

WOODFIBRE LNG
WORKER ACCOMMODATION
Application to Amend
Environmental Assessment Approvals

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EXECUTIVE SUMMARY

On October 26, 2015 Woodfibre LNG Limited received an Environmental Assessment Certificate (EAC #E15-02) for development of a liquefied natural gas processing facility (Project) with marine storage and off-loading located at the former Woodfibre Pulp and Paper Mill known to the Squamish Nation as *Swiyat*; a fee simple, industrially zoned brownfield site. Two amendments to the EAC have been submitted since it was issued, the first on July 12, 2017 for changes to the cooling process and the second on July 19, 2019 to clarify the definition of construction. The federal government issued a Federal Decision Statement as part of a substituted process on March 17, 2016 and re-issued the decision statement on March 7, 2018. The Squamish Nation conducted an independent review of the EAC application (the Application) under its own environmental assessment process and on October 14, 2015 issued Environmental Certificate #2015-001 for the Project.

The approved Certified Project Description (CPD) did not include worker accommodation because, at the time of publication, enough accommodation options were thought to be available in the local communities for workers. Following issuance of the Project's environmental assessment approvals, the detailed planning process identified the need for additional accommodation options to support the construction phase of the Project. Housing affordability and availability have come to the forefront for local government planning initiatives. In addition, community engagement discussions have suggested that there is a lack of rental housing and temporary accommodation options in the Greater Vancouver and Squamish areas; a large influx of workers into at-market housing could create challenges for permanent residents to find affordable housing in an already restrictive local housing market.

The purpose of this application (the Amendment) is to amend the environmental approvals for the Project to include: temporary self-contained floating worker accommodation (floatel) with approximately 400 – 600 beds and associated mooring infrastructure, workforce accommodation onboard a marine construction vessel, onshore drinking water treatment, and pedestrian access path to the floatel. The location of the proposed changes to the CPD are all within the Certified Project Area assessed in the Application.

This document provides an overview of changes to the effects assessments presented in the Application as a result of the proposed Amendment and assesses whether adverse effects have changed from those presented in the Application. After assessment of valued and intermediate components that were considered to have an interaction with the Amendment it was determined that adverse effects associated with the proposed Amendment are unchanged from those assessed and presented in the Application. The mitigation measures, potential residual adverse effects and cumulative effects identified in the Application have not changed as a result of the Amendment. No new significant adverse effects were identified as a result of the Amendment. The proposed Amendment is expected to result in additional Project benefits including reduced impact on at-market housing within the Squamish-Lillooet Regional District and Vancouver, reduced pressure on community infrastructure and services, and reduced vehicle traffic on the Sea to Sky Highway (Highway 99).

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Appendix B	Floatel Terrestrial Site Assessment Report
Appendix C	2019 Floatel Marine Habitat Report

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
Application	Application for an Environmental Assessment Certificate
Amendment	Amendment Application to the EAO
BC	British Columbia
BMP	best management practice
CPA	Certified Project Area
CPD	Certified Project Description
DFO	Fisheries and Oceans Canada
EAA	Environmental Assessment Approvals
EAC	Environmental Assessment Certificate
EAO	BC Environmental Assessment Office
ERP	Emergency Response Plan
FDS	Federal Decision Statement
Floatel	temporary floating worker accommodation
FSO	floating, storage, and offloading
FTE	full-time equivalent
IAAC	Impact Assessment Agency of Canada
IC	intermediate component
ITA	Industry Training Authority
LAA	local assessment area
LNG	liquefied natural gas
M	Modified
OGC	Oil and Gas Commission
PR	partial retention
Project	liquefied natural gas production facility with marine storage and offloading
Proponent	Woodfibre LNG Limited
RAA	regional assessment area
SLRD	Squamish-Lillooet Regional District
Woodfibre LNG	Woodfibre LNG Limited
VC	valued component

SYMBOLS AND UNITS OF MEASUREMENT

Unit of Measurement	Definition
%	percent
μPa	micro-Pascal
dB	decibel
dBA	A-weighted decibel
km	kilometre
m	metre
m^3/day	cubic metres per day
m^3/s	cubic metres per second

1.0 INTRODUCTION

Woodfibre LNG Limited (Woodfibre LNG) is proposing to build a liquefied natural gas (LNG) processing facility with marine storage and off-loading (Project). The Project was subject to environmental assessment processes administered by the Province of British Columbia, Canada and Squamish Nation. The British Columbia (BC) Environmental Assessment Office (EAO) issued an Environmental Assessment Certificate (EAC) #E15-02 for the Project on October 26, 2015. Amendment #1 to the EAC for changes to the cooling process was issued on July 12, 2017, and Amendment #2 to clarify the definition of construction was issued on July 19, 2019. The federal government issued its Federal Decision Statement (FDS) as part of a substituted process under the *Canadian Environmental Assessment Act, 2012* (SC 2012, c. 19, s. 52) on March 17, 2016 and re-issued the FDS on March 7, 2018. The Squamish Nation conducted an independent review of the Application for an EAC (Application) under its own environmental assessment process and on October 14, 2015 issued an Environmental Certificate #2015-001 for the Project. These environmental assessment certificates and decision statements, based on the Environmental Assessment Application (Application) and review processes, are collectively referred to herein as the Environmental Assessment Approvals (EAAs). The purpose of this application (the Amendment) is to amend the EAAs for the project to include worker accommodation as described herein. The proposed amendments to the Certified Project Description (Schedule A of EAC #E15-02) described herein are being submitted to EAO, Impact Assessment Agency of Canada (IAAC) and Squamish Nation as a collective application to amend the Project's EAAs.

The Certified Project Description (CPD) does not include worker accommodation infrastructure because, at the time of the initial Application, sufficient accommodation options were thought to be available in local communities with a bus connection to the Project's ferry service. As a result of changing conditions for worker accommodation in these communities and across the region, and following the receipt of local community feedback on land-based work camps, Woodfibre LNG is now proposing temporary accommodation for construction workers at the site. This requires an Amendment to the EAAs, to include the following:

- Temporary floating worker accommodation (floatel) and associated mooring infrastructure
- Workforce accommodation on marine construction vessel
- Onshore drinking water treatment for supply to the floatel
- Pedestrian access path to the floatel, including two clear-span bridge crossings: one over Woodfibre Creek and one over an unnamed creek to the south of Woodfibre Creek.

The Project is located approximately 7 kilometres (km) southwest of Squamish, BC within the District of Squamish (Squamish) municipal boundaries. The site is the former Woodfibre Pulp and Paper Mill known to the Squamish Nation as *Swiyat*; it is a fee simple, industrially zoned brownfield site that has been used for more than 100 years for industrial use and has deep-water marine only access via Howe Sound. The location of the proposed Amendment to the Project is within the Certified Project Area (CPA) assessed in the Application (**Figure 1**).

**Temporary Floating Worker
Accommodation Amendment**

Legend

WNLNG Project Features	Floatel Project Features
(H) Helipad	--- 30 m Riparian Buffer
Existing Water Line from Mill Creek	- - - Access Trail and Utility Corridor
Project Feature	××× New Fence Line
Certified Project Area	— Project Feature
Green Zone	Marine Construction Area ¹
New or Upgraded Roadway	Terrestrial Construction Area ²
Certified Marine Terminal Area	Basedata
	— Creek Shoreline
	— Contour (10 m interval)
	- - - Forestry Road
	— Watercourse
	□ Parcel Boundary
	■ Waterbody

Notes

1. Marine construction footprint is a 25 m buffer of the marine footprint.
2. Terrestrial construction footprint is a 15 m buffer of the terrestrial footprint.
3. All mapped features are approximate and should be used for discussion purposes only.
4. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licences - British Columbia & District of Squamish
- Data courtesy of KBR Technical Services, Inc.
- Aerial Image: ESRI World Imagery

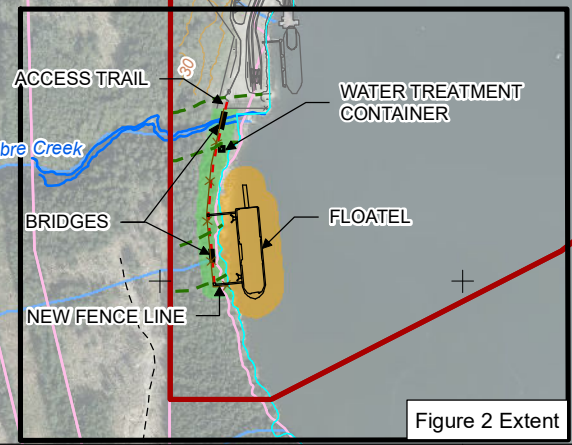
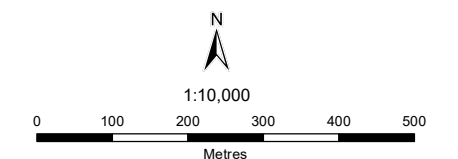
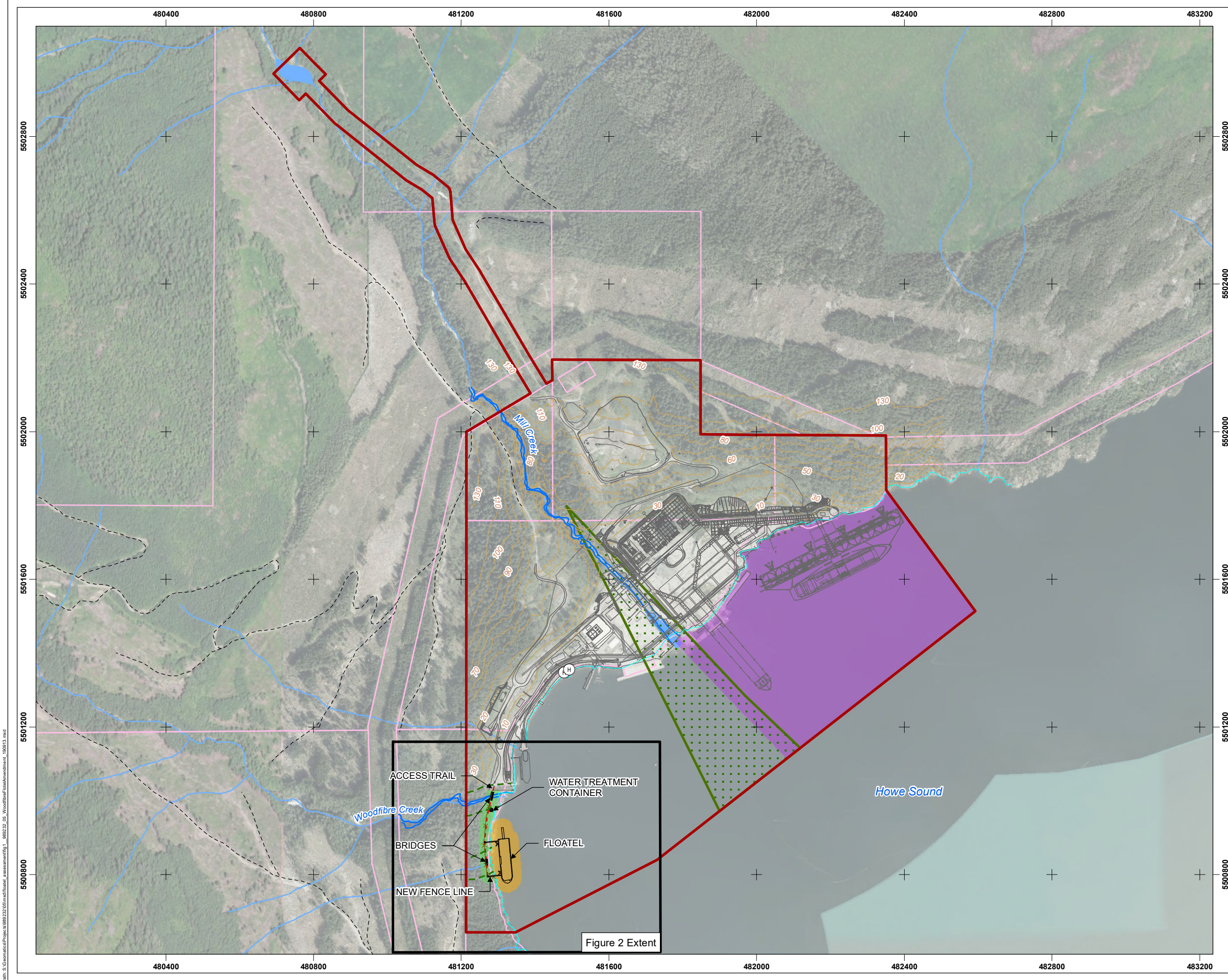


Figure 2 Extent



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1.1 Accommodation Background

Following issuance of the Project's EAAs, the detailed planning process identified the need for additional accommodation options to support the construction phase of the Project. Housing affordability and availability have come to the forefront for local government planning initiatives. In addition, community engagement discussions (see **Section 3.0**) have suggested that there is a lack of rental housing and temporary accommodation options in the Greater Vancouver and Squamish areas; a large influx of workers into at-market housing could create challenges for permanent residents to find affordable housing in an already restrictive local housing market.

New provincial requirements for housing needs took effect in April 2019 and require all local governments in BC to complete housing needs reports by April 2022 and every five years thereafter. Housing needs reports are a means for communities to better understand the current and future housing needs by identifying existing and projected gaps in housing supply (Government of BC 2019). Regional districts and local governments are required to collect information about current and projected population, household income, and currently available and anticipated housing units for each electoral area.

Pursuant to this requirement and in response to identified concerns, the Squamish-Lillooet Regional District (SLRD) has initiated a housing need and demand study to better understand the housing pressures facing rural areas. The study will support future planning in the SLRD and will explore the anecdotal evidence of a lack of available affordable housing, leading to many challenges including a worker shortage (SLRD 2019a). The SLRD has received complaints regarding, and identified issues with, illegal short-term rentals and their long-term effects to neighbourhood character and rental housing (SLRD 2019b).

Squamish is undertaking a short-term rental review, with the aim of establishing a regulatory framework for rentals. The goals of the framework include protecting the long-term rental housing supply for Squamish residents (District of Squamish 2019a). The District of Squamish is also developing a long-term Affordable Housing Program to manage existing and new affordable housing stock (M'akola Development Services 2017, Squamish Chief 2018).

Current rental accommodation vacancy rates reflect the shortage of accommodation in the Greater Vancouver and Squamish areas and the province. Generally, rates between 5 percent (%) to 7% are considered to provide a balance in the number of available units (Rental Property Reporter 2011). Lower rates result in greater demand and consequent higher rental costs. Recent vacancy rates for Squamish, Metro Vancouver, and BC are summarized below:

- Squamish: Private apartment vacancy rate was 0.3% in October 2018, an increase from 0.0% in October 2016 and 2017 (complete data set not available) (CMHC 2019).
- Metro Vancouver: Vacancy rates for bachelor and single bedroom units have been less than 1.0% for the period 2014 to 2017. Vacancy rates were slightly higher (>1%) for 2012 and 2014 (CMHC 2018a) (Metro Vancouver 2018). Rates in Vancouver were 1% in November 2018, the lowest of selected Canadian census metropolitan areas (CMHC 2018b).
- BC: Vacancy rates remained low, increasing from 1.3% in 2017 to 1.4% in 2018, due to supply slightly outpacing demand (CMHC 2018a).

With these low vacancy rates, finding accommodation for the estimated number of Project construction workers in the Greater Vancouver and Squamish area without causing adverse effects on local communities is unlikely. Woodfibre LNG has therefore reviewed several alternatives for worker accommodation, including the floatel, as described in **Section 1.2**.

