-based survey is undertaken as directed by a Qualified Professional to confirm that the biophysical attributes of critical habitat for marbled murrelet are not present (construction)<br>17. Identify ways to schedule vegetation clearing to limit the overlap with the nesting window – while executing the work safely and without causing additional environmental effects (for example, water quality effects). Where vegetation clearing is required during the nesting window, have a Qualified Professional undertake or supervise point counts for songbirds, and surveys for conspicuous- and cavity-nesting species, per ECCC's guidelines to avoid harm to migratory birds<br>18. Personnel will aim to not work within buffer zones around active nests during the nesting period. However, for any work conducted within the buffer zone during a nesting period, Cedar will consult with a Qualified Professional to determine whether additional feature-specific mitigation is required and implement those mitigation measures (construction)Mitigation for lighting (10) |
| SARA species | | Wildlife – Bats | 19. Pre-clearing surveys for little brown myotis habitat features (for example, roosts, hibernacula and maternity roosts) if clearing is required during sensitive timing windows;<br>20. Where work is required to be completed during sensitive timing windows (for example, due to safety considerations) that will affect a candidate little brown myotis roost, hibernacula, or maternity roost site as identified in pre-clearing surveys, a Qualified Professional will determine appropriate feature-specific mitigations for effects; and<br>21. Lighting mitigation (10) and wildlife mitigation (14). |
| | 2(a)(ii) | Wildlife – Western Toad and Coastal Tailed Frog | 22. Avoid clearing, grubbing and grading within 30 m of a western toad breeding sites during the breeding and post-breeding dispersal periods (beginning in April, with post-breeding dispersal extending through to October). If grubbing and grading activities cannot be avoided during this period, implement an amphibian salvage and relocation program. Additional measures may be specified by a Qualified Professional (for example, installation of silt fencing to direct dispersal away from work areas) (construction)<br>23. Limit clearing, grubbing, and grading within 30 m of watercourse known to be occupied by coastal tailed frog at all times of the year. If grubbing and grading cannot be avoided within 30 m of a watercourse known to be occupied by coastal tailed frog, implement an amphibian salvage and relocation program. Additional measures may be recommended by a Qualified Professional (for example, additional sediment control measures or use of clear-span bridges to cross the watercourse) (construction); and<br>24. Lighting mitigation (10) and wildlife mitigation (14). |
| | | | |
| Change to the environment that | 2(b)(i) | Air Quality | 25. Manage vehicle and equipment emissions by conducting regular maintenance during all Project phases<br>26. Control fugitive dust emissions (for example, dust suppression by water and vehicle speed limits) from the movement of construction equipment during construction and decommissioning |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| would occur on federal lands | | | 27. Develop and implement a community feedback process including:<br>○ Providing Feedback – Cedar will notify local community, residents, and stakeholders, Indigenous nations (Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida) about the community feedback process.<br>○ This process will invite interested parties to submit feedback on project construction and operation via telephone, email, online form, or other methods, if required. Individuals providing feedback may do so anonymously, provide credentials, or self-identify as an Indigenous nation member.<br>○ Analysis of Feedback – all feedback will be reviewed to determine specific actions to address community questions, issues, or concerns. Feedback determined to be a complaint or grievance related to the Project will be categorized as such and responded to, monitored, and reconciled as needed.<br>○ Grievance-related feedback related to construction activities will be classified as low, moderate, or high impact and mitigative actions will be implemented accordingly. High impact concerns may require the implementation of additional mitigation measures or monitoring.<br>○ Reporting – During construction, Cedar will report quarterly on its website regarding feedback received, twice annually during the first five years of operation, and cease on the fifth anniversary of the start of operation. Cedar will also provide annual reports to the Agency and Indigenous nations (Schedule B) regarding its community feedback process. Additionally, Cedar will host bi-annual community meetings during construction to provide project updates and address community needs.<br>○ Continuous Monitoring and Improvement – the community feedback process will be revised and updated periodically based on experience and feedback received.<br>28. Marine communication procedures mitigation (31) |
| | | Acoustics | • Provide advance notification to residences (within 3 km of activities extending to Kitamaat Village) of planned high-disturbance noise-causing activities (i.e., blasting, helicopter work, and pile driving) at the Facility Area and along the transmission line (construction)<br>• Fit gas or diesel engine exhausts with noise mufflers and turn off equipment when not in use to minimize idling<br>• Conduct regular maintenance of machinery and equipment to ensure noise emissions are within range set by manufacturer<br>29. Consider noise ratings of construction and operation equipment in the procurement process<br>30. Community feedback process mitigation (25)<br>• Marine communication procedures (31) |
| | | Vegetation Resources | • Effects on vegetation resources on federal lands are from air emissions; therefore, see the Air Quality section above for relevant measures (23-25). |
| | | Freshwater Fish | • Freshwater fish mitigations (1-5) |
| | | | |
| In another province or outside Canada | 2(b)(i) | Greenhouse Gas Emissions | • Greenhouse gas mitigations (58-61) |
| | | | |
| | 2(c)(i) | Heritage | • Develop and implement chance find procedure for heritage resources (construction) |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| Physical and Cultural Heritage and Current Use of Lands and Resources for traditional purposes or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance | 2(c)(ii) | | Marine use mitigation (31) |
| | | Marine Use | 31. Develop and implement a marine transportation plan in consultation with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida that includes:<br>○ LNG carrier shipping schedule notification processes for Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida<br>○ Reporting mechanisms for Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, Haida, and marine users to report on any concerns related to LNG carrier interference with marine use<br>○ Methods for regular communication on operation activities with marine users, including recreational users, commercial tourism operators, fishers, Transport Canada, and other relevant stakeholders during all phases of the Project<br>○ Use by Cedar LNG carriers of the Canadian Coast Guard's Marine Communications and Traffic Services to provide notice of planned vessel arrival time at the Triple Island Pilot Boarding Station (all phases)<br>○ Establish and communicate a safety zone around the marine terminal during operation<br>○ Cedar must participate in relevant federal multi-stakeholder initiatives related to effects of marine shipping in the region and industry is invited to participate.<br>○ Cedar must work with the Pacific Pilotage Authority and British Columbia Coast Pilots to determine guidance on safe vessel speed for LNG carriers visiting Cedar LNG facilities.<br>• Community feedback process (25) |
| | | Marine Resources | • Marine Resources mitigations (6-13) for quantity and quality of marine resource impacts |
| | | Malfunctions and Accidents | • Malfunctions and Accidents mitigations (52-57) for quantity and quality of marine resource impacts |
| | | Acoustics | • Acoustics mitigations (26-29) for sensory impacts (terrestrial and marine) |
| | | Air Quality | • Air Quality mitigations (23-25) for sensory impacts (terrestrial and marine) |
| | | Land and Resource Use | Terrestrial access impacts:<br>32. Develop and implement a program to restrict non-local contractor workforce personnel from engaging in recreational hunting, fishing or ATV or snowmobile use during off-work hours in the local assessment area (LAA) for land and resource use, as defined in Section 7.9 of the Application |
| | | Vegetation Resources | Quantity and quality of resource impacts:<br>33. Delineate clearing boundaries prior to site preparation to keep clearing activities within the designated Project footprint (via physical flagging or electronic delineation where appropriate)<br>34. Control the spread of invasive species following most recent Environmental Protection and Management Guidelines<br>35. Naturally revegetate or actively reclaim temporary construction areas on Crown land and are not required for operations (reclamation on private land to follow lease agreements) |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | 36. If requested by Haisla, incorporate traditional use plants into reclamation planning for temporary construction areas on Crown land<br>37. Implement windthrow management strategies such as edge stabilization techniques in areas of old growth forest on Crown land<br>38. Identify sensitive areas to be flagged and vegetation and soils to be retained or salvaged with required methods and monitoring<br>39. Develop and implement a wetlands compensation plan with Haisla Nation if required under published federal ECCC guidance<br>• Freshwater fish mitigations (1-5) and air quality mitigations (23-25) to reduce the effects of sediment and erosion or air quality emissions on vegetation |
| | | Wildlife | • Wildlife mitigations (14-18) |
| | | | • |
| Health, social or economic conditions of the Indigenous peoples of Canada | 2(d) | Air Quality | • Air Quality mitigations (23-25) for health impacts |
| | | Acoustics | • Acoustics mitigations (26-29) for health impacts |
| | | Marine Use | • Marine use mitigations (31) |
| | | Land and Resource Use | • Land and resource use mitigation (32) |
| | | Employment and Economy | 40. Inform local residents and Indigenous nations of job and procurement opportunities during all project phases<br>41. Identify potential shortages of workers with specific skill requirements and training, and work with the Haisla employment department, local and regional Indigenous employment centers, local and regional training and education facilities, and communities to increase opportunities for Indigenous and local community members to obtain training required for project participation<br>42. Provide information to local and Indigenous employment agencies and economic development organizations to help them plan for increased demand for labour<br>43. Provide on-the-job training programs and apprenticeship opportunities<br>44. Implement procurement policies and practices to provide opportunities to local businesses and contractors<br>45. Consider opportunities over the life of Cedar LNG to enable Haisla and Indigenous, local and regional businesses and contractors to have repeated or ongoing contracts |
| | | Human and Community Well-Being | • GBA mitigations (63-65) |
| | | Infrastructure and Services | 46. Develop and implement a Worker Code of Conduct and provide cultural awareness training for all workers that includes local and cross-cultural awareness<br>47. Provide onsite first-aid station, medical room(s) with beds and certified first-aid staff and dedicated communications devices for requesting outside emergency aid to limit demand on local health services during construction<br>48. Implement onsite security services and security gate at the Cedar LNG site to increase safety by reducing unauthorized access and crime, thereby reducing demand on Kitimat police services during construction and operation<br>49. Prepare and implement an emergency management program for operation to assist in avoidance / management of emergencies at the Cedar LNG site, thereby limiting demand on emergency services in the LAA for infrastructure and services as defined in Section 7.11 of the Application. |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | 50. Develop and implement a waste management plan to reduce usage of landfills in the LAA for infrastructure and services as defined in Section 7.11 of the Application through recycle/reuse/etc. of non-hazardous solid wastes transportation of hazardous waste to an offsite facility<br>51. Develop an accommodation policy that includes measures to ensure that accommodation for contractor construction personnel residing outside the Infrastructure and Services LAA is exclusively within existing work camps or other temporary accommodations and does not include rental of local housing. |
| | | | |
| Accidents and Malfunctions | 22(1) (i) | Malfunctions and Accidents | 52. Implement a maintenance program for operations that includes regular inspections and maintenance of the FLNG equipment and infrastructure to ensure the facility is maintained in a state of good repair, following the guidance of equipment manufacturers<br>53. Implement programs during construction and operation that address site safety and response to unplanned incidents<br>54. Implement an emergency management program for operations consistent with CSA Z246.2<br>55. Participate, as relevant, in the development of shipping-related spill response plans or other agreements subject to requirements of the *Canada Shipping Act*, 2001 and facilitate the involvement of Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida in the development of these shipping-related spill response plans, where appropriate<br>56. Share information with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida and Canadian Coast Guard, on any Cedar LNG carrier incident that results in a release of cargo or fuel to the environment. The report will include a description of the incident, identification of the government agencies that are engaged in a response to the malfunction or accident, a summary of environmental information collected (if available), and mitigation measures adopted and implemented to prevent future occurrences (if applicable)<br>57. Cedar must work with the CCG during development of its operations phase emergency response program to establish roles, responsibilities and communication processes for responses to incidences that may occur at the facility (operations)<br>• Marine use mitigation (31) |
| | | | |
| The extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change | 22(1)(a) (i) | Greenhouse Gas Emissions | 58. Meet the federal requirement that Cedar LNG does not emit greater than net 0 kt $CO_2e$/yr by January 1, 2050, as calculated in Equation 1 (Net GHG Emissions) in Section 2.1 of Draft Technical Guide Related to the Strategic Assessment on Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment (August 2021). Cedar must develop a Net-Zero Plan to demonstrate how Cedar will prioritize the implementation of BAT/BEP to reduce GHG emissions between the start of Construction and January 1, 2050 over relying on offset measures to achieve net-zero on January 1, 2050.<br>59. Conduct regular maintenance to manage vehicle and equipment emissions (all phases)<br>60. Take into account the BC OGC Flaring and Venting Reduction Guideline to reduce quantity of GHG released to the atmosphere by reduction of flaring and venting (operations)<br>61. Utilize electricity to power the pre-treatment and liquefaction of natural gas (operations)<br>• Vegetation mitigation (35) |
| | | | |
| Effects of the Environment | 22(1) (j) | Potential Changes to the Project that May | 62. Consider seismic design criteria in applicable codes and standards in the design of onshore infrastructure |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | be Caused by the Environment | |
| | | | |
| GBA Plus | 22(1) (s) the intersection of sex and gender with other identity factors | Human and Community Well-Being | 63. Develop and implement a gender equity and diversity program that focuses on hiring Haisla Nation members, local and Indigenous persons, and women to increase project employment among underrepresented populations and consideration of the baseline labour force participation status of under-represented groups in Kitimat and the region (all Project phases)<br>64. Develop and implement a drug and alcohol policy (all Project phases)<br>65. Develop and implement workplace violence, harassment, bullying and discrimination processes that:<br>○ promote a safe and respectful environment<br>○ contains gender appropriate and gender- and sexuality- specific policies and processes which promote a safe, respectful and inclusive environment for all employees, including women and sexual minorities;<br>○ includes consideration of Indigenous women and girls and Calls to Justice 13.1 to 13.5 addressed to the extractive and development industries within the Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls (all Project phases) |