1.2 Alternative Accommodation Considerations

To support the necessary accommodation requirements the chosen option must have the following characteristics, which were considered as criteria in the selection of the preferred option:

1. Housing for up to approximately 600 staff at one time at peak construction
2. Reliable availability for the construction period from 2021 to 2024
3. Support of local communities, including the Squamish Nation
4. Access to the ferry terminal
5. Minimize impacts of temporary workers in the community (e.g., traffic and housing availability).

Several accommodation options have been considered for housing workers during the construction phase of the Project:

- A mainland worker camp operated by a third party outside the CPA and within the District of Squamish: A mainland camp was strongly opposed by the Squamish community during discussion, with concerns voiced about adverse interactions with the community and increased demand on local services (see **Section 3.0**).
- Land-based camp inside the CPA: The topography of the CPA yields limited suitable land available for construction of a camp large enough to accommodate the required construction team inside the terrestrial portion of the CPA. Theoretically, an area for the camp could be created inside the CPA but would require significant clearing and earthworks, which was considered to have a material adverse environmental impact.
- Accommodation in the local community (Squamish): Woodfibre LNG has been closely following the availability of accommodation for construction workers within Squamish and has determined that vacancy rates for rental properties in Squamish are extremely low (1.0%), and there is currently insufficient housing capacity to accommodate the forecasted influx of Project workers. In addition, during review of the Application and in subsequent discussions with Squamish, concerns were expressed regarding increased demand on local services if workers were housed in the community.
- Floating camp in the CPA: Floating accommodation (floatel) moored for the construction phase with worker access to the shore and construction areas.

In response to the changes in accommodation availability, concerns from the community, and suitable terrain availability at the Project site, a floating worker accommodation camp was selected as the preferred option. This is the only option that satisfactorily achieves the requirements for worker accommodation for Woodfibre LNG and satisfactorily addresses the potential environmental effects. The Amendment is expected to result in reduced impact on at-market housing within the SLRD and Vancouver, and reduced vehicle traffic on the Sea to Sky Highway (Highway 99) due to bus and private vehicles in transit to and from the Project's ferry terminal and reduce pressure on community infrastructure and services.

This Amendment request is a result of Woodfibre LNG's ongoing efforts to continually improve the environmental performance of the Project by reducing the effects of construction on the environmental pillars identified through the environmental assessment processes (EAO, IAAC, Squamish Nation). No significant adverse effects are anticipated as a result of the Amendment, and some effects, for which there was a need for mitigation in EAC #E15-02, will be substantially reduced with this Amendment – notably, the reduced need for traffic planning and control of vehicle congestion and emissions associated with daily travel to site by construction workers.

2.0 PROPOSED CHANGES TO THE CERTIFIED PROJECT DESCRIPTION

Woodfibre LNG proposes to add the following components to Schedule A of the CPD of EAC #E15-02 for review by the BC EAO:

- Temporary floating worker accommodation (floatel) and associated mooring infrastructure
- Workforce accommodation on marine construction vessel
- Onshore drinking water treatment for supply to the floatel
- Pedestrian access path to the floatel, including two clear-span bridge crossings: one over Woodfibre Creek and one over an unnamed creek to the south of Woodfibre Creek.

The proposed changes to the Project are entirely contained within the CPA assessed in the Application and included in EAC #E15-02. The proposed additional Project components for the floatel will only be required during the construction phase of the Project. The location of the proposed changes to the CPD included in this Amendment are shown in **Figure 2**.

Detailed Amendment Infrastructure

Legend

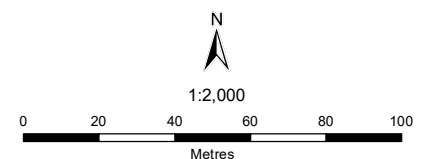
- Certified Project Area
- New or Upgraded Roadway
- Floatel Project Features**
- 30 m Riparian Buffer
- Access Trail and Utility Corridor
- New Fence Line
- Project Feature
- Marine Footprint
- Marine Construction Area¹
- Terrestrial Footprint
- Terrestrial Construction Area²
- Basedata**
- Forestry Road
- Watercourse
- Parcel Boundary

Notes

1. Marine construction area is a 25 m buffer of the marine footprint.
2. Terrestrial construction area is a 15 m buffer of the terrestrial footprint.
3. All mapped features are approximate and should be used for discussion purposes only.
4. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

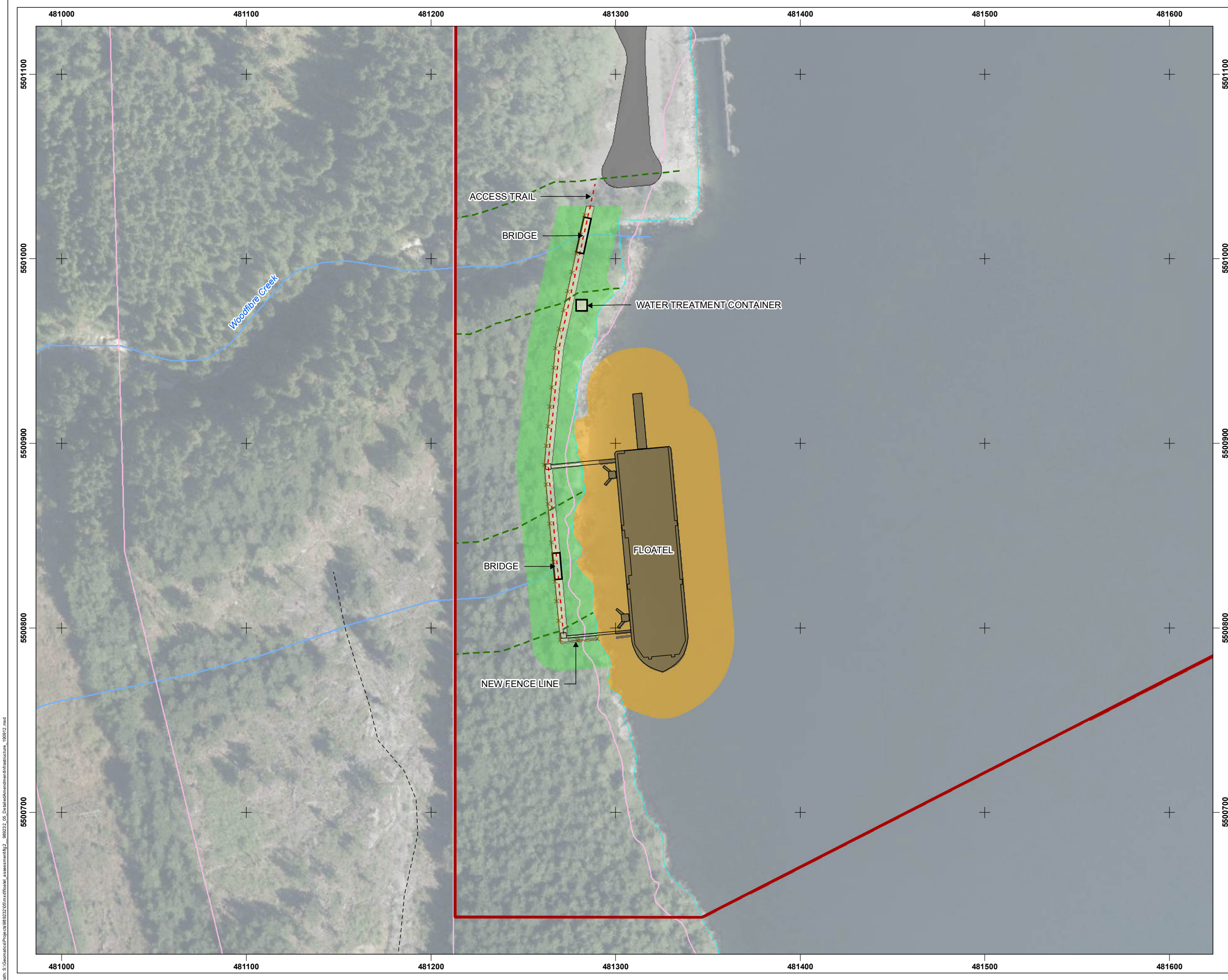
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- Data courtesy of KBR Technical Services, Inc.
- Aerial Image: District of Squamish, 2019 (10 cm)



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2.1 Floatel

The floating accommodation facility will be approximately 125 metres (m) long, 32 m wide, and 22 m high. It is anticipated to be in operation during the portion of the construction period when the highest numbers of workers will be present, from April 2021 to February 2024.

The floatel will be a self-contained accommodation facility with approximately 400 - 600 beds, an on-board kitchen, recreational areas, sewage collection and holding tanks, garbage collection, and a loading dock. Power will be provided from BC Hydro via an existing connection at the Woodfibre site, with contingency backup power from onboard diesel generators. Service vessels will remove solid waste and sewage from the floatel for disposal at a licensed offsite facility. The floatel will be towed to site and moored as it has no internal propulsion capability. Construction staff will be ferried to and from the floatel at the start and end of their shift schedule. Off-duty transport to Squamish will not be accommodated except for medical appointments and other approved activities.

Piles and dolphins will be installed to moor the floatel. The mooring is expected to consist of six piles (one vertical king pile and two offset batter piles) per dolphin, with two dolphins in total. Based on preliminary designs, pile diameter will be less than 2 m. Once in position, the floatel will be moored at the location for the duration of the Project's construction phase. Following construction, the floatel will be towed from the site, and the mooring infrastructure will be left in place provided that Woodfibre LNG identifies an ongoing use. If there is no future use identified the infrastructure will be removed.

2.2 Workforce Accommodation on Construction Vessel

The Application included an assessment of the potential effects from use of marine construction vessels to build the LNG jetty and mooring infrastructure for the floating LNG storage facility. However, the assessment did not include the accommodation of the crew onboard one of the marine construction vessels as is the typical approach in the industry. Woodfibre LNG is proposing to use a marine construction vessel that includes accommodation for approximately 150 workers for the duration of LNG jetty and mooring construction, approximately 14 to 20 months. Over this duration, the vessel will be regularly relocated within the certified marine terminal area as required to support construction of marine components inside the CPA (**Figure 1**). It is not anticipated that the marine construction vessel will be located in one place for more than approximately 8 weeks. Sewage and solid waste will be stored on the vessel and collected periodically by service vessels for disposal at a licensed offsite facility. Electrical power will be generated on the vessel using diesel generators. The vessel will be approximately 110 m long, 30 m wide, and 34 m high with the crane stowed. Drinking water tanks will be filled using onboard water makers or from the floatel drinking water supply if there is extra capacity within the previously approved withdrawal limit from Woodfibre Creek.

2.3 Floatel Drinking Water Supply

A water treatment plant is required for the supply of potable water to the floatel and marine construction vessel. A water withdrawal of 0.07 cubic metres per second (m³/s) from Woodfibre Creek was approved in EAC Amendment #1 (Air Cooling Amendment). This withdrawal is sufficient for that purpose and can also accommodate the peak drinking water demand of approximately 0.001 m³/s. Water will be treated using a shore-based, self-contained water treatment system housed in a shipping container on the south bank of Woodfibre Creek (**Figure 2**). Water treatment will include filtration and chlorination in accordance with Canadian drinking water standards. Treated drinking water will be piped overland following the temporary service corridor aligned with the pedestrian access pathway to the floatel. Reject water from backwashing filters in the water treatment system will be collected and discharged at a licensed offsite facility.

2.4 Floatel Access

Terrestrial access to the floatel will be provided by two shore gantries that will be linked to the LNG facility via a covered pedestrian walkway (see **Figure 2**). Two new temporary clear span bridges will be constructed to provide access: one over Woodfibre Creek, and one over the unnamed creek to the south. Marine access to the floatel will be provided via the integrated loading dock on the floatel.

2.5 Project Footprint

The footprint for the floatel (**Figure 2**) is the area of disturbance associated with installation and or use of the floatel, and is sufficient in size to allow for some flexibility in final positioning of floatel infrastructure. The expected changes to the marine and terrestrial footprints as a result of the proposed Amendment are shown in **Table 2-1**. The footprint includes those areas directly disturbed by shading or underwater substrate disturbance, which comprise approximately 0.4 hectares (ha) of the marine environment shaded by the floatel, approximately 0.002 ha of the marine environment for piling installation, and 0.11 ha of the terrestrial environment required for the pedestrian access. Shading of the operational marine footprint was estimated as 3.1 ha in the Application. The impacts for this Amendment extend the operation footprint effects from the Application into the construction period for an approximately 0.4 ha footprint.

Table 2-1 Amendment-related Footprint Areas

Area Disturbed	Amendment Area (ha)	Application Area (ha)	Change (ha)
Marine footprint	0.4	n/a ¹	+0.4
Seafloor disturbance (pilings)	0.002	0.1 ²	+0.002
Terrestrial footprint	0.11	41 ³	+0.11

¹ The Application did not include any areas for marine footprint during construction

² Application disturbance area excluding marine seawater intakes associated with cooling no longer required as per the Air Cooling Amendment

³ Maximum land disturbance area stated in the Application and CPD.

2.6 Proposed Revisions to Schedule A of the Certified Project Description

Woodfibre LNG is proposing to amend Section 3.0 Construction Infrastructure, Facilities, and Activities of Schedule A of the CPD to include the following:

- *Temporary floating worker accommodation (floatel) and associated mooring infrastructure*
- *Workforce accommodation on marine construction vessel*
- *Onshore drinking water treatment for supply to the floatel*
- *Pedestrian access path to the floatel, including two clear-span bridge crossings: one over Woodfibre Creek and one over an unnamed creek to the south of Woodfibre Creek.*

3.0 CONSULTATION

Below is a summary of the consultation activities conducted to date related to the Amendment.

3.1 Aboriginal Consultation

The EAO's Section 11 Order, which was issued on March 21, 2014, sets out three Aboriginal Group Schedules with different consultation requirements as follows:

- Schedule B: Squamish Nation – Consultation on all Project Components
- Schedule C: Tsleil-Waututh Nation – Consultation on Offsite Project Effects
- Schedule D: Notification by the EAO as per part 12.2 of the Section 11 Order:
 - Musqueam Indian Band,
 - Cowichan Tribes First Nation,
 - Halalt First Nation,
 - Lake Cowichan First Nation,
 - Lyackson First Nation,
 - Penelakut Tribe,
 - Stz'uminus First Nation, and
 - Métis Nation BC.

In accordance with Woodfibre LNG's engagement strategy and the direction per the Section 11 Order, and in concert with the Engagement Policy and Engagement Principles described in the Application, Woodfibre LNG engages with Squamish Nation regarding all Project components and the Tsleil-Waututh Nation regarding offsite Project-related effects. Woodfibre LNG also keeps Schedule D Aboriginal groups notified of proposed amendments to the CPD.

Consultation with Aboriginal groups is ongoing and satisfies Conditions 2.10 and 2.11 of the federal Decision Statement, specifically:

- Condition 2.10: The Proponent [Woodfibre LNG] shall consult with Aboriginal groups prior to initiating any material change(s) to the Designated Project that may result in adverse environmental effects and shall notify the Agency in writing no later than 60 days prior to initiating the change(s).
- Condition 2.11: In notifying the Agency pursuant to Condition 2.10, the Proponent [Woodfibre LNG] shall provide the Agency with an analysis of the adverse environmental effects of the change(s) to the designated Project, as well as the results of the consultation with Aboriginal groups.

The scope of engagement efforts is influenced by each of the Amendment Application's components and activities as well as their potential effect on the continued exercise of Aboriginal Interests, including effects on current use of lands and resources for traditional purposes.

While Woodfibre LNG remains committed to documenting Project-related consultation activities in a manner that satisfies the regulatory requirements of EAO and IAAC, Woodfibre LNG also respects the preferences of Aboriginal groups regarding the reporting of consultation activities.

3.1.1 Squamish Nation

Woodfibre LNG and Squamish Nation entered into an agreement to conduct a separate Project review process (Squamish Nation Process) to assess the potential effects of the Project on Squamish Nation's Aboriginal interests, including traditional lands, water, and heritage resources. Discussions between Woodfibre LNG and Squamish Nation under the Squamish Nation Process were considered confidential and were not reported in the Application. On October 14, 2015, at the conclusion of the Squamish Nation Assessment Process, Squamish Nation issued an Environmental Certificate for the Project that included conditions to be met by Woodfibre LNG. The Squamish Nation is a Regulatory Authority for the Project.

Consultation with Squamish Nation regarding the proposed Amendment is described in **Section 3.3: Regulatory Authority Consultation**.

3.1.2 Tsleil-Waututh Nation

Woodfibre LNG began initial discussions with the Tsleil-Waututh Nation in early 2014 following the EAO's issuance of the Section 11 Order. The Tsleil-Waututh Nation participated in the EAO Technical Working Group. Outside the Technical Working Group, consultation activities with the Tsleil-Waututh Nation have included a mix of formal and informal meetings and discussions, provision of capacity funding, and support of Current and Traditional Aboriginal Use and Values studies. Per the Woodfibre LNG Tsleil-Waututh Nation Memorandum of Understanding (signed December 16, 2014), the Tsleil-Waututh Nation provided the results of the Traditional Land Use Study in March 2015, and Woodfibre LNG submitted an updated Tsleil-Waututh Nation Current Use report to the EAO in June 2015.

Woodfibre LNG has shared information with Tsleil-Waututh Nation on the proposed changes to the Project in a letter dated October 24, 2019. The letter describes the proposed Amendment and seeks direction on how Tsleil-Waututh Nation would like to receive information and provide input with respect to the proposed Amendment. Woodfibre LNG is working to schedule a meeting with Tsleil-Waututh Nation to discuss the proposed Amendment.

3.1.3 Schedule D Aboriginal Groups

The EAO's Section 11 Order to Woodfibre LNG, issued March 21, 2014, includes a Schedule D, which lists the Aboriginal groups that Woodfibre LNG was required to notify on major Project developments. Further and in accordance with Sections 2.10 and 2.11 of the FDS, Woodfibre LNG sent letters to the Schedule D Aboriginal Groups on October 24, 2019 advising of the proposed Amendment and seeking direction on how they would like to receive information and provide input with respect to the proposed Amendment.

3.2 Public and Local Government Consultation

Woodfibre LNG strives for transparency and open dialogue with the Squamish community and the broader BC public. Questions and discussion around the Amendment will be encouraged and responded to, through in-person meetings and through the engagement website at www.askwoodfibrelng.ca.

Woodfibre LNG has met with many stakeholders and municipal elected officials, reviewed information publicly provided by municipalities, and closely monitored the activities of third-party housing providers as they pursue developments in region. As a result of feedback received and recent media coverage, Woodfibre LNG is aware that the concept of floating accommodation within the CPA is appealing to many in the community.

Woodfibre has notified the District of Squamish of the proposed Project changes and started formal meetings on September 23, 2019 to discuss applicable Environmental Management Plans and the proposed Amendment, and met again on October 4, 2019 and October 16, 2019.

Woodfibre LNG will continue to provide potentially affected groups with the opportunity to discuss proposed Project changes. These opportunities will include reaching out to potentially affected groups to solicit feedback and provide an opportunity to meet with Woodfibre LNG. Groups that Woodfibre LNG will consider engaging include: first responders, community groups (e.g., Squamish Lions Club, Squamish Rotary, Squamish Chamber of Commerce, Sea to Sky Community Services), commercial marine users, recreational marine user groups, and other groups identified through Woodfibre LNG's ongoing engagement with the community and through discussion with representatives of the District of Squamish.

Woodfibre LNG anticipates that general public consultation regarding the proposed Project changes will be undertaken during the public comment period required by the EAO's amendment process.

Woodfibre LNG has been tracking public opinion regarding the floatel. Documented opinion towards the Amendment have generally been favourable with members of the public requesting a floatel as their preferred option. A record of community feedback regarding the floatel is included in **Table 3-1**.

Table 3-1 Community Feedback Log

Topic	Date	Source	Origin	Comment	Reference
Worker accommodation options	04-Mar-19	Public comment	Public	<i>"You know everyone within that huge camp in Kitimat — that 4,000-man camp — was pretty much running rampant in that town," said Donnie Whorley. "They weren't going home, going to the gym after. They were going out to the bar, causing fights, sleeping with people's wives, sleeping with people's husbands." The last sentence drew a few chuckles from the audience. He suggested a better alternative would be to anchor a cruise ship adjacent to the Woodfibre site, which is an approach that has been implemented in Kitimat. "I've worked in camps," he told The Chief beforehand. "These camp workers will do what they want." He was afraid workers would fight with local youths, drink and consume drugs in public places. There were a number of people present who echoed this concern either publicly or in conversations with The Chief. Some also repeated that the Woodfibre site would be a better place to put the camp.</i>	https://www.squamishchief.com/news/local-news/south-britannia-temporary-work-camp-proposal-sparks-fiery-debate-1.23652660
Worker accommodation options	27-Apr-19	Public comment	Public	Local environmental activist Tracey Saxby states: <i>"...repeated suggestions previously made by Britannia residents. She said the camp could either be put on the Woodfibre site or workers could be accommodated on a cruise ship anchored close to the LNG project."</i>	https://www.squamishchief.com/news/local-news/slrld-seeks-provincial-input-on-proposed-sea-to-sky-work-camp-1.23804529
Worker accommodation options	04-Jun-19	Public comment	Public	Public question: <i>"why worker camp can't be closer to Woodfibre site or on its actual site?"</i>	https://www.squamishchief.com/news/local-news/britannia-temporary-work-camp-again-draws-contentious-debate-1.23844376?fbclid=IwAR3GE0jrE31zXUQZwhiYJuxZBUozcGkc689s9ZaYyWwNVwUziZ5simT7dRc
Worker accommodation options	20-Jun-19	Public comment	Public	Letter from Doug Brownridge states: <i>"The LNG project could rent a cruise ship, easily able to house and entertain the 550 workers closer to the worksite. Minimal disruption to lifestyle, traffic flow and services for Squamish and area."</i>	https://www.squamishchief.com/opinion/letters/letter-no-to-the-workcamp-in-britannia-1.23860677

3.3 Regulatory Authority Consultation

Woodfibre LNG has been in discussions with EAO, IAAC and Squamish Nation regarding the Amendment for several months and submitted a scoping letter to these Regulatory Authorities on August 6, 2019 requesting feedback to guide the preparation of the Amendment application. Feedback received from Regulatory Authorities on the scoping document has been incorporated into this Amendment Application.

In accordance with the Environmental Assessment Agreement dated October 14, 2015 between Woodfibre LNG and Squamish Nation, discussions regarding the Amendment have been held through multiple channels including the Woodfibre Environmental Working Group since January 2019. Topics discussed have ranged from the Amendment concept to technical scoping.

Woodfibre LNG will continue to discuss the proposed Amendment with Squamish Nation through regular Woodfibre Environmental Working Group meetings, the Amendment Application Technical Working Group, and direct discussions with Squamish Nation representatives. Woodfibre LNG will report on non-confidential consultative activities with Squamish Nation, as required by EAO and IAAC.

4.0 ASSESSMENT METHODOLOGY

The assessment methodology for this Amendment follows a two-step screening process to identify potential effects to the valued components (VCs) and intermediate components (ICs) identified in the Application. The first step involves screening the potential for an interaction between the new Project components associated with the Amendment (i.e., floatel, accommodation on the construction barge, drinking water treatment, and shore access) with the VC or IC previously assessed in the Application and any new VC or IC that might interact with the Amendment particulars (**Table 7-1**). The results of this screening have been shared with the EAO, IAAC, and the Squamish Nation (Hemmera 2019). Any VC and IC with potential to interact is carried forward for further assessment in the second step (**Section 6.0**); those that do not interact are not carried forward and a rationale is provided (**Section 5.0**). The second step assesses whether the new Project interactions are likely to result in a new or increased effect with the VC or IC (**Section 6.0**). If potential new or increased effects are identified, additional mitigation may be proposed and a determination of residual effect will be made for the VCs. Where applicable, the mitigation from the Application is noted in the text. Woodfibre LNG is committed to implementing the conditions listed in the EAC, the FDS, and the Squamish Nation Environmental Assessment Agreement.

The assessment methodology used to characterize potential effects to VCs and ICs for this Amendment is consistent with the methodology used in the Application (refer to Section 4.6 of the Application). Local assessment areas (LAAs) and regional assessment areas (RAAs) are also consistent with those used in the Application.

There are no new activities for the operation and decommissioning phase of the Project. Removing the floatel following Project construction is considered within the scope of the activities listed in the CPD as its removal will be similar to removing other floating construction-phase equipment. Interactions between the activities listed in this Amendment and each VC or IC are classified as follows:

- **No interaction:** No interaction is likely between a Project component and a VC or IC.
- **No new interaction:** No new interaction is identified beyond those already included in the Application.
- **Minor interaction:** An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the classification; however, it is not carried forward to a consideration of potential effects.
- **Carried forward:** Interactions have the potential to result in an adverse effect.

An adverse residual effect for the VC will be rated as negligible, not significant, or significant. Definitions for these ratings are as follows:

- Significant (S)** The basis for determining that a residual effect is significant will be provided in the section for each VC, if required. The determination of significance will be the same as identified for each VC in the Application.
- Not significant (NS)** Effects determined to be not significant are those likely to be greater than negligible; however, they do not meet the definition of significant.
- Negligible (N)** Defined as undetectable or unmeasurable. If, following mitigation, negligible residual effects are anticipated, the effect is not carried forward for an assessment of the significance of residual effects.

Consistent with the Application, a determination of significance is provided for VCs only. Should the significance determination change, potential changes to residual cumulative effects will be assessed, consistent with the methodology used in the Application.

5.0 INTERACTION OF PROPOSED PROJECT CHANGES WITH INTERMEDIATE COMPONENTS AND VALUED COMPONENTS

5.1 Project Interactions with Proposed Project Changes

The VCs and ICs considered in the Application are also considered in this Amendment. The floatel is a self-contained and isolated work camp, and Woodfibre LNG has control of ingress and egress. Construction staff will be housed on the floatel for the duration of their shifts with limited ability to access Squamish.

A summary of the VCs and ICs and their potential to interact with the proposed Project changes is provided in **Table 5-1**, which identifies interactions between the proposed Project changes and the VC and IC that have the potential to cause an adverse effect. The components selected for assessment are:

- Intermediate components: Atmospheric sound and light
- Valued components: Vegetation communities, freshwater fish and fish habitat, marine benthic habitat, marine birds, forage fish and other fish, marine mammals, labour market, sustainable economy, infrastructure and community services, marine transport, land and resource use, visual quality, current use of land and resources for traditional purposes, and community health and well-being (CHWB).

Table 5-1 Summary of the Potential for Intermediate Components and Valued Components to Interact with Proposed Project Changes

Valued or Intermediate Component	Application Section	Potential Interaction with Proposed Amendment				Carried Forward in Amendment	Rationale
		Floatel	Construction Vessel	Drinking Water Treatment	Shore Access		
Intermediate Component							
Atmospheric Sound	5.4	✓	✓	✓		Yes	The potential effects to atmospheric sound from the floatel will be assessed in this Amendment.
Light	5.5	✓	✓		✓	Yes	The floatel construction vessel and walkways will be illuminated at night for safety purposes. The potential effects to the light regime will be assessed in this Amendment.
Geotechnical and Natural Hazards	5.6	✓	✓		✓	No	The addition of the Amendment components to the Project will not result in a material change to the geotechnical and natural hazard assessment in the Application. The Amendment changes are not expected to affect or be affected by geotechnical conditions or natural hazards in ways that were not already assessed. Application baseline studies included an assessment of the entire CPA, which includes the areas where Amendment changes are located. The mitigation measures included in the Application are considered appropriate to avoid or reduce potential changes in geotechnical and natural hazards.
Site Contamination	5.7				✓	No	The addition of the Amendment components to the Project will not result in a material change to the assessment in the Application. Application baseline studies included an assessment of the entire CPA, which includes the areas where Amendment changes are located. Site contamination in the CPA was assessed as part of the Application. The mitigation measures included in the Application and reflected in the EAC conditions are considered appropriate to avoid or reduce potential changes in site contamination.
Surface Water Quality	5.8					No	The addition of the shore access, electricity, and drinking water supply lines to the floatel is not expected to result in an interaction with surface water as these will be land-based. The mitigation measures included in the Application and EAC conditions are considered appropriate to avoid or reduce potential changes in surface water quality.
Surface Water Quantity	5.9					No	At peak occupancy, approximately 0.001 m ³ /s of water will be diverted from Woodfibre Creek, treated, and pumped to the floatel. This amount is included in 0.07 m ³ /s withdrawal approved in Amendment #1. There are no new interactions with surface water quantity and as a result of the proposed changes to the Project.
Marine Water Quality	5.10					No	Approximately 5 m ³ /day of backwash water from the water treatment plant will be generated. The reject water will be collected and disposed of at a licensed offsite facility. There will be no emissions to the marine environment as a result of the proposed changes to the Project.
Valued Components							
Atmospheric Environment (Air Quality)	5.2	✓	✓			No	The Application determined that the expected effects from the construction and decommissioning phases will be less than during the operation phase. The air quality assessment focused on predicting maximum offsite effects from the operation phase of the Project, which is considered the phase that will likely result in the greatest overall changes to air quality. Because no changes are proposed to Project operation, the floatel emergency generators and construction vessel occupation are not expected to result in a material change to the assessment and mitigation presented in the Application. The mitigation measures included in the EAC conditions are considered appropriate to avoid or reduce potential effects to air quality. This Amendment reduces transit-related emission to the atmospheric environment due to the reduction in Sea to Sky Highway vehicle and ferry vessel journeys required through the construction period. A benefit to air quality and the atmospheric environment is anticipated from this Amendment.
Greenhouse Gas Management (Greenhouse Gas Emissions)	5.3	✓	✓			No	Electrical power from the BC Hydro grid will be supplied to the floatel. Electrical power will be generated on the construction vessel using diesel generators and on the floatel only in the event of a BC Hydro power failure. The backup generators on the floatel will be used infrequently and for short durations that cannot be quantified. Their contribution to greenhouse gas emissions is expected to be negligible and this contingency power supply is not considered further. Greenhouse gas emissions from marine construction vessels were included in the Application for construction of the floating storage and offloading unit jetty, and the potential effects have already been assessed. The mitigation measures included in the Application are considered appropriate to avoid or reduce potential changes in greenhouse gas emissions. This Amendment will result in a reduction in transit-related greenhouse gas emission due to the reduction in Sea to Sky Highway vehicle and ferry vessel journeys required through the construction period. The Amendment will result in an environmental benefit.
Vegetation Communities	5.11			✓	✓	Yes	Approximately 0.11 ha of clearing will be required to construct the terrestrial infrastructure. The potential effects to vegetation communities will be assessed in this Amendment.