| | | | |
| Follow Up Program | | Multiple | **Air Quality**<br>• In the first three years of operation Cedar will provide an annual summary report with a comparison of pre-operation and post-operation air quality for that year. At the end of the three-year period following commencement of operation, the air quality data from the Kitimat monitoring stations will be consolidated and the results compared to:<br>○ Air quality modelling results<br>○ Federal and provincial air quality objectives<br>○ Residual effects characterization criteria applied in the Application<br>• Results of this review should include consideration of health effects, along with identifying any implementable corrective actions should monitoring show the characterization of effects exceeds what is provided in the Application, will be provided to Agency, Health Canada, Northern Health, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla<br><br>**Acoustics**<br>• Starting the year before construction and continuing through the first three years of operation of the FLNG facility, Cedar will undertake noise monitoring at four receptor locations. The results of the monitoring will be compared to:<br>○ Noise modelling results in the Application<br>○ Permissible sound levels established by the British Columbia Noise Control Best Practices Guideline Version 2.2 published by the Oil and Gas Commission in 2021<br>○ Thresholds (for percent highly annoyed or %HA, nighttime sound level or Ln, maximum A-weighted sound level or $LA_{max}$) established in Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise published by Health Canada in 2017 |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | • The follow-up program will determine if the characterization of actual effects aligns with the characterization of potential effects assessed in the Application<br>• Results of this review, along with identifying any implementable corrective actions should monitoring show the characterization of effects exceeds that presented in the Application will be provided to the Agency, Health Canada, Northern Health, and Haisla<br><br>**Wetlands**<br>• A description of design and construction measures to reduce effects on wetlands<br>• An update of wetland area disturbed by the final design (i.e., within areas of clearing and/or grading) based on ortho-rectified post-construction air photographs or as-built survey data<br>• An update of the wetland area adjacent to the transmission line or marine terminal footprint that may be subject to indirect effects, which will be monitored for effectiveness of mitigation measures<br>• A description of a construction monitoring program for wetland mitigations to be completed during each year of construction activities, including triggers to adjust or add mitigation measures to manage potential indirect effects. This is anticipated to consist of monitoring water quality of site runoff and integrity of culverts and erosion and sediment control measures adjacent to wetlands<br>• A comparison of the area and type of wetland disturbed by the final design to the predictions of the EA<br>• Maps showing the comparison and the area to be monitored<br>• An analysis of the accuracy of the characterization criteria<br>•<br>**Wildlife**<br>• Comparison of the as-built change in habitat to the effects predicted in the Application for the following species and species groups with annual reporting:<br>▪ Little brown myotis (roosting and foraging habitat);<br>▪ Marbled murrelet (summer breeding habitat)<br>▪ Old forest songbird community (summer breeding habitat);<br>▪ Young forest songbird community (summer breeding habitat);<br>▪ Coastal tailed frog (year-round habitat; see additional detail below);<br>▪ Western toad (breeding)<br>• Verification of potential project effects on marbled murrelet summer breeding habitat using results from a habitat suitability model<br>• Cedar will undertake surveys for, and salvages of, pond-dwelling amphibians in each year of construction if there is potential to cause injury or mortality. Cedar will prepare an annual report on salvage and relocation. If injury or mortality occurs, incidents will be included in the report;<br>• Cedar proposes to track and report wildlife interactions, injuries, and mortalities associated with the facility and transmission line. Perimeter searches of facilities can be undertaken on a semi-regular basis, but logistical challenges with monitoring the transmission line exist. As such, Cedar proposes to document the discovery of birds of federal interest that may collide with the transmission line using a chance find procedure during inspections and maintenance of the transmission line. For each chance find, Cedar will investigate available lines of evidence that may have led to the collision to determine whether additional mitigation could be used to reduce future potential risk |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | • As part of the mitigation measure above, Cedar will document the location, date, species (if discernible), and evidence of cause for bird strandings or mortalities associated with lit infrastructure. If lighting is identified as a contributing factor to an incident, Cedar will determine whether additional mitigation can be implemented to reduce future potential risk. Monitoring is for the first two years of operation and reporting will occur annually in the first two years of operations<br>• Cedar will report on any observed instances of bird strikes by LNG carriers, as coordinated and discussed with BC Pilots<br>• Reports will be provided to THE AGENCY, ECCC, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla<br><br>**Marine Resources**<br>The marine baseline data collection plan will include:<br>• Collecting additional water quality baseline data before the start of construction, taking into account the *BC Marine Monitoring Guidance* The additional water quality sampling will include:<br>o Sampling during both ebbing tides and flooding tides<br>o Sampling during summer and winter<br>o Near surface, approximately 12 m depth, and near bottom sampling for metals, anions, nutrients and hydrocarbons, with a focus on potential contaminants of concern to be present in effluents<br>o In situ measurements of temperature, dissolved oxygen, oxidation reduction potential, pH, specific conductivity, and turbidity;<br>o Collection of conductivity-temperature-depth (CTD) profiles of the water column<br>o Monitoring at locations in the receiving environment immediately adjacent to outfalls, mid-field locations, far-field locations and reference locations not expected to be impacted by the Project<br><br>The marine effects monitoring plan will include, at a minimum:<br>• Repetition of the water quality sampling program once per year in the first five years of operations, but with sampling mid-plume (as determined by in-situ water quality) instead of at 12 m depth<br>• During the first five years of operation of the Project provide the Agency, Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla with copies of the annual monitoring reports. These will be accompanied by a memorandum that compares the results of the monitoring to the Canadian Water Quality Guidelines for the Protection of Aquatic Life (Marine) and the effects predictions included in the Application.<br>• If the small craft jetty is required, monitoring of underwater noise and suspended particulates during construction<br><br>**Marine Use**<br>• Prior to operations, Cedar will determine if new publicly available information on characteristics of wake from marine shipping activities, or new mitigation measures to reduce wake effects on Indigenous traditional harvesting activities is available<br>• Cedar will then offer to meet with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida to review these results and discuss potential effects and ways to mitigate them along the shipping route ( a communication plan) prior to the arrival of the first LNG carrier to the Project's terminal<br>• Cedar will integrate feedback from the review into the follow-up program<br>• The results of the review and meeting(s) will be reported to the Agency and to each of Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla, and Haida prior to the first LNG carrier visiting the marine terminal<br>• The report will also describe new or modified mitigation measures to be implemented, as applicable |