Valued or Intermediate Component	Application Section	Potential Interaction with Proposed Amendment				Carried Forward in Amendment	Rationale
		Floatel	Construction Vessel	Drinking Water Treatment	Shore Access		
Avifauna (Migratory Birds)	5.12				✓	No	Avifauna may nest in any vegetated area within the CPA. The potential effects of approximately 0.11 ha of additional clearing of disturbed vegetation can be effectively mitigated by applying the same mitigation measures presented in Condition 11 of the EAC and Condition 4.1 of the FDS. The addition of the shore access to the Project is not expected to result in a material change to the assessment presented in the Application. The mitigation measures included in the Application are considered appropriate to avoid or reduce potential effects to avifauna.
At-risk Bats (Listed Species at Risk)	5.13				✓	No	All vegetated areas within the CPA are considered potential bat roosting habitat. The potential effects of approximately 0.11 ha of additional clearing of disturbed vegetation can be effectively mitigated by applying the same mitigation measures presented in Condition 9.1 of the FDS. The addition of the shore access to the Project is not expected to result in a material change to the assessment presented in the Application. The mitigation measures included in the Application are considered appropriate to avoid or reduce potential effects to at-risk bats.
Amphibians	5.14				✓	No	Western toad and red-legged frog may be present throughout the CPA. Coastal tailed frog is considered present in Woodfibre and Mill creeks. The potential effects of approximately 0.11 ha of additional clearing can be effectively reduced by applying the mitigation measures presented in the Application. The addition of the pedestrian shore access to the Project is not expected to result in a material change to the assessment presented in the Application.
Freshwater Fish and Fish Habitat (Fish and Fish Habitat)	5.15				✓	Yes	The Project changes will require additional riparian vegetation clearing and two new clear-span bridges. The potential effects to fish and fish habitat will be assessed in this Amendment.
Marine Benthic Habitat	5.16	✓				Yes	Additional mooring piles will be required to secure the floatel. The potential effects to marine benthic habitat will be assessed in this Amendment.
Marine Birds	5.17	✓				Yes	The potential effects on marine birds from the floatel will be assessed in this Amendment.
Forage Fish and Other Fish	5.18	✓				Yes	The potential effects of the floatel on forage fish and other fish will be assessed in this Amendment.
Marine Mammals	5.19	✓				Yes	The potential effects of the floatel to marine mammals will be assessed in this Amendment.
Labour Market	6.1	✓	✓	✓	✓	Yes	Additional construction tasks, as well as maintenance and operation of the floatel will create employment opportunities in the area. The potential effects to labour market will be assessed in this Amendment.
Sustainable Economy	6.2	✓	✓	✓	✓	Yes	There will be changes to employment opportunities and construction worker spending as a result of the Amendment. The potential effects to sustainable economy will be assessed in this Amendment.
Infrastructure and Community Services	7.2	✓	✓	✓	✓	Yes	There will be decrease in demand for local infrastructure and community services as a result of the floatel. The potential effects to infrastructure and community services will be assessed in this Amendment.
Marine Transport	7.3	✓	✓			Yes	Marine traffic to the site is expected to decrease as a result of the floatel. The potential effects to marine transport will be assessed in this Amendment.
Land and Resource Use	7.4	✓	✓		✓	Yes	Potential interactions with marine fish and freshwater fish as a result of the floatel may affect land and resource use. The potential effects to land and resource use will be assessed in the amendment.
Visual Quality	7.5	✓				Yes	There is potential for additional sensory disturbance due to changes in visual quality. The potential effects to visual quality will be qualitatively assessed in this Amendment. The Application included visibility modelling of the operation phase. Because the proposed changes to the Project are limited to construction, additional visibility modelling will not be undertaken.
Current Use of Lands and Resources for Traditional Purposes	7.6	✓	✓		✓	Yes	Potential interactions with marine fish and freshwater fish as a result of the floatel may affect the current use of land and resources for traditional purposes. The potential effects to current use of lands and resources for traditional purposes will be assessed in this Amendment.
Heritage Resources	8.2	✓			✓	No	All areas within the CPA are considered to have the potential for heritage resources. The potential effects of approximately 0.11 ha of additional terrestrial disturbance and 0.01 ha of marine disturbance can be effectively avoided or reduced by applying the same mitigation measures presented in the Application and EAC conditions. The addition of the floatel piles and shore access to the Project is not expected to result in a material change to the assessment presented in the Application.
Community Health and Well-being	9.2.1	✓	✓	✓	✓	Yes	There is potential for changes in the interactions with CWHB. The potential effects to community health and well-being will be assessed in this Amendment.
Human Health Risk Assessment (Human Health)	9.2.2			✓		No	Water from Woodfibre Creek will be treated to meet Canadian drinking water standards to protect human health. The addition of the Woodfibre Creek water use to the Project is not expected to result in a material change to the assessment presented in the Application. The mitigation measures included in the Application and EAC conditions are considered appropriate to avoid or reduce potential effects to human health risks.

6.0 ASSESSMENT OF ADVERSE EFFECTS FROM PROPOSED PROJECT CHANGES

The potential interactions between the proposed changes to the CPD included in this Amendment and the relevant VCs and ICs are discussed in the following sections. Each anticipated interaction and how that translates to an adverse change (to a VC) or effect (to an IC) are discussed. Where applicable, the mitigation from the Application is noted in the text. A list of the mitigation measures from the Application referenced in the text is included as **Appendix A**.

6.1 Summary of Effects of Project-related Changes

A summary of the changes to the mitigation measures presented in the Application and the characterization of residual effects and significance determination are presented in **Table 6-1**. The assessments in this Amendment do not result in any changes to the mitigation listed in the Application, FDS, Amendment #1, EAC Conditions, or Squamish Nation Environmental Assessment Certificate. Characterizations of residual effects and significance determinations in the Application remain accurate and adequately address the additional activities proposed in this Amendment. The management and monitoring plans currently in progress for the Project will be amended to include the changes to the CPD included in this Amendment if it is approved.

Table 6-1 Summary of Changes to Mitigation Measures, Characterization of Residual Effects, and Determination of Significance for the Amendment

Valued Component	Application Section	Change to Mitigation Measures	Change to the Application's Characterization for VCs	Change to the Application's Determination of Significance for VCs
Atmospheric sound	5.4	No change	NA	NA
Light	5.5	No change	NA	NA
Vegetation communities	5.11	No change	No change	No change
Freshwater fish and fish habitat	5.15	No change	No change	No change
Marine benthic habitat	5.16	No change	No change	No change
Marine birds	5.17	No change	No change	No change
Forage fish and other fish	5.18	No change	No change	No change
Marine mammals	5.19	No change	No change	No change
Labour market	6.2	No change	No change	No change
Sustainable economy	6.3	No change	No change	No change
Infrastructure and community service	7.2	No change	No change	No change
Marine transport	7.3	No change	No change	No change
Land and resource use	7.3	No change	No change	No change
Visual quality	7.5	No change	No change	No change
Current use of lands and resources for traditional purposes	7.6	No change	No change	No change
Community health and well-being	9.1	No change	No change	No change

6.2 Atmospheric Sound

The atmospheric sound IC assessment in the Application considered changes to ambient sound in the proximity to the Project site and an increase in low-frequency noise (Section 5.4.5 of the Application). The Application found that sound level predictions during construction are expected to result in changes to atmospheric sound that meet Health Canada Guidance for the percent highly annoyed (%HA), sleep disturbance and speech intelligibility criteria at points of reception. Although the sound level at the receptor SR1 exceeded the 45 dBA nighttime limit in the Health Canada Guidance, the baseline-case sound level already exceeded the limit and there was a negligible increase due to the Project. Based on the construction sound contour mapping presented in the Application the daytime and nighttime equivalent sound levels at the floatel are expected to be in the 60 to 65 dBA, and 55 to 60 dBA range respectively.

6.2.1 Potential Interactions between Project Changes and Atmospheric Sound

The potential interactions between atmospheric sound and the proposed Project changes are limited to the floatel and drinking water treatment for domestic purposes (Table 6-2).

Table 6-2 Potential Project Interactions with Atmospheric Sound

New Project Activities and Physical Works	Atmospheric Sound Interaction
Construction Phase	
Floating worker accommodation (floatel)	Minor interaction: Operation of the floatel has the potential to contribute to the construction atmospheric sound levels.
Accommodation onboard marine construction vessel	No new interaction: Sound from the marine construction vessel is not expected to change as a result of adding worker accommodation.
Treatment of water for domestic purposes	Minor interaction: Sound producing equipment (pumps) have the potential to contribute to construction atmospheric sound levels.
Shore access	No interaction: No sound producing sources are present.

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

Minor interactions with atmospheric sound were identified for the floatel and treatment of water from Woodfibre Creek, specifically in relation to changes in ambient sound. The addition of shore access and worker accommodation on the marine construction vessel are not anticipated to result in any interaction or any new interaction with atmospheric sound. There are no major sources of low frequency noise to increase the construction LFN noise levels.

6.2.1.1 Changes in Ambient Sound

Potential changes in predicted construction sound levels were determined by considering the increase in the predicted sound levels at the floatel and water treatment facility as a result of the changes to the CPD included in this Amendment. Sound pressure levels of equipment expected to be on the floatel are listed in **Table 6-3**. Overall sound levels generated by the floatel are expected to be below the existing construction noise levels. Adding sound levels logarithmically from the floatel sources to the predicted construction sound levels is expected to result in a less than 3 dBA overall increase in sound at the floatel. A less than 3 dBA increase is below the level of barely perceptible change for humans (3 dBA) and represents a negligible increase in sound above construction levels.

Operation of the water treatment equipment will result in increased sound from the operation of water pumps. The contribution to the overall noise from the electrically powered pumps is expected to be less than 2 dBA, which is considered a negligible increase. In addition, water treatment equipment will be housed in an insulated shipping container to attenuate the noise and reduce the contribution to construction sound.

Because changes in sound levels at these locations are negligible (not perceptible), it is anticipated that the changes in sound in the vicinity of these activities or at the OGC guideline thresholds (1.5 km) will also be negligible (OGC 2018).

Table 6-3 Sound Pressure Levels of Floatel Equipment

Activity / Sound Source	Sound Pressure Level (dBA)
Washing machine	50 to 70
Commercial kitchen	60 to 75
Refrigerators	40 to 50
Television at medium volume	60
Vacuum Cleaner at 3 m*	70
Electric water pump (1 horse power)	60 to 80
Bilge pumps (intermittent)	60 to 85
Normal Conversation at 1 m	60

Notes: *Harris 1997; dBA – A-weighted decibel

The floatel will provide sleeping quarters for construction workers who will be working 12-hour shifts. Noise will be kept to a minimum to facilitate worker rest. Engineering controls will be implemented in the form of vessel design such as siting noise producing equipment away from sleeping quarters and equipment isolation, as well as procedural controls such as specific timing windows for louder activities such as vacuum cleaning to minimise disturbance.

Concerns were raised at the Squamish Nation working group in an amendment scoping discussion regarding the potential for transmission of sound through the hull to marine receptors. No details of the hull construction were available at the time of writing to determine sound attenuation and expected underwater noise. To better understand the potential sound transmission Woodfibre LNG will include underwater noise measurement in the vicinity of the floatel sufficient to establish the sound levels as part of the Marine Works Management plan (see SNEA and FDS conditions for underwater sound).

6.2.1.2 Summary

The predicted changes to atmospheric sound as a result of the proposed Amendment are negligibly changed from those identified in Section 5.4 of the Application. No new mitigation measures are required, and the implementation of mitigation measures identified in the Project EAA's will continue to constitute practical means of preventing or reducing potential changes on atmospheric sound as result of the proposed Amendment.

6.3 Light

The light IC assessment in the Application considered changes in two parameters: change in sky glow and change in light trespass (Section 5.5 of the Application). The Application assessed the effects from light during the operation phase only because the construction phase was considered to have lower sky glow and light trespass than the operation phase (Section 5.5.3.3 of the Application). The Application concluded that Project-related light emissions are not likely to result in a change to the existing environmental lighting zone classifications at the points of reception.

6.3.1 Potential Interactions between Project Changes and Light

The potential interactions between light and the proposed Project changes are limited to the floatel and shore access (Table 6-4).

Table 6-4 Potential Project Interactions with Light

New Project Activities and Physical Works	Vegetation Communities Interaction
Construction Phase	
Floating worker accommodation (floatel)	Minor interaction: The floatel will have external lighting for safety purposes.
Accommodation onboard marine construction vessel	Minor interaction: Lighting on the construction vessel may increase during worker off shift time.
Treatment of water for domestic purposes	No interaction: There is no external lighting associated with the water treatment infrastructure.
Shore access	Minor interaction: The covered walkway will have lighting for safety purposes. The vegetation between the highwater mark and the walkway will be left in place as design level mitigation to limit the visibility of the shore access lighting.

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

Minor interactions with light were identified for the floatel, marine construction vessel, and shore access, specifically in relation to changes in sky glow and light trespass. No interaction was identified for the treatment of water.

The Application included design measures for managing the potential effects to light. For clarity, the existing design measures are presented below to manage light from the new proposed activities:

- Lighting fixtures will be fully shielded (i.e., full cutoff) to minimize uplight to the atmosphere.
- Lighting for the Amendment activities will be designed to achieve the required light levels to ensure worker health and safety onsite while minimizing luminous flux, within the guidelines outlined by the engineering team.
- Where possible and subject to safety requirements, structures will be dark in colour to absorb most of the incident light.

In addition, as shown in Figure 2, vegetation between the highwater mark and the shore access trail will be left in place to screen the walkway lighting from view. Woodfibre LNG will implement the construction wildlife management plan (Condition 11), which requires implementation of the following measures related to minimizing lighting effects:

- M5.12-5 Subject to safety and operational requirements, Woodfibre LNG Limited will use blue or green lighting rather than red or white lighting in order to reduce attractiveness to birds.
- M5.13-2 Minimize the Amount of Ultraviolet Light. Woodfibre LNG Limited will, where possible, use lighting technology that minimizes the amount of ultraviolet light generated, thereby minimizing its attractiveness to insects.
- M5.17-8 Development of a Marine Bird Management Plan.

6.3.1.1 Summary

With the implementation of the design measures, the proposed new activities are not anticipated to result in a change to the existing environmental lighting zone classifications, as described in Section 5.5 of the Application. No new mitigation measures are required, and the implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential changes on light as result of the proposed Amendment.

6.4 Vegetation Communities

The Vegetation Communities VC assessment in the Application considered the potential Project-related effects to native and invasive vegetation (Section 5.11 of the Application). During construction, the potential effects to vegetation communities included the loss of native vegetation communities, the change in extent and distribution of invasive species, and the potential for fugitive dust to affect vegetation.

The Application found that construction of the Project may result in small losses of vegetation communities compared to that present in the area: 4 ha of immature forest (0.5% of similar habitat present in the RAA) and 2 ha of mature forest (0.5%⁴ of similar habitat present in the RAA). Transportation of equipment and material to the Project area could result in the introduction of new invasive plant species to the Project area and LAA. Such introductions, and proliferation of existing invasive plants into newly cleared areas, would decrease the extent and diversity of native vegetation communities. Following the implementation of mitigation measures, residual effects on vegetation communities and introduction or proliferation of invasive species were assessed to be not significant⁵.

The potential for the new proposed Project changes to result in new and additional effects to vegetation communities is discussed in the following section.

6.4.1 Potential Interactions between Project Changes and Vegetation Communities

The assessment of proposed Project changes that may interact with vegetation communities included consideration of the potential for a loss of vegetation communities, a change in extent and distribution of invasive species, and for fugitive dust to affect vegetation (Table 6-5).

Table 6-5 Potential Project Interactions with Vegetation Communities

New Project Activities and Physical Works	Vegetation Communities Interaction
Construction Phase	
Floating worker accommodation (floatel)	No interaction: The proposed changes to the CPA will occur in a marine environment and will not affect terrestrial vegetation communities.
Accommodation onboard marine construction vessel	No interaction: The proposed changes to the CPA will occur in a marine environment and will not affect terrestrial vegetation communities.
Treatment of water for domestic purposes	Minor interaction: The loss of native vegetation communities and potential for the introduction and extent expansion of invasive species have been addressed and mitigation has been identified in the Application.
Shore access	Minor interaction: Loss of native vegetation communities and potential for the introduction and extent expansion of invasive species have been addressed and mitigation identified in the Application.

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

⁴ Application stated 2 ha of mature forest loss constituted 0.6% of similar habitat in the RAA, however, the actual number is slightly lower at 0.5% (2 ha removed / 441 ha total in RAA = 4.53%)

⁵ A significant effect was defined as a residual effect predicted to exceed the resilience and adaptability limits of a population and that could result in a population that is not self-sustaining or maintaining its ecological function.

The addition of the floatel and worker accommodation onboard the marine construction vessel are not anticipated to result in interactions with vegetation communities. Shore access to the floatel and the water treatment facility may result in minor interactions with vegetation communities for loss of native vegetation communities and introduction and expansion of invasive species.

6.4.1.1 Loss of Native Vegetation Communities

The shore access trail and water treatment facility will be located in a immature forest vegetation community (**Figure 2**). A survey of the access trail area was conducted in spring 2019 to identify the current conditions for native and non-native vegetation and invasive species (**Appendix B**).

Vegetation communities in the proposed shore access trail footprint are predominantly immature forest, with portions that are advancing to a more mature forest. Close to Woodfibre Creek the vegetation was largely invasive species, with native species becoming dominant farther from the creek. The vegetation communities and non-native species distribution are summarized in **Appendix B**.

The Amendment will result in loss of up to 0.11 ha of immature forest within the CPA. With this small additional effect, the total loss of vegetation in the RAA remains at 0.5% (as identified in the Application). Mitigation measures M5.9-2 (Minimize Vegetation Clearing) and M5.11-3 (Pre-Construction Rare Plant Surveys and Salvage) remain relevant and effective in reducing the effects of Project-related vegetation removal.

The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) to vegetation communities from loss of native vegetation, as described in Section 5.11.3.4 of the Application.

6.4.1.2 Introduction and Extent Expansion of Invasive Species

The shore access trail and water treatment facility may increase the potential for the introduction and spread of the invasive species (**Figure 2**) that currently occur along Woodfibre Creek (**Appendix B**). Implementation of the mitigation for control of invasive species (Condition 10 of the EAC) is considered effective for detecting, controlling, and monitoring invasive plants in the floatel access trail area. The additional effects related to potential spread of invasive species are minor in extent and similar to those already assessed, and the characterization of residual effects and determination of significance (i.e., not significant) does not change for effects from the introduction and extent expansion of invasive species, as described in Section 5.11.3.4 of the Application.

6.4.1.3 Summary

No new mitigation measures are required, and the implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on vegetation communities as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) to vegetation communities from loss of native vegetation and the introduction and expansion of invasive species, as described in Section 5.11.3.4 of the Application.

6.5 Freshwater Fish and Fish Habitat

The freshwater fish and fish habitat assessment in the Application considered the potential effects to resident and anadromous fish (Section 5.15) during construction, including:

- Removal of riparian vegetation
- Generation and deposition of dust and debris
- Vibration associated with blasting
- Changes to fish habitat
- Fish mortality
- Changes in flows
- Entrainment and impingement of fish.

Following implementation of mitigation measures in the Application, the residual effects of the Project on freshwater fish and fish habitat were determined to be negligible. The potential for changes associated with the Amendment to result in new and additional effects to freshwater fish and fish habitat is discussed in the following sections.

6.5.1 Potential Interactions between Project Changes and Freshwater Fish and Fish Habitat

The potential interactions between the proposed Amendment activities and freshwater fish (resident and anadromous fish) and fish habitat are limited to the shore access changes (**Table 6-6**).

Table 6-6 Potential Project Interactions with Freshwater Fish and Fish Habitat

New Project Activities and Physical Works	Interaction with Freshwater Fish and Fish Habitat
Construction Phase	
Floating worker accommodation (floatel)	No interaction: The proposed changes to the CPA occur in a marine environment and will not affect freshwater fish or fish habitat.
Accommodation onboard marine construction vessel	No interaction: The proposed changes to the CPA occur in a marine environment and will not affect freshwater fish or fish habitat.
Treatment of water for domestic purposes	No interaction: At peak occupancy, approximately 0.001 m ³ /s of water from the already permitted extraction volume will be diverted from Woodfibre Creek, then treated and pumped to the floatel. This amount is permitted in the 0.07 m ³ /s withdrawal approved in Amendment #1. No new interactions with freshwater fish and fish habitat are anticipated from treatment of already permitted water extraction volumes.
Shore access	Minor interaction: Removal of riparian vegetation has the potential to reduce allochthonous inputs to the aquatic environment, reduce streamside shading, and destabilize banks.

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

Of the Project-related effects on freshwater fish and fish habitat (listed in Section 6.5 above) during the construction period, only the removal of riparian vegetation was considered relevant to the proposed Project changes, i.e., potentially resulting in interactions with shore access from the floatel (**Table 6-6**).

6.5.1.1 Removal of Riparian Vegetation

The use of a floatel for the purpose of worker accommodation during construction will require a land-based shore access trail (**Figure 2**). Access to the floatel will be provided by two ship-to-shore gantries that will be linked to the LNG facility construction site via a covered pedestrian walkway. There will also be two new temporary clear-span bridges to accommodate worker foot traffic: one over Woodfibre Creek and one over the unnamed creek to the south. Clearing of riparian vegetation at the crossing locations for these two watercourses will be required to install the clear-span bridges. The extent of riparian clearing will be limited to the narrow right-of-way (approximately 5 m wide) and will only include clearing that is necessary to safely construct the foot bridge crossings and prevent windthrow of the existing trees.

6.5.1.2 Summary

No new mitigation measures are required, and the implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on freshwater fish and fish habitat as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) for freshwater fish and fish habitat from removal of riparian vegetation as described in Section 5.15.3.2 of the Application.

6.6 Marine Benthic Habitat

The marine benthic habitat assessment in the Application considered the potential Project-related effects to marine sediment and marine benthic communities (Section 5.16 of the Application). During construction, the effects to marine sediment included a potential change in sediment quality due to inputs of sediment mobilized from the site during construction, changes in seabed disturbance and contamination during marine construction, and changes in sediment quality due removal of existing creosote pilings. The potential effects to the marine benthic communities during construction included seabed disturbance affecting biota, change in habitat quality from removal of existing creosote (wood) pilings, and direct loss of habitat from construction and demolition of infrastructure.

Following the implementation of mitigation measures, residual effects during construction were anticipated to include change in sediment quality due to seabed disturbance and contamination during marine construction and change in sediment quality from removal of existing creosote (wood) pilings. These effects were assessed to be negligible.

The potential for the changes described in this Amendment to result in new and additional effects to marine benthic habitat is discussed in the following section.

6.6.1 Potential Interactions between Project Changes and Marine Benthic Habitat

The potential interactions between the activities described in this Amendment and marine benthic habitat are limited to the installation of piles for the floatel and benthic habitat shading from the floatel (**Table 6-7**).

Table 6-7 Potential Project Interactions with Marine Benthic Habitat

New Project Activities and Physical Works	Marine Sediment	Marine Benthic Communities
Construction Phase		
Floating worker accommodation (floatel)	Minor interaction: Additional piling to moor the floatel could result in additional seabed disturbance and marine contamination during construction.	Minor interaction: The additional of the floatel will shade subtidal vegetation in the area of seafloor beneath the vessel resulting in vegetation loss.
Accommodation onboard marine construction vessel	No interaction: A marine construction vessel was included in the Application; it will frequently relocate within the marine construction area. The addition of worker accommodation on the vessel does not result in any additional interactions not already assessed in the Application.	
Treatment of water for domestic purposes	No interaction: The proposed changes to the CPA are limited to the treatment facility site adjacent to Woodfibre Creek and will not affect marine benthic habitat.	
Shore access	No interaction: The access path is land-based and will therefore not interact with marine benthic habitat.	

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

The addition of water treatment for domestic purposes, and shore access are not anticipated to result in any interactions with marine benthic habitat because the facility is terrestrially based. The addition of accommodation to the construction vessel will not result in any new interactions not already assessed in the Application.

Minor interactions with marine benthic habitat were identified for the floatel component of this Amendment due to interactions from seabed disturbance, contamination during marine construction (floatel piling installation), and direct loss of habitat from shading of marine vegetation by the floatel.

6.6.1.1 Seabed Disturbance and Contamination during Marine Construction

There is a minor seabed disturbance and potential for contamination mobilization as a result of the additional mooring piles for the floatel. The mooring piles will result in additional disturbance of approximately 0.002 ha. This is a 2.0% increase in seafloor disturbance: it is temporary and represents a negligible increase in additional disturbance in the Project area.

Mitigation measures outlined in Condition 6 of the EAC (Marine Water Quality Management and Monitoring Plan), and Project design such as piling configuration to site piles in gravelly areas to minimize sediment mobilization are considered to be effective in reducing the effects of disturbance and contaminant mobilization on marine sediment conditions.

Implementation of mitigation identified in Section 5.16.3.2.4 of the Application are practical means of preventing or reducing potential adverse effects on marine benthic habitat from seabed disturbance and contamination mobilization during piling installation for the floatel. The area of additional effect is small, the types of effects were previously considered in the Application and effective mitigation is available. As such, the addition of the floatel is anticipated to result in a minor interaction that can be appropriately mitigated. The assessment in this Amendment did not result in a change to the characterization of residual effects and will not result in a change in the determination of significance (i.e., negligible) for marine benthic habitat, as described in Section 5.16.3.3 of the Application.

6.6.1.2 Direct loss of Habitat from Shading of Marine Vegetation

The marine habitat surveys for the Project area over the past 5 years were supplemented by specific SCUBA surveys conducted in the spring of 2019 beneath the proposed floatel using the working draft Marine Foreshore Environmental Assessment Procedure (DFO 2004) to identify intertidal and subtidal habitat that could be affected by activities described in this Amendment (**Appendix C**). Information was collected on the seafloor physical characteristics, riparian habitat, intertidal habitat, subtidal habitat, and the presence of marine species. Key points from past surveys and the recent survey pertinent to evaluating marine benthic habitat quality are:

- The subtidal area beneath the floatel is largely absent of marine vegetation (see Section 3.4 of Appendix C).
- Sediment laden water from Squamish River shades marine substrates (due to the reduced light penetration), inhibiting the growth of algal communities that could contribute to higher trophic levels (e.g., benthic invertebrates and forage fish) the duration of the effect is expected to be year-round.
- The steep, soft substrates of the nearshore habitat do not provide cover, rearing, or spawning habitat for finfish.
- The hard substrate observed in the shallow sections of the proposed floatel area do not provide high quality attachment sites for algae, likely due to the strong freshwater influence of the Squamish River at the northern end of Howe Sound.

The floatel will shade 0.4 ha of seafloor, which represents a temporary and negligible increase in marine shading in the Project area. Mitigation measures outlined in Condition 6 of the EAC (Marine Water Quality Management and Monitoring Plan) including mitigation measures in the Application (M5.16-1 Minimize Marine Shading) are considered to be effective in reducing the effects on marine benthic communities, which as noted above are largely absent in the proposed floatel area.

Implementation of mitigation measures identified in Section 5.16.3.2.4 of the Application are a practical means of preventing or reducing potential adverse effects on marine benthic habitat from habitat loss and shading. In conjunction with the low habitat values in the affected area the addition of the floatel is anticipated to result in only a minor interaction that can be appropriately mitigated using measures

described within the Application. Amendment activities will not result in a change to the characterization of residual effects and will not result in a change in the determination of significance (i.e., negligible) for marine benthic habitat, as described in Section 5.16.3.3 of the Application.

6.6.1.3 Summary

No new mitigation measures are required; implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on marine benthic habitat as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) to marine benthic habitat from seabed disturbance or loss of habitat as described in Section 5.16.3.3 of the Application.

6.7 Marine Birds

The marine bird assessment, Section 5.17, in the Application considered the potential Project-related effects to marine birds and marine bird habitat. During construction, the potential effects assessed were:

- Direct loss of marine bird breeding, nesting, foraging and staging habitat
- Indirect loss of potential foraging habitat due to:
 - sensory disturbance
 - changes in prey availability due to water quality effects on forage fish habitat
- Behavioural response due to sensory disturbance
- Direct mortality due to clearing and vessel transportation.

The Application found that the construction phase of the Project may result in a direct loss of breeding, nesting, foraging, and staging habitat for marine birds. An estimated 8.6 ha of marine foreshore (intertidal) and nearshore (subtidal) habitat could be removed as a result of Project construction (0.03%⁶ of available habitat within the RAA). For one species, the at-risk listed marbled murrelet (*Brachyramphus marmoratus*), the Application found that 0.06 ha of mapped critical habitat for the species (EC 2014) will be affected (**Figure 3**). A field assessment of the affected area found low to nil nesting habitat potential for marbled murrelet in the CPA and the LAA due to the lack of suitable habitat characteristics (**Appendix B**). Effects to marine birds in general, and to marbled murrelet critical breeding habitat resulting from the proposed Project were determined to be negligible.

⁶ Application stated 0.02% of available habitat within the RAA, however, the actual number is slightly higher at 0.03% (8.6 ha removed / 32,000 ha total in RAA = 0.027%)














The Application also considered the potential for marine bird behavioural responses to sensory disturbance from construction noise and light. The loudest construction activities were estimated to fall between 80-85 dBA. Two artificial lights for overnight work were estimated to produce 4,300 lumens (lm) and 10,000 lm. Through Project design (minimizing amount of light used, directing lights downward, using light shields) and mitigation, such as an underwater noise management plan (Condition 9 of the EAC and Condition 3.8 of the FDS) and a marine bird management plan (Condition 4.2 of the FDS), effects from construction noise and light were determined to be not significant.

Construction activities leading to sediment-laden surface water runoff entering the marine environment and altering or degrading marine bird habitat through changes in water quality were assessed. With the implementation of an erosion prevention and sediment control plan (Condition 3.2 of the FDS), effects to marine bird foraging habitat were determined to be not significant.

Mortality to marine birds as a result of vegetation clearing during the breeding season (e.g., eggs or fledglings may be killed) and strikes with marine vessels was considered. Restricting vegetation removal to periods outside of breeding and applying setbacks from any known nest locations were proposed as proven and effective measures to mitigate the potential for marine bird mortality (Condition 11 of the EAC). The potential for mortality from vessel strikes during the day was found to be unlikely; however, during nighttime and inclement weather disorientation due to light produced on vessels or structures may result in a higher collision potential. Project design will reduce potential for bird strikes (i.e., the use of artificial light will be minimized and oriented in such a way as to decrease potential effects to marine birds).