| Federal Conditions Section | IAA linkage | BC EAO Valued Component or Assessment Factor | Key Mitigation Measures |
|---|---|---|---|
| | | | • The follow-up program (i.e., literature review and meetings) will be repeated five years after the start of LNG shipping<br>• Cedar will monitor changes to marine vegetation along the shipping route using remote sensing data. The monitoring will include data collection once in summer months in each of two years before the start of LNG shipping and once in summer months in each of three years after start of LNG shipping. Areas of interest will be selected in consultation with Haisla, Gitga'at, Gitxaała, Kitselas, Kitsumkalum, Lax Kw'alaams, and Metlakatla nations.<br>**Infrastructure and Services**<br>• The follow-up program will provide annual employment and health reporting during construction and for the first five years of operation. These reports will include information, including any disaggregated data that is voluntarily disclosed to Cedar or its contractors to:<br>  ○ The labour force, specifically the number of people working on the Project, where the people are from, and their accommodation (if non-local)<br>  ○ Workplace hospital visits in Terrace and Kitimat including:<br>  ▪ Number of total unscheduled emergency room visits<br>  ▪ Number of emergency room visits that have an associated Workers Compensation Board claim (i.e., are related to a work injury)<br>  ▪ Number of in-patient admissions<br>  ▪ Number of in-patient admissions that are related to a Workers Compensation Board claim<br>  ▪ The "home" health services location for emergency room visits (i.e., are they from northwest British Columbia, from another area within the Northern Health Authority, or from an area outside of the Northern Health Authority)<br>• A copy of the annual reports will be provided to Northern Health and Schedule B Indigenous nations, and Cedar will be available to meet regarding the reports<br><br>**GHG Emissions**<br>• During the first five years of operations of the Project: compare the GHG emissions calculated to meet the federal reporting requirements under ECCC's Greenhouse Gas Reporting Program, to the predicted GHG emissions from the Application, and outline and justify discrepancies<br>• Annually estimate and report Cedar LNG's GHG emissions throughout the lifetime of Cedar LNG<br>• During Operations, annually quantify GHG emissions intensity from Cedar LNG, and outline and justify discrepancies between predicted values and actual values.<br><br>**GBA Plus**<br>• Review any new disaggregated data that becomes available for Kitimat and the region where workforce would be hired from (such as using Census 2021 data, once available) to support development of the gender equity and diversity policy<br>• Report out on the results annually during Construction and the first five years of Operations of the gender equity and diversity policy including voluntarily provided data on workforce hired by identity factors (for example, gender, Indigenous Peoples, LGBTQ2+, (dis)abled people, newcomers/Immigrants) and job type. |

# APPENDIX 2 – ENVIRONMENTAL ASSESSMENT METHODOLOGY AND OVERVIEW OF POTENTIAL EFFECTS

## *1 ENVIRONMENTAL ASSESSMENT METHODS*

In the EAO's Assessment Report (EAO's Report), the EAO assessed whether Cedar LNG is likely to have significant adverse environmental, economic, social, heritage and health effects, including cumulative effects. The EAO's assessment included contemplation of the mitigation measures proposed in the Application, or otherwise developed through the provincial EA process, in addition to conditions proposed by the EAO and recommended federal mitigation measures under the IAA.

The EAO also assessed effects to other matters related to risk of malfunctions and accidents, effects to distinct human populations, biophysical factors that support ecosystem function, current and future generations, land use plan, greenhouse gas emissions, alternative means of carrying out the project and effects of the environment on the project which are aspects of the *Environmental Assessment Act* (2018). Cedar supported this inclusion and assessed these matters in its Application.

As a substituted EA, the EAO conducted the EA for Cedar LNG. The substituted process met the requirements of the IAA. The approval was granted with the understanding that the assessment would be conducted by the EAO in the spirit of the Impact Assessment Cooperation Agreement between Canada and British Columbia (Cooperation Agreement) (2019) entered into by the Impact Assessment Agency of Canada (the Agency) and the EAO.

To conduct this assessment, the EAO followed the methods outlined in its Effects Assessment Policy (2020). This section provides a brief summary of the general methods followed. The methodological steps in B.C.'s EA process are shown in the Figure 23 below:

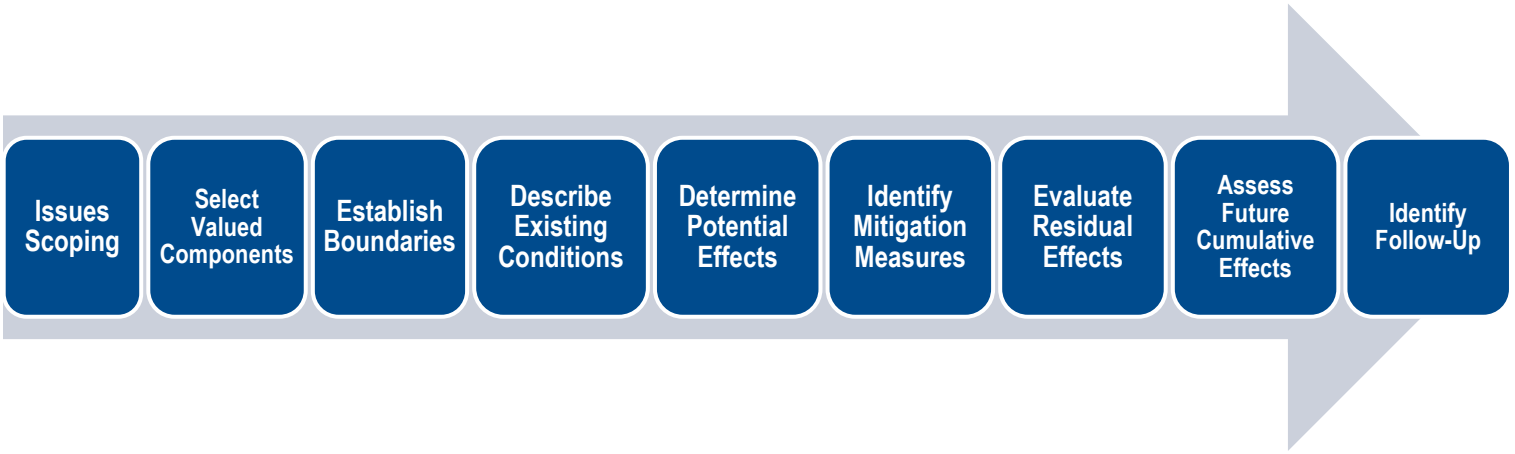


**Figure 23: EAO's Environmental Assessment Methods**

EA in B.C. 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, Indigenous 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.

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 the EAO upon finalization of the AIR. Much of the early part of the Pre-Application phase is focused on consultation on the VCs, key indicators, study area boundaries and technical requirements with Working Group members (including Indigenous nations) and the public.