Marine Bird Floatel Assessment Area

Legend

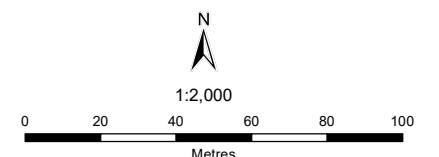
-  Marbled Murrelet (MAMU) Critical Habitat
-  Certified Project Area
-  New or Upgraded Roadway
- Floatel Project Features**
-  30 m Riparian Buffer
-  Access Trail and Utility Corridor
-  New Fence Line
-  Project Feature
-  Marine Footprint
-  Marine Construction Area¹
-  Terrestrial Footprint
-  Terrestrial Construction Area²
- Basedata**
-  Forestry Road
-  Watercourse

Notes

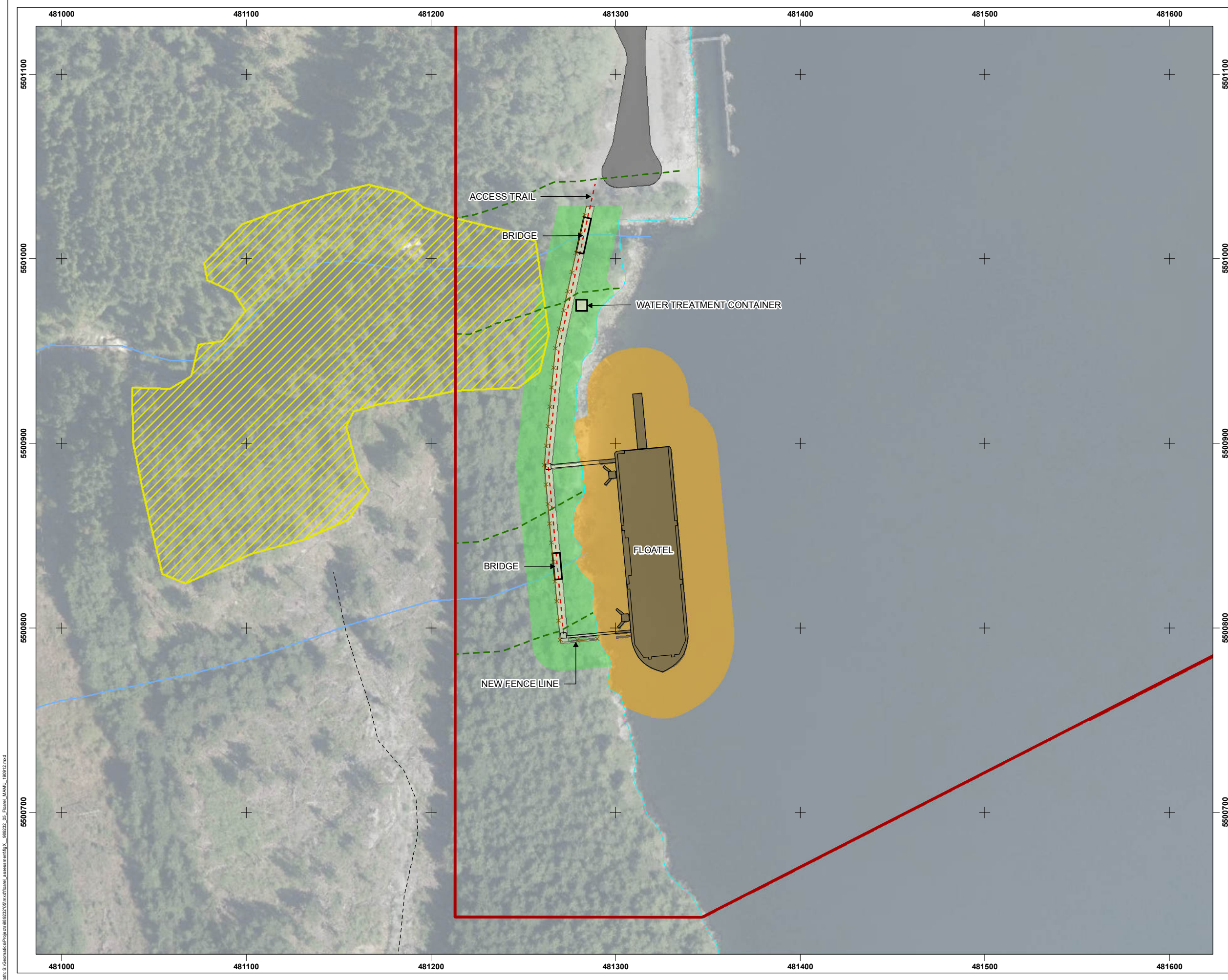
1. Marine construction area is a 25 m buffer of the marine footprint.
2. Terrestrial construction area is a 15 m buffer of the terrestrial footprint.
3. All mapped features are approximate and should be used for discussion purposes only.
4. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licences - British Columbia & District of Squamish
- Data courtesy of KBR Technical Services, Inc.
- Aerial Image: District of Squamish, 2019 (10 cm)



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Following the implementation of mitigation measures, residual effects from loss or degradation of nesting or foraging habitat and injury or mortality due to changes to the CPD included in this Amendment were assessed to be not significant⁷.

6.7.1 Potential Interactions between Project Changes and Marine Birds

The potential interactions between marine birds are limited to the floatel (**Table 6-8**). The potential interactions considered are a reduction or alteration of marine bird habitat and marine bird mortality.

Table 6-8 Potential Project Interactions with Marine Birds

New Project Activities and Physical Works	Marine Birds Interaction
Construction Phase	
Floating worker accommodation (floatel)	<p>Minor interaction: the proposed changes to the CPA will reduce or alter the available marine habitat (through direct habitat loss, i.e., floatel presence, and indirect habitat loss, i.e., potential for decrease in use resulting from increased noise and light). This habitat is largely considered low value for marine bird foraging. These effects have been addressed and mitigated for in the Application.</p> <p>Minor interaction: the proposed changes to the CPA will increase noise and light to the surrounding area which may cause a behavioural response due to sensory disturbance to marine birds.</p>
Accommodation onboard marine construction vessel	<p>No interaction: the proposed changes to the CPA may result in a reduction of marine bird mortality resulting from vessel strikes as the need for a regularly operating water taxi to move workers will be reduced (i.e., workforce will only need transportation to/from site every week, rather than daily).</p>
Treatment of water for domestic purposes	<p>No interaction: the proposed changes to the CPA are limited to an area beside Woodfibre Creek that is not used by marine birds for breeding or foraging.</p>
Shore access	<p>No interaction: the proposed changes to the CPA are limited to terrestrial habitat and are not anticipated to affect marine birds.</p>

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

⁷ A significant effect was defined as residual effect predicted to exceed the resilience and adaptability limits of a population and that could result in a population that is not self-sustaining or maintaining its ecological function. Significant effects could result from either a decline to zero or apparent stabilization, but at a level that is sensitive to stochastic events that could cause extirpation, or at a level that is too low for ecological function to be maintained.

The addition of the water treatment to supply the floatel, worker accommodation onboard the marine construction vessel, and shore access trail are not anticipated to result in any interactions with habitat used by marine birds. Minor interactions were identified and are discussed below:

- Direct loss of marine bird breeding, nesting, foraging and staging habitat
- Behavioural response due to sensory disturbance

6.7.1.1 Direct Loss of Marine Bird Breeding, Nesting, Foraging and Staging Habitat

The marine habitat surveys for the Project area over the past 5 years were supplemented by specific SCUBA surveys conducted in the spring of 2019 beneath the proposed floatel (**Appendix C**). Key points from the surveys pertinent to evaluating marine bird habitat quality are:

- Suitable spawning substrate (e.g., rockweed algae) for some marine bird forage species (e.g., Pacific herring (*Clupea pallasii*)) was limited in the foreshore habitat.
- Sediment laden water from Squamish River shades marine substrates (due to the reduced light penetration), inhibiting the growth of algal communities that could support marine bird forage species (e.g., benthic invertebrates and forage fish), the duration of the effect is expected to be year-round.
- The steep, soft substrates of the nearshore habitat do not provide cover, rearing, or spawning habitat for forage species preyed upon by marine birds (e.g., finfish).
- Foraging habitat for marine bird prey species that use soft, silt, and sand substrates (e.g., English sole (*Parophrys vetulus*) and sculpins) was determined to be low value.
- The hard substrate observed in the shallow sections of the proposed floatel area were not found to provide high quality attachment sites for algae or potential marine bird forage species, likely due to the strong freshwater influence of the Squamish River at the northern end of Howe Sound.

The use of the floatel will result in the loss or alteration of up to an additional 1.34 ha of foreshore and nearshore marine habitat. This habitat, however, is considered low value forage and breeding habitat for marine birds, and only constitutes 0.004% of the available marine habitat within the RAA (marine habitat loss relative to the RAA will remain at 0.03%).

Implementation of mitigation measures in Condition 11 of the EAC (including Application Table 22-1 and Sections 5.12 – 5.14 and 5.17) are a practical means of preventing or reducing potential adverse effects on marine birds from loss of marine bird habitat. As such, the addition of the floatel is anticipated to result in a minor interaction that can be appropriately mitigated using measures described in the Application.

6.7.1.2 Behavioural Response Due to Sensory Disturbance

The addition of the floatel will result in an increase in noise and light. This potential for sensory disturbance (i.e., indirect habitat interaction) is not anticipated to change substantially during the construction period compared to that predicted in the Application (see Table 5.1). The construction period lighting is temporary

and of much lower intensity to the permanent lighting effects predicted during the operation period. As a result, the minor interactions as a result of construction period lighting were not carried forward to further assessment.

Implementation of mitigation measures identified in Condition 4.2 of the FDS constitute practical means of preventing or reducing potential adverse effects on marine birds from sensory disturbance. As such, the addition of the floatel is anticipated to result in a minor interaction that can be appropriately mitigated using measures described in the Application. The assessment in this Amendment does not change to the characterization of residual effects and will not result in a change in the determination of significance (i.e., not significant) for marine birds, as described in Section 5.17.3.4 of the Application.

6.7.1.3 Summary

No new mitigation is required, implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on marine birds as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) to marine birds from direct loss of marine bird breeding, nesting, foraging and staging habitat, and behavioural responses due to sensory disturbance as described in Section 5.17.3.4 of the Application.

6.8 Forage Fish and Other Fish

The potential effects of the Project on forage fish and other fish were assessed in Section 5.18 of the Application, which during construction were:

- Change in habitat quality due to accidental release of deleterious substances;
- Change in habitat quality due to site erosion and sediment transport;
- Change in habitat quality due to seabed disturbance and siltation;
- Fish mortality and adverse change in habitat quality due to release of cementitious material;
- Change in habitat quality from removal of existing creosote piles;
- Contamination with landfill leachate;
- Loss of habitat from construction of infrastructure;
- Loss of habitat from shading of marine vegetation; and
- Mortality and behavioural changes from underwater noise.

Following implementation of mitigation measures, residual Project effects of the Project were determined to be negligible. The potential for changes associated with this Amendment to result in new and additional effects to forage fish and other fish is discussed in the following sections.

6.8.1 Potential Interactions between Project Changes and Forage Fish and Other Fish

Potential interactions between forage fish and other fish resulting from the proposed Project changes are limited to floatel and accommodation on the marine construction vessel (**Table 6-9**). The interactions are:

- Loss of habitat from shading of marine vegetation
- Loss of habitat from construction of infrastructure
- Change in habitat quality due to seabed disturbance and siltation
- Mortality and behavioural changes from underwater noise.

Table 6-9 Potential Project Interactions with Forage Fish and Other Fish

New Project Activities and Physical Works	Interaction with Forage Fish and Other Fish
Construction Phase	
Floating worker accommodation (floatel)	<p>Minor interaction: The proposed changes to the CPA temporarily increase the area of marine shading of 0.4 ha.</p> <p>Minor interaction: Loss of marine habitat from installation of six additional piles in the marine environment for mooring of the floatel. Seabed disturbance and suspension of seafloor sediments during installation of the piles and mooring of the floatel as well as increased underwater noise.</p>
Accommodation onboard marine construction vessel	<p>No interaction: A marine construction vessel was included in the Application. The addition of worker accommodation on the vessel does not result in any additional interactions not already assessed in the Application.</p>
Treatment of water for domestic purposes	<p>No interaction: The proposed changes to the CPA occur in the terrestrial environment and will not affect forage fish and other fish in the marine environment.</p>
Shore access	<p>No interaction: The proposed changes to the CPA occur in a terrestrial environment and will not affect forage fish and other fish in the marine environment. Effects of activities associated with shore access are assessed in the Freshwater Fish and Fish Habitat section of this Amendment.</p>

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

6.8.1.1 Loss of Habitat from Shading of Marine Vegetation

The installation of the floatel represents a small increase (0.4 ha) in the shaded area of the CPA. As with other proposed structures in the CPA, the floatel will not be installed over areas where marine vegetation was observed. The 2019 SCUBA surveys did not document the presence of any eelgrass, valued habitat for forage fish, in the vicinity of the floatel or moorings (**Appendix C**). Shading also has the potential to affect juvenile salmon behaviour by disrupting vision, migratory paths, or by decreasing prey and habitat availability. The proposed location for mooring of the floatel avoided the mouth of Woodfibre Creek and reduces the potential effects of shading on fish behaviour.

Shading of marine vegetation is not anticipated to cause loss of habitat or fish behaviour to a greater extent than that identified in the Application. The values in this part of the CPA are low, and implementation of mitigation measures identified in the Application (M5.16-1) are a practical means of preventing or reducing potential adverse effects on forage fish and other fish. The assessment in this Amendment does not result in a change to the characterization of residual effects and the determination of significance (i.e., negligible) for forage fish and other fish as described in Section 5.18.3.4 of the Application.

6.8.1.2 Loss of Habitat from Construction of Infrastructure

The installation of six additional piles (for floatel mooring) and a marine construction vessel to support construction of the LNG jetty and moorings of the floating LNG storage has potential effect on forage fish habitat. The potential environmental effects from marine construction vessels were assessed in Section 5.18 of the Application; however, the potential effects of accommodation onboard these vessels were not assessed. The crew operating the construction vessel and undertaking marine construction will be accommodated onboard the vessel as is the typical approach in the industry. The vessel will accommodate approximately 150 workers for the duration of LNG jetty and mooring construction (approximately 14 to 20 months). The vessel will be moved around in the marine construction area inside the CPA.

Accommodation of workers on the construction vessel is not anticipated to materially change the assessment of effects included in the Application. Implementation of mitigative measures identified in the Application including M5.10-1 Marine Works Management Plan, represent standard and proven measures to prevent or reduce potential adverse effects of construction vessel operation on forage fish and other fish. The addition of accommodations onboard the construction vessel proposed in this Amendment is, therefore, unlikely to result in a change to the characterization of residual effects and determination of significance (i.e., not significant) for forage fish and other fish described in Section 5.18.3.4 of the Application.

6.8.1.3 Change in Habitat Quality due to Seabed Disturbance and Siltation

Sediment suspension can mobilize contaminants that can uptake and accumulate in fish tissues, potentially leading to sub-lethal immune responses and fin erosion and lesions (Golder 2014). These same contaminants can subsequently bio-accumulate in the food chain where they can lead to toxic concentrations in higher trophic-level predators. Sediment re-suspension effects were addressed in Section 5.1 (Marine Water Quality) and Section 5.16 (Marine Benthic Habitat) in the Application and apply equally to potential seabed disturbance during driving of the six piles and vessel movement associated with the floatel installation. Dive surveys indicated that the seafloor was sandy in the area of the pilings, which is less susceptible to remobilization during construction.

Changes in habitat quality due to seabed disturbance and siltation associated with Amendment activities is not anticipated to cause contaminant accumulation in fish to a greater extent than that identified in the Application. Implementation of Condition 8 of the EAC, Condition 3.2 of the FDS, and mitigative measures

identified in the Application comprise practical means of preventing or reducing potential adverse effects on forage fish and other fish. The additional change in habitat quality due to seabed disturbance and siltation proposed in this Amendment will not result in a change to the characterization of residual effects and the determination of significance (i.e., negligible) for forage fish and other fish as described in Section 5.18.3.4 of the Application.

6.8.1.4 Mortality and Behavioural Changes from Underwater Noise

Potential effects of increased underwater noise during in-water pile driving were assessed in Section 5.18 of the Application. Noise effects from pile driving in the CPA are predicted to exceed behavioural thresholds and may disturb fish; however, those effects are expected to be localized and of limited duration. Condition 3.3 of the FDS and mitigation described in the Application will be implemented to reduce the effects of underwater noise during installation of the piles for the floatel.

The floatel is not anticipated to change the assessment of effects included in the Application. The six additional piles are an insignificant addition to the 92 piles that will be installed during the construction phase of the Project. Implementation of mitigative measures identified in the Application and Condition 3.3 of the FDS are a practical means of preventing or reducing potential adverse effects associated with the floatel.