## *2 STUDY BOUNDARIES*

Study boundaries serve to define the scope or limits of the assessment and encompass the areas within which Cedar LNG is expected to have potential effects on the selected VCs.

The study areas for the Application generally include the:

- Project area or Project footprint – the area directly disturbed by Cedar LNG's physical works and activities;
- Local Assessment (LAA) – varies by VC, the area surrounding and including the Project area, where there would be reasonable potential for Cedar LNG-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 Cedar LNG-related effects within the LAA, in most cases

encompassing the area within which potential residual adverse effects of Cedar LNG would likely 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.

The temporal boundary is defined as the life of the project, from construction through decommissioning (phases described below). For the effects assessments within this Report, the temporal boundaries are as follows:

- Construction - 4 years;
- Operations - a minimum of 25 years and up to 40 years; and
- Decommissioning - approximately 12 months.

**Construction:** The phase of Cedar LNG during which physical alteration of land, vegetation or any other aspect of the natural environment, occurs.

**Operations:** The phase of Cedar LNG beginning on the date where full commercial operations and marine shipping to customers begins. The operations phase ends when commercial operations permanently cease, and the decommissioning phase begins.

**Decommissioning:** The phase of Cedar LNG where all commercial operations cease and the marine terminal is removed, the FLNG facilities and infrastructure are decommissioned, demolished and/ or removed, where they will not serve a future use, from the Cedar LNG site in accordance with the lease agreement between Cedar and Haisla Enterprises, Haisla's development plans and any applicable regulatory requirements.

## *3 ASSESSMENT OF VALUED COMPONENTS*

For each selected VC (or grouping of VCs), the Application describes the existing conditions within the study area in sufficient detail to enable potential Cedar LNG-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 project or other projects and activities in the local area.

The assessment then considers the potential interactions of the 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 positive and adverse effects resulting from the project.

The assessment then describes the mitigation measures that would be incorporated into Cedar LNG, including: site and route selection; project scheduling; project design; and construction and operation procedures and practices.

Consistent with the B.C. ENV Environmental Mitigation Policy and Procedures, the 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,

BMPs, EMPs, contingency plans, Emergency Response Plans, 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 Cedar LNG 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, direction and magnitude, extent, duration, frequency, reversibility, affected populations, risks (likelihood and consequences) and uncertainty. These criteria are summarized below and definitions for Cedar LNG are provided in Appendix 4.

***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 effects of natural and human-caused trends in the condition of the VC.

**Magnitude** refers to adverse or positive direction of effects and 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.

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

**Affected Population** refers to the distribution of the effect amongst the population of affected peoples. This criterion is only applicable to VCs relating to human use or effects.

**Risk (likelihood and consequences)** refers to the likelihood and consequences of a potential residual effect occurring will be described as risk. Likelihood is the probability of an event occurring and can be influenced by many factors.

**Consequence** is the outcome of an event affecting the VC.

**Uncertainty** refers to the degree of scientific uncertainty related to the data and methods used within the framework of this analysis.

The identification of significant adverse residual effects is a requirement of the Act. 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. Significance is critical for making an informed decision about proposed projects; as it is important to understand the characteristics and significance of project-specific residual effects in order to also understand the relative contribution of a project to cumulative effects.

Significance was determined for the residual effects of Cedar LNG on receptor VCs, as well as for the cumulative effects. This is critical for making an informed decision about Cedar LNG. 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 Cedar LNG to cumulative effects. The cumulative effects assessment is discussed further below.

## *4 CUMULATIVE EFFECTS ASSESSMENT*

If the proposed project is expected to result in any residual adverse effects on the selected VC, there is a need to consider cumulative effects. The cumulative effects assessment is focused on the methods for assessing the potential future cumulative effects of the project by examining the project effects in combination with reasonably foreseeable future projects and activities. The assessment of the cumulative effects information from the VC assessment are used to inform the assessment of the future cumulative effects.

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 and listed in Part A of the report. 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 22(1)(a)(ii) of the IAA.

The EAO evaluated cumulative effects for Cedar LNG by considering how residual effects associated with Cedar LNG would be expected to interact with the residual effects of other past, present and reasonably foreseeable projects and/ or activities included in Cedar's cumulative effects assessments. Projects and activities are discussed where relevant under the cumulative effects section for each VC in this Report.

# APPENDIX 3 – LIST OF WORKING GROUP MEMBERS

## PROVINCIAL GOVERNMENT[89]

BC Oil and Gas Commission
Northern Health Authority
Ministry of Environment and Climate Change Strategy
Ministry of Forests
Ministry of Land, Water and Resource Stewardship
Ministry of Municipal Affairs
Ministry of Tourism, Arts, Culture and Sport
Ministry of Transportation and Infrastructure

## FEDERAL GOVERNMENT

Canadian Coast Guard
Environment and Climate Change Canada
Employment and Social Development Canada
Fisheries and Oceans Canada
Health Canada
Indigenous Services Canada
Innovation, Science and Economic Development
Natural Resources Canada
Public Safety Canada
Transport Canada
Women and Gender Equality Canada

## LOCAL GOVERNMENT

City of Terrace
District of Kitimat
Regional District of Kitimat Stikine

## INDIGENOUS GROUPS

Gitga'at Nation
Gitxaała Nation
Haisla Nation
Kitselas First Nation
Kitsumkalum First Nation
Lax Kw'alaams Band

[89] On April 1, 2022 the BC Government, broke up the Ministry of Forests, Natural Resource Operations and Rural Development, as part of a reform of rural and resource development, and representatives on the Working Group from this former Ministry went to the Ministry of Forest, the Ministry of Land, Water and Resource Stewardship and the Ministry Tourism, Arts, Culture and Sports.