The reduction in vessel noise as a result of fewer ferry trips between Squamish or Darrell Bay and Woodfibre site is considered an environmental benefit. The assessment in this Amendment does not change the characterization of residual effects and determination of significance (i.e., negligible) for forage fish and other fish, as described in Section 5.18.3.4 of the Application.

The assessment in this Amendment does not change the characterization of residual effects and determination of significance (i.e., negligible) for mortality and behavioural changes from noise for forage fish and other fish, as described in Section 5.18.3.4 of the Application.

6.8.1.5 Summary

No new mitigation measures are required; implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on forage fish and other fish as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., negligible) to forage fish and other fish from loss of habitat from shading of marine vegetation, loss of habitat from construction of infrastructure, change in habitat quality due to seabed disturbance and siltation, and mortality and behavioural changes from underwater noise as described in Section 5.18.3.4 of the Application.

6.9 Marine Mammals

The potential effects of the Project on marine mammals assessed in Section 5.19 of the Application were changes in habitat quality, underwater noise, behaviour, and harm (physical injury or mortality) to marine mammals and indirect effects from changes in food availability due to potential changes in forage fish habitat quality.

Following the implementation of mitigation measures, the only residual effects during construction were potential injury as a result of underwater noise due to pile driving activities and changes in behaviour due to underwater noise. All residual effects were assessed to be not significant.

6.9.1 Potential Interactions between Project Changes and Marine Mammals

Potential interactions between marine mammals resulting from the proposed Project-related changes are limited to the floatel (Table 6-10).

Table 6-10 Potential Project Interactions with Marine Mammals

New Project Activities and Physical Works	Marine Mammal Interaction
Construction Phase	
Floating worker accommodation (floatel)	Minor interaction: Underwater noise effects from pile driving and change in food availability due to direct loss of forage fish habitat from shading.
Accommodation onboard marine construction vessel	No interaction: A marine construction vessel was included in the Application. The addition of worker accommodation on the vessel does not result in any additional interactions not already assessed in the Application.
Treatment of water for domestic purposes	No interaction: Water treatment will be a land-based activity. Water withdrawal was assessed and approved in Amendment 1.
Shore access	No interaction: The access path is land-based and will therefore not interact with marine mammals.

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

The addition of worker accommodation onboard the marine construction vessel, water treatment/supply to the floatel, as well as shore access are not anticipated to result in any interactions with marine mammals; rationale is provided in Table 6-10.

There is a potential for a minor interaction with the piling associated with the floatel, which could include underwater noise effects from pile driving for construction of floatel mooring and a change in food availability due to direct loss of forage fish habitat from shading under the floatel (see also Section 6.8).

6.9.1.1 Underwater Noise

Elevated underwater noise in the marine environment has the potential to injure or affect the behaviours of various marine mammal species, depending on the sound frequency. For impulsive sounds, such as those generated by pile driving activities, the U.S. National Ocean and Atmospheric Administration defines the underwater noise thresholds for all marine mammals as 180 decibels (dB) re 1 micro-Pascal (μPa) for potential injury and 160 dB re 1 μPa for behavioural responses. The methodology and discussion of underwater noise effects on marine mammals is in Section 5.19.3.2.2 of the Application. As modelled in Section 5.19.3.2.3 of the Application, the noise generated from pile driving will attenuate to below the injury threshold at approximately 340 m from the source, following the implementation of mitigation measures (e.g., bubble curtains). The distance to the point where behavioural responses could be experienced is estimated to be 4,642 m for vessel operation noise and 7,322 m for pile driving noise.

To moor the floatel, two dolphins each consisting of three piles are proposed to be installed, generating underwater noise during the construction phase of the Project. The approved CPD already includes the installation of 92 piles within 1 km of the proposed floatel site. The additional installation of the six piles will be subject to Condition 9 of the EAC, Condition 4.1 of the Squamish Nation Environmental Certificate, and Condition 3.8 of the FDS, such as using a vibratory pile hammer when possible and deploying bubble curtains around pile driving activities. Thus, floatel mooring is not anticipated to appreciably increase underwater noise nor affect marine mammals over and above what has already been assessed in the Application. With mitigation, the incremental underwater noise produced from the installation of six additional piles, and its concomitant effect on marine mammal hearing and behaviour, is considered to be negligible. The reduction in vessel noise as a result of fewer ferry trips during construction on the route between Squamish and the Woodfibre site is considered an environmental benefit for marine mammals.

6.9.1.2 Changes in Food Availability Due to Potential Changes in Forage Fish Habitat

The floatel will shade 0.4 ha of subtidal area additional to that approved in the CPD. A habitat assessment of the proposed floatel site determined that the subtidal area does not contain macroalgae, hard substrates, or complex features that would provide suitable foraging or spawning habitat for forage fish species such as Pacific herring (*Clupea pallasii*); rather, the zone is comprised of soft substrates, primarily sand and silt, and hosts infaunal invertebrate communities (**Appendix C**, see also Section 6.6 and 6.8). Shading caused by the floatel is predicted to have no effect on forage fish populations; because no effects to forage fish are predicted, no impacts to marine mammals from this effect pathway are anticipated.

Implementation of mitigation measures identified in Condition 9 of the EAC, Condition 4.1 of the Squamish Nation Environmental Certificate, and Condition 3.8 of the FDS are a practical means of preventing or reducing potential adverse effects to marine mammals from the floatel and construction of the floatel mooring. As such, the floatel is anticipated to result in a minor interaction.

This Amendment does not change the characterization of residual effects and will not result in a change in the determination of significance (i.e., not significant) for marine mammals, as described in Section 5.19.3.4 of the Application.

6.9.1.3 Summary

No new mitigation measures are required; implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on marine mammals as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) to marine mammals from underwater noise and changes in food availability due to potential changes in forage fish habitat as described in Section 5.19.3.4 of the Application.

6.10 Labour Market

The labour market assessment in the Application (Section 6.2) considered the potential effects to the local and regional labour market resulting from Project activities related to employment, labour market capacity, labour income, and training opportunities. The assessment included consideration for the potential for the Project to generate direct, indirect, and induced employment opportunities during the construction, operation, and decommissioning phases of the Project in the LAA (i.e., the District of Squamish, Resort Municipality of Whistler, SLRD Electoral Area D, Squamish First Nation and Metro Vancouver) and the RAA (BC). The Project is expected to generate benefits (i.e., positive effects) in terms of increased employment, training opportunities, and an increase in annual wages or salaries and employment income in these areas. The Application stated that Woodfibre LNG intends to maximize access to the local labour market through implementation of procurement policies and industrial training programs but noted that the available pool of local and regional workers may not be adequate to supply Project labour demands in certain skill areas. The potential for Project-related adverse effects on the labour market, including the potential for the Project to generate short-term labour supply constraints (i.e., during construction), increased labour costs, and potential employee losses in other local businesses was also assessed in the Application.

The key indicators for the labour market VC assessment were:

- Change in employment (due to Project-related labour requirements for direct, indirect and induced labour demand)
- Change in labour market balance (due to temporary in-migration of workers and labour market imbalance if the Project's labour requirements exceed the local or regional capacity)
- Change in labour income
- Change in industrial training opportunities.

No Project-related adverse residual effects on the labour market were identified in the Application; it was anticipated that the local and regional labour force would be able to adequately supply the Project, with Woodfibre LNG sourcing additional workers from outside the LAA and RAA if required (refer to Section 6.2 in the Application for further details). Consequently, no mitigation measures were proposed. Positive effects

were identified with respect to change in employment, labour income, and training opportunities. Opportunities will be created for employees, businesses, and contractors directly involved in Project construction as well as for those involved in industries and activities that would benefit from indirect and induced expenditures. The potential for the floatel, accommodation on the marine construction vessel, and related new proposed components and activities to result in new and additional effects to the labour market is discussed in the following section.

6.10.1 Existing Conditions

Changes to existing conditions in terms of the indicators for the labour market in the period since the Application was approved inform the changes to previously identified effects or any new effects. Data from the 2011 Census for the LAA and RAA were used to inform the labour market assessment in the Application. More recent census data from 2016 for LAA communities are provided below to illustrate some of the changes that have occurred in the local labour force in that five-year period and provide a more accurate assessment of effects for the Amendment.

The characteristics of the labour force are described by factors including the size of the labour force, the relative proportions of workers in various occupations and industries, and participation and unemployment rates. In Metro Vancouver, the total labour force population increased by approximately 6.0% from 2011 to 2016 (Statistics Canada 2013a, 2017a). Labour force composition has remained generally stable overall, with services-related occupations (e.g., retail, health care, etc.) comprising approximately 85% of the total labour force in 2011 and 2016, and goods-related occupations (e.g., construction, manufacturing) comprising approximately 15%. However, the construction labour force increased from 6.6% of the total labour force in 2011 to 7.3% in 2016, which is attributable to ongoing growth in residential and non-residential construction in the Lower Mainland (CPABC 2019). The overall unemployment rate declined, from 7.1% in 2011 to 5.4% in 2016, and the participation rate increased by 10.3%, from 66.1% to 76.4% (Statistics Canada 2017a). In August 2019, unemployment in Metro Vancouver was estimated to be 4.5% (Statistics Canada 2019a).

In Squamish, the construction industry in 2016 continued to make up a large portion of the labour force, but the number of workers in the industry declined slightly from 1,430 to 1,400, reflected in a proportional decline from 14.0% of the labour force in 2011 to 12.1% in 2016 as worker numbers in other industries increased. The unemployment rate in 2016 in Squamish was 5.4%, compared to 8.1% in 2011 (Statistics Canada 2013b, 2017b).

Approximately 11.7% of Squamish Nation's labour force reported as working in the construction industry in 2016, representing a 2.9% increase from 2011 (Statistics Canada 2013c, 2017c). The proportion of Squamish Nation workers employed in the trades and related occupations has increased since 2011 by approximately 3.0%, to 20.6%. Squamish Nation's unemployment rate has declined since 2011, from 16.6% to 12.7%, out of a total labour force of 930 (Statistics Canada 2013c, 2018).

Whistler’s workforce employed in trades and related occupations was 10.5% of the total workforce in 2016, decreasing by 2.0% from 2011. The unemployment rate was 4.7% in 2016, decreasing notably from 8.7% in 2011 (Statistics Canada 2013d, 2017c).

Median income from all sources has increased since 2011 in the LAA and RAA, continuing previous trends (Table 6-11, and refer to 6.2 Labour Force in the Application for 2001 and 2006 census data). To align with the Application, total median individual income, which includes employment income, government transfers and all other income, is provided for comparison by census year in Table 6-11. Squamish and Electoral Area D of the SLRD had median incomes notably higher than the provincial median in 2016, while incomes in Whistler and Metro Vancouver were fairly similar to the provincial median. Data on median income for the SLRD Electoral Area D were not available in 2011. Squamish Nation median income was notably lower than the provincial median in 2011 and 2016 but increased by 21.2% from 2011 to 2016.

Table 6-11 Median Income in the Local Assessment Area and Regional Assessment Area in 2011 and 2016

	District of Squamish	Whistler	Squamish Nation	SLRD Electoral Area D	Metro Vancouver	British Columbia
2016						
Median individual income (\$)	40,119	35,491	17,312	42,240	32,612	33,012
2011						
Median individual income (\$)	33,799	32,432	13,648	-	28,726	28,765

Source: Statistics Canada 2013a, b, c, d; 2017a, b, c; 2018

Under the Industry Training Authority (ITA), industry training programs for specific sectors have continued to expand, with the ITA currently managing over 100 trades programs (ITA 2019a). In 2017/2018, the ITA reported a total of 10,666 employer sponsors and 37,703 registered apprentices (including 3,527 women apprentices and 2,570 Indigenous apprentices), across all listed trades (ITA 2019b). The ITA also provides information on LNG-related careers specifically for youth, listing career options and steps to initiate career planning (ITA 2019c).

6.10.2 Potential Interactions between Project Changes and Labour Market

The potential interactions between the labour market VC and the new proposed Project changes are outlined in Table 6-12.

Table 6-12 Potential Project Interactions with Labour Market

New Project Activities and Physical Works	Labour Market Interaction
Construction Phase	
Floating worker accommodation (floatel)	<p>Minor interaction (positive): The majority of the construction workforce will be accommodated in the floatel for weeklong shifts during peak construction; therefore, induced employment associated with worker spending (e.g., for gas, groceries, etc.) is expected to be reduced as a result of this Amendment. The floatel accommodation will therefore reduce the magnitude of the overall positive interaction of the Project with the labour market, although the interaction will still be positive.</p> <p>Minor interaction (positive): The floatel will create direct employment to operate the floatel during construction, thereby having a positive minor interaction with the labour market. In addition, indirect employment due to the floatel (e.g., marine transport service, catering) and induced employment (i.e., generated by worker spending) will be created.</p>
Accommodation onboard marine construction vessel	<p>Minor interaction (positive): Accommodation on the vessel will be provided for marine jetty construction workers, for 17 months. Since workers will be living aboard the vessels rather than local communities, this will result in reduced worker spending in the LAA and thus reduced induced employment, although the interaction is still positive.</p> <p>Minor interaction (positive): The construction vessels will create direct employment to operate the vessels during Project construction, indirect employment through catering, housekeeping, maintenance services etc., and induced employment due to worker spending associated with the marine construction vessel workforce.</p>
Treatment of water for domestic purposes	<p>Minor interaction (positive): Construction and maintenance of the water treatment facility will require labour.</p>
Shore access	<p>Minor interaction (positive): The construction of the shore gantries, pedestrian walkway and clear span bridges to connect the floatel to the LNG facility will require labour for construction.</p>

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

No interactions that should be carried forward for further assessment were identified in the review of potential pathways for new and changed effects in **Table 6-12**. However, Project construction expenditures and the length of the construction schedule have changed due to the proposed Amendment activities, necessitating an updated economic analysis. The results of this analysis inform the updated discussion for each interaction from the Project changes in the following sections.

The following minor, positive interactions of the Project on the labour market are reviewed in consideration of changes in the existing conditions to the labour market, updates to Project expenditures and the interactions identified in **Table 6-12**:

- Change in employment due to Project-associated labour demand and capacity of the labour force to address the incremental demand

- Change in labour market balance
- Change in labour income
- Change in training opportunities.

6.10.2.1 Change in Employment due to Project Labour Demand and Capacity of the Labour Force to Address the Incremental Demand

The change in labour demand includes direct employment for workers to build the Project, indirect employment for workers involved with the production of goods and services for the Project, and induced employment for non-Woodfibre staff associated with expenditures by Woodfibre LNG workers using their wages and income earned as a result of the Project. The total number of full-time equivalent (FTE) positions for one person-year of employment) are provided in **Table 6-13**, compared with previous estimates from the 2014 economic analysis, as provided in Section 2.6.5 of the Application. The direct employment estimates for construction are lower in the updated analysis, due to lower construction expenditures (i.e., \$556 million) over a longer construction period (approximately four years). Indirect employment in the LAA has increased, primarily due to the proposed addition of the floatel and its operational employment requirements, which will be drawn from the local community. The construction of the shore access infrastructure (i.e., pedestrian walkway, shore gantries and clear span bridges) and the water treatment facility will also create employment opportunities, assumed to be part of the indirect employment estimate. The estimate for induced employment is lower in the updated analysis since workers will be housed on the floatel and the marine construction vessels during their weeklong shifts, with presumably less opportunity for local spending of employment income. Labour for the construction and/or fitting out of the floatel itself is assumed to be completed offshore and is not included in the updated analysis.