Metlakatla First Nation
Council of Haida Nations – Haida

# APPENDIX 4 - RESIDUAL EFFECTS CHARACTERIZATION DEFINITIONS

| Criteria | Description | Applicable VCs | Definition |
|---|---|---|---|
| **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 effects of natural and human-caused trends in the condition of the VC. | Acoustics<br>Air Quality<br>Employment and Economy<br>Freshwater Fish<br>Greenhouse Gas Emissions<br>Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife | **Low –** The indicator has low resiliency or is acutely sensitive to existing conditions<br>**Moderate –** The indicator has moderate resiliency or is mildly sensitive to existing conditions<br>**High –** The indicator has high resiliency or is generally not sensitive to existing conditions |
| **Direction and Magnitude** | Adverse or positive direction of effect and the expected size or severity of the residual effect. Considers the proportion of the VC affected within the spatial boundaries and the relative effect (for example, relative to natural annual variation in the magnitude of the VC or other relevant characteristics). | Freshwater Fish<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife | **Negligible**—effects which are so small that they are neither detectable nor measurable and are not anticipated to influence the short- or long-term viability of the VC or a subcomponent.<br><br>**Low—**effect cannot be distinguished from baseline case conditions; magnitude of effect is less than or within the typical variation of the baseline conditions; the potential residual effect will slightly alter or change the VC without changing its role or function.<br><br>**Moderate**—effect would result in demonstrable change and may alter or change the nature, role, or function of a VC but remains below a level of effect that could exceed the resilience and adaptability limits of the natural environment.<br><br>**High**— the potential residual effect will substantially alter or change the |

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| | | | nature, role, or function of the VC and is sufficiently large that it approaches or falls within the range of effects that could exceed the resilience and adaptability of the natural environment. |
| | | Acoustics | **Negligible—**effects are neither detectable nor measurable and are not anticipated to influence the short- or long-term viability of Noise.<br>• Application noise levels are a ≤3 dB change from baseline noise levels<br>• Change in %HA of ≤6.5%<br><br>**Low:**<br>• Application noise levels ≤PSL<br>• Change in %HA of ≤6.5%<br><br>Moderate:<br>• Application noise levels exceed the PSL by ≤5 dB<br>• Change in %HA of ≤10%<br><br>**High:**<br>• Application noise levels exceed the PSL by >5 dB<br>• Change in %HA of >10% |
| | | Employment and Economy Infrastructure and Services | **Negligible**—effects which are so small that they are neither detectable nor measurable and are not anticipated to influence the short- or long-term viability of the VC or a subcomponent.<br><br>**Low—**effect cannot be distinguished from baseline case conditions; magnitude of effect is less than the typical variation of the baseline conditions.<br><br>**Moderate—**effect would result in demonstrable change but remains within historical norms; magnitude of effect is of the same order of the typical variation of the baseline conditions.<br><br>**High—**effect results in changes that are beyond historical norms; magnitude of effect is greater than the typical variation of the baseline conditions. |
| | | Human Health | **Negligible:** Project would likely have no measurable change. |

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| | | | **Low:** Residual effect would be within normal variability of baseline conditions; guidelines or objectives would not be exceeded.<br><br>**Moderate:** Residual effect would likely increase or decrease with regard to baseline but within guidelines and objectives.<br><br>**High:** The Project would itself, or as a substantial contribution in combination with other sources, cause exceedances of guidelines or objectives beyond the Project boundaries. |
| | | Air Quality | **Negligible**—the predicted change in maximum concentration is less than or equal to 1% of the provincial ambient air quality objective (AQO) and/or Canadian Ambient Air Quality Standards (CAAQS).<br><br>**Low—**the predicted change in the maximum concentration is between >1% and 10% of the AQO and/or CAAQS and either (1) the application case maximum concentration is still below the AQO and/or CAAQS or (2) the base case maximum concentration already exceeds the AQO and/or CAAQS.<br><br>**Moderate—** the predicted change in the maximum concentration is greater than 10% of the AQO and/or CAAQS and the application case maximum concentration is still below the AQO and/or CAAQS or the predicted change in the maximum concentration is between >10% and 50% of the AQO and/or CAAQS and the base case maximum concentration already exceeds the AQO and/or CAAQS.<br><br>**High—** the predicted change in the maximum concentration is greater than 1% of the AQO and/or CAAQS and the application case maximum concentration exceeds the ambient air quality objective while the base case maximum concentration does not or the predicted change in the maximum concentration is larger than 50% of the AQO and/or CAAQS and the maximum concentration in the base case already exceeds the AQO and/or CAAQS. |
| | | Greenhouse Gas Emissions | **Negligible**—effects which are so small that they are neither detectable nor measurable and are not anticipated to influence the short- or long-term viability of the VC or a subcomponent. |

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| | | | **Low—**>0.1% but <1% of the provincial emission levels, or >2% but <16% of the national sector emission levels, or >0.01% but <0.1% of the federal emission levels.<br><br>**Moderate—**>1% but <5% of the provincial emissions levels, or >16% but <75% of the national sector emission levels, or >0.1% but <0.5% of the federal emission levels**.**<br><br>**High—**>5% of the provincial emission levels, or >75% of the national sector emission levels, or >0.5% of the federal emission levels. |
| | | Land and Resource Use | **Negligible**—effects which are so small that they are neither detectable nor measurable and are not anticipated to influence the short- or long-term viability of the VC or a subcomponent.<br><br>**Low—**effect cannot be distinguished from baseline case conditions; magnitude of effect is less than the typical variation of the baseline conditions.<br><br>**Moderate—**effect would result in demonstrable change but remains within historical norms; magnitude of effect is of the same order of the typical variation of the baseline conditions.<br><br>**High—**effect results in changes that are beyond historical norms; magnitude of effect is greater than the typical variation of the baseline conditions. |
| **Extent** | The spatial scale over which the residual effect is expected to occur. | Acoustics<br>Air Quality<br>Employment and Economy<br>Freshwater Fish<br>Greenhouse Gas Emissions<br>Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use | **Site-specific** – Residual effect is restricted to the Project area or a specific area of the LAA<br>**Local** – Residual effect is restricted to the LAA<br>**Regional** – Residual effect is restricted to the RAA<br>**Beyond Regional –** Residual effect extends beyond the RAA |

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| | | Vegetation Resources<br>Wildlife | |
| **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). | Acoustics<br>Air Quality<br>Employment and Economy<br>Freshwater Fish<br>Greenhouse Gas Emissions<br>Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife | **Short-term –** Residual effect is present for less than one year.<br>**Medium-term –** Residual effect present during construction or decommissioning phases<br>**Long-term –** Residual effect present for the life of the Project<br>**Permanent –** Residual effect is present indefinitely |
| **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. | Acoustics<br>Air Quality<br>Employment and Economy<br>Freshwater Fish<br>Greenhouse Gas Emissions<br>Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife | **Infrequent** – Residual effect occurs once or rarely over the specified duration<br>**Frequent/ Regular** – Residual effect occurs frequently, at regular intervals<br>**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. | Acoustics<br>Air Quality<br>Employment and Economy<br>Freshwater Fish<br>Greenhouse Gas Emissions | **Reversible –** Residual effect is reversible<br>**Partially reversible –** Residual effect can be reversed partially<br>**Irreversible** – Residual effect is permanent |

<table>
<tr><td></td><td></td><td>Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife</td><td></td></tr>
<tr><td>Affected Populations</td><td>The distribution of the effect amongst the population of affected peoples. This criterion is only applicable to VCs relating to human use or effects.</td><td>Acoustics<br>Air Quality<br>Employment and Economy<br>Human Health<br>Infrastructure and Services<br>Marine Use</td><td>Even – the potential effect is experienced by any or all sub-populations<br>Disproportionate –the potential effect is experienced only by certain populations or experienced more acutely by certain sub-populations</td></tr>
<tr><td>Risk (likelihood and consequences)</td><td>The likelihood and consequences of a potential residual effect occurring will be described as risk<br>Likelihood is the probability of an event occurring and can be influenced by many factors.<br>Consequence is the outcome of an event affecting the VC.</td><td>Acoustics<br>Air Quality<br>Freshwater Fish<br>Greenhouse Gas Emissions<br>Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife</td><td>Likelihood<br>Low – <40% chance of effect occurring<br>Medium – 40 to 80% chance of effect occurring<br>High – >80% chance of effect occurring<br>Consequence can be assessed as minor, moderate, or major based on the combination of magnitude and extent.<br>Risk is Consequence x Likelihood (see risk rating table) and may be assessed as low, moderate, or high.
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<tr><td rowspan="2"></td><td></td><td colspan="3">Consequence</td></tr>
<tr><td></td><td>Major</td><td>Moderate</td><td>Minor</td></tr>
<tr><td rowspan="3">Likeli-hood</td><td>High</td><td>High</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Medium</td><td>High</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Low</td><td>Moderate</td><td>Low</td><td>Low</td></tr>
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</td></tr>
<tr><td>Uncertainty</td><td>The degree of scientific uncertainty related to the data and methods used within the framework of this analysis.</td><td>Acoustics<br>Air Quality<br>Employment and Economy<br>Freshwater Fish<br>Greenhouse Gas Emissions</td><td>Low: there is a good understanding of the cause-effect relationship between the Project and a VC, and sufficient data is available to support the assessment. The effectiveness of the selected mitigation measures is moderate to high. There is a low degree of uncertainty associated with</td></tr>
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| | | Human Health<br>Infrastructure and Services<br>Land and Resource Use<br>Marine Resources<br>Marine Use<br>Vegetation Resources<br>Wildlife | data inputs and/or modelling techniques, and variation from the predicted effect is expected to be low.<br><br>**Moderate:** the cause-effect relationships between the Project and a VC are not fully understood (for example, several unknown external variables or data sets for the Project area are incomplete). The effectiveness of mitigation measures may be moderate or high. Modelling predictions are relatively confident.<br><br>**High:** the cause-effect relationships between the Project and a VC are poorly understood. There may be several unknown external variables and/or data for the Project area that is incomplete. The effectiveness of the mitigation measures may not yet be proven. Modelling results may vary considerably given the data inputs. There is a high degree of uncertainty in the conclusions of the assessment.<br><br>To consider when determining confidence: the reliability of data inputs and analytical methods used to predict Project effects, the confidence regarding the effectiveness of mitigation measures, and the certainty of the predicted outcome. |