Table 6-13 Project-related Construction Employment Estimates in the Local Assessment Area

	EMPLOYMENT (FTE JOBS)				
	Direct	Indirect	Induced	Approximate Duration	TOTAL
2014 Estimate					
TOTAL Construction Employment (LNG Facility)	1,324	605	477	24 months	2,406
2019 Estimate					
Construction of LNG Facility	663	266	281	51 months	1,210
Floatel Operation	117	374	99	35 months (peak facility construction)	590
Marine Construction Vessel Operation	24	78	21	17 months (jetty construction)	123
TOTAL Construction Employment	804	738	401	-	1,923

In the RAA, total employment to construct the Project was estimated in 2019 to be 2,025 FTEs (i.e., 1,312 FTE direct employment for facility construction). Some jobs related to aspects of the facility construction will be conducted in BC but outside of the LAA. Employment related to the floatel and marine construction vessel operation are all assumed to take place in the LAA. The estimate of total construction employment in the RAA was 2,406 in 2014.

Sourcing of construction workers may change from the estimates provided in Section 6.2 of the Application. Currently, several multi-billion-dollar projects are planned or underway in BC (i.e., Site C dam, LNG Canada, Coastal GasLink pipeline, and potentially the Trans Mountain Expansion Project). An estimated 10,000 to 11,000 workers (depending on the degree of overlap with construction schedules) will be needed to construct the Site C dam, LNG Canada and Coastal GasLink, with an additional 4,000 to 5,000 workers required for Trans Mountain (Bennett 2019). Trade organizations such as BC Building Trades will work to predict labour requirements and coordinate with industry, government, and other unions to provide workers for projects from BC, across Canada, and other locations if needed (Bennett 2019).

Specific to the Project, and as described in Section 2.7 (Project Benefits) and in Section 6.2 (Labour Market) of the Application, Woodfibre LNG has committed to undertaking a local hiring strategy and a local training strategy. The hiring strategy is in alignment with EAO Condition 13, which requires that Woodfibre LNG must design and deliver programs to support local and Aboriginal employment and contracting opportunities, skills training and education. As part of this strategy, Woodfibre LNG will direct its construction contractor to give hiring priority in the following order: Squamish Nation; Tsleil-Waututh Nation, Squamish and Sea to Sky residents; Lower Mainland residents; other British Columbians and Canadians. Workers will be recruited from outside Canada only if labour requirements at the appropriate skill level cannot be met after a thorough canvassing of those communities and the country.

The proposed Project changes result in changes to employment estimates for direct, indirect, and induced employment during construction. The capacity of the labour force in the LAA and RAA to meet Project employment requirements is likely to be constrained, based on existing low unemployment and the likelihood of competition for construction and other service workers from other major projects. However, the change to employment in the LAA and RAA remains as a positive economic effect. The potential for adverse Project-related effects on employment is not carried forward for further assessment.

6.10.2.2 Change in Labour Market Balance

Labour supply and capacity conditions in the LAA and RAA indicate that the Project will likely need to source an increased proportion of workers from outside the LAA and the RAA in comparison to estimates provided in the Application. The generally low unemployment rate in LAA communities is similar to the theoretical 5% natural unemployment rate, which reflects the level of unemployment in a healthy economy. An economy operating at full capacity and without inflationary wage increases is expected to have a certain

low level of unemployment due to technological advances or other factors (Bank of Canada 2019). The change in the geographic composition of the workforce is expected to have a negligible adverse effect on the labour market balance in the LAA, in the light of current labour force capacity and the workforce needs of other major projects. The likely negligible adverse effect on labour market balance in the LAA due to Project-related changes is therefore not carried forward for further assessment.

6.10.2.3 Change in Labour Income

The total labour income in the LAA associated with construction of the Project is estimated to be approximately \$94.0 million, which is lower than the \$150.6 million estimated in the Application. When combined with the operation of the floatel and marine construction vessels, total labour income for all direct, indirect, and induced employment is estimated to be \$128.4 million. Based on Statistics Canada's 2014 provincial input-output multipliers, the total FTEs in the LAA due to construction are estimated to have an average annual labour income of approximately \$67,000 (compared to approximately \$62,000 in 2014). For direct FTEs, income is estimated to be approximately \$76,000 annually, compared to \$72,000 according to 2014 estimates. These updated estimates are not considered to have materially changed from the 2014 estimates, which used Statistics Canada's 2010 input-output multipliers. The effect is considered to be positive, and there is no material change to the assessment of this effect as presented in the Application.

6.10.2.4 Changes in Training Opportunities

Pursuant to Condition 13 of the EAC for the Project, Woodfibre LNG has committed to "design and develop programs to support local and Aboriginal employment and contracting opportunities, skills training and education". Training opportunities during the construction period are expected to be relatively limited due to the short training time available and the short work periods required for many workers. This has not changed as a result of the Amendment activities or trends in labour market conditions since the Application. No changes to training opportunities are identified as a result of the proposed Project changes. Due to the likely overall beneficial effects of the Project on industrial training opportunities, the potential for adverse Project-related effects as a result of the new proposed Project changes is not carried forward for further assessment.

6.10.2.5 Summary

The Amendment-related changes to the Project are not anticipated to materially change the assessment of effects to the labour market from those identified and assessed in the Application. In summary, the Project is still anticipated to have positive effects during construction. No new mitigation measures are required, and implementation of mitigation measures in the Project's EAAs constitute practical means of preventing or reducing potential adverse effects on the labour market VC. Positive effects will be further realized through enhancement measures such as the local hiring strategy that will be implemented by Woodfibre

LNG. As such, there are no material changes to the effects in the labour market assessment from that described in the Application, and the Amendment will not result in a change in the determination of significance for the labour market, as described in Section 6.2 of the Application.

6.11 Sustainable Economy

The sustainable economy assessment in the Application included consideration for the Project to potentially affect the sustainable economy and its subcomponents, namely: regional economic development, commercial marine use, and local government finances. Spatial boundaries for the assessment of sustainable economy are defined specific to the subcomponent as follows:

- Regional economic development: LAA: District of Squamish, Resort Municipality of Whistler (Whistler), SLRD Electoral Area D, Squamish First Nation communities, and Metro Vancouver; RAA: BC.
- Marine commercial use: LAA: marine portion of the Project area (a 2.0 km area extending from the Project boundary, and the worker ferry and water taxi direct routes with 0.5 km assessment area in the marine environment on either side); RAA: Howe Sound.
- Local government finance: LAA and RAA: District of Squamish and SLRD.

The Application suggested that Project expenditures were expected to generate benefits to the regional economy in terms of increased contracting opportunities for local businesses. Further, Project demand for goods and services could affect the local and regional supply in terms of induced output and availability and pricing of goods and services. With respect to marine commercial use, Project-related vessels could affect other recreational marine uses. With respect to local government finances, Project tax payments would be expected to have a positive effect on local government revenues. In addition, local government expenditures could be affected if the Project or its workers require direct provision of services.

No potential Project-related adverse interactions were predicted in the Application for effects on regional economic development and government finances in the LAA and RAA. Positive interactions were predicted in terms of the Project contributions to the sustainable economy through contracting opportunities and increased spending, and through tax contributions to government revenues.

The Application identified a potential adverse effect for commercial marine use: displacement of marine-based tourism activities due to the passage of certain Project-related vessel traffic transiting through areas used intensively for marine-based tourism and recreational activities. To mitigate the potential effect Woodfibre LNG committed to co-develop, with local groups, a Squamish Harbour Vessel Traffic Plan (now incorporated into the draft Marine Transport Plan) to minimize displacement of marine activities. After implementation of mitigation measures, the residual effect was considered low in magnitude and not significant, with high confidence since areas, volume, and timing of vessel movements in the area were well known.

6.11.1 Existing Conditions

Identified changes to existing conditions for the sustainable economy in the period since the Application was reviewed and approved are summarized to inform the changes to previously identified effects or any new effects. The following presents a brief update of existing conditions in the LAA for the regional economy and commercial marine use. No material changes to existing conditions described in the Application for local government finances were identified.

6.11.1.1 Regional Economy

Provincially, employment growth in 2018 to 2019 was focused on the services sector (e.g., educational services, public administration, and wholesale and retail trade). Employment in the services sector in BC grew overall by 3.9% from August 2018 to August 2019, while employment in goods-producing industries declined slightly overall (-1.0%) (Statistics Canada 2019b). In Squamish, local companies grew by 7% in 2018, continuing general economic growth trends noted in the Application. The total number of companies with one or more employee in Squamish was 939 in 2018, and the growth of companies in Squamish was noted to exceed the provincial (2%) and Vancouver (2%) averages. In the District of Squamish's annual Economic Development Business Survey, local business owners were asked to rate the current state of their business. Approximately two-thirds of respondents stated that their business was "good or increasing" in 2018, which represented a 15% increase in this statistic from 2017. A total of 177 new businesses were incorporated in 2018, representing a 28% increase over the previous 10-year average, but down 24% from the record high year of 2016. Finally, the total value of building permits was nearly \$150 million in 2018, which represents a 12% increase from the previous record high year of 2017. The cost of doing business in Squamish was also perceived to increase in 2018, based on direct labour, business taxes, inventory costs, and other costs. Squamish continued to prioritize growth in the green economy (clean energy, agri-foods, etc.) and outdoor recreation and tourism, which together with other targeted industries represented 24% of total businesses in 2018 (District of Squamish 2019b).

Squamish Nation, together with Tsleil-Waututh Nation and Musqueam Indian Band, formed the MST Development Corporation in 2015 with the goal of regaining ownership of significant lands in their shared territories and expanding the Nations' economic base (Squamish Nation 2016). In 2019, Squamish Nation's involvement with multiple real estate developments included plans for a major housing development on its lands in Vancouver, near the Burrard Bridge. The development is planned to include approximately 3,000 rental housing units and potential community amenities (Boynton 2019). Squamish Nation has been active in developing trades training programs and many other initiatives to support economic development. Own Source Revenues from leases, taxation, and Squamish-owned businesses in 2015/16 were \$45.4 million, up from \$36 million in 2008 (Squamish Nation 2016).

Whistler’s economy continues to rely nearly completely on tourism and recreation. Annual gross domestic product generated by consumer spending was \$1.53 billion in 2015 and 2.7 million visitors were reported in that year (Whistler n.d.).

6.11.1.2 Commercial Marine Use

Howe Sound marine areas are used for commercial, traditional, government, and recreational activities. Commercial and government vessels identified in Howe Sound include passenger ferries, tugs and barges, deep sea cargo ships, Canadian navy and other government ships, fishing boats, and water taxis. Squamish Nation members and other Aboriginal groups pursue marine-based activities throughout Howe Sound. Recreational vessels identified include yachts, pleasure boats, and self-propelled craft. Associated marine recreational activities identified include fishing, diving, waterskiing and wakeboarding, windsports (kiteboarding and windsurfing), kayaking, and paddle-boarding. No specific updated information on commercial marine use is identified as materially changed from that presented in the Application.

6.11.2 Potential Interactions between Project Changes and Sustainable Economy

The potential interactions between the pathways to effects for the sustainable economy and the proposed Project changes are outlined in **Table 6-14**.

Table 6-14 Potential Project Interactions with Sustainable Economy

New Project Activities and Physical Works	Sustainable Economy Interaction
Construction Phase	
Floating worker accommodation (floatel)	<p>Minor interaction (positive): Operation of the floatel as worker accommodation will create a positive interaction in terms of increased contracting opportunities (e.g., marine transport service, catering). Communities in the LAA are expected to benefit from these opportunities in terms of incremental goods and services contracting revenues.</p> <p>Minor interaction: A change in Project-related marine vessel activity may affect the displacement of marine-based tourism activities.</p> <p>Minor interaction (positive): Operation of the floatel will generate municipal tax payments and fees to District of Squamish and SLRD.</p>
Accommodation onboard marine construction vessel	<p>Minor interaction (positive): Operation of the marine construction vessels as worker accommodation will create a positive interaction in terms of increased contracting opportunities (e.g., marine transport service, catering). Communities in the LAA are expected to benefit from these opportunities in terms of incremental goods and services contracting revenues.</p> <p>Minor interaction: A change in Project-related marine vessel activity may affect the displacement of marine-based tourism activities.</p> <p>Minor interaction (positive): Operation of the marine construction vessels will generate municipal tax payments and fees to District of Squamish and SLRD.</p>

New Project Activities and Physical Works	Sustainable Economy Interaction
Treatment of water for domestic purposes	Minor interaction (positive): Construction and maintenance of the water treatment facility will create additional contracting opportunities.
Shore access	Minor interaction (positive): The construction of the shore gantries, pedestrian walkway and clear span bridges to connect the floatel to the LNG facility will create additional contracting opportunities.

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

Minor interactions with the floatel and the accommodation onboard the construction vessel were identified for the regional economic development, commercial marine use, and local government subcomponents. The following interactions from the activities on the sustainable economy subcomponents during construction are discussed below:

- Regional economic development:
 - Change in goods and services revenues (due to Project expenditures on goods and services that would be supplied by businesses in the LAA)
 - Change in induced output (due to household expenditures in LAA at various businesses and institutions by Project-associated employment)
 - Change in availability and pricing of goods and services.
- Commercial marine use:
 - Displacement of marine-based tourism activities.
- Local government finances:
 - Change in local government revenues: positive interaction
 - Change in local government expenditures: positive interaction.

6.11.2.1 Change in Goods and Services Contracting Revenues

Based on the 2019 analysis, Woodfibre LNG’s total expenditures on wages and supplies in the LAA, measured as total direct output, were estimated to be \$226.8 million over the 51-month construction period. Project-associated goods and services expenditures for indirect suppliers to make or provide production inputs for the Project were estimated as \$69.5 million. These amounts are lower than the 2014 total estimates (\$262.6 million and \$93.8 million, respectively), but still constitute positive potential effects on the local and regional economy. Effects on business opportunities in the LAA resulting from Project-associated spending on goods and services will be beneficial during the construction phase. No material changes to this effect are considered likely, and this effect is not carried forward for further assessment.

6.11.2.2 Change in Induced Output

Induced output is revenue earned by businesses that would supply the household requirements of Project workers. Example businesses include grocery stores, clothing stores, gas stations, and entertainment venues. In 2019, induced output was estimated to be \$76.6 million, compared to \$80.9 million in 2014. The induced output for the Project still constitutes a positive potential effect. Effects on business opportunities in the LAA resulting from Project-associated spending on goods and services will be beneficial during the construction phase. No material changes to this effect are considered likely, and this effect is not carried forward for further assessment.

6.11.2.3 Change in Availability and Pricing of Goods and Services

Project demand for goods and services will likely have a negligible effect on availability and pricing of goods and services in the LAA. Sources of capital equipment are not expected to change as a result of the Amendment, and the Project will be able to access a large pool of suppliers of goods and services in the Lower Mainland. As such, no changes to the assessment of this effect resulting from the new proposed Project-related changes are identified and this effect is not carried forward for further assessment.

6.11.2.4 Displacement of Marine-based Tourism Activities

The Application anticipated a net increase in marine vessel activity due to the Project in Squamish Harbour that could interact with marine recreational and tourism activities in Howe Sound, including kiteboarders and windsurfers. Because accommodation on the floatel and marine construction vessel will reduce the daily employee transport vessel traffic from Darrell Bay to weekly transits, the potential for Project interactions with marine recreational traffic are likely to be reduced overall. In addition, Woodfibre LNG is currently exploring the option of subcontracting the transport of employees directly from the Vancouver Airport to the site via ferry (maximum 350 persons capacity) (refer to Section 6.12.1.2 for further detail). The current mitigation to develop a Squamish Harbour Vessel Traffic Plan (now incorporated into the draft Marine Transport Plan) is still considered effective. Although transits of crew boats and ferries are expected to be less frequent due to the floatel, given the high and intensive use of marine areas of Howe Sound as documented in the Application, the characterization of the residual effect as a result of the new proposed Project-related changes is not considered to be reduced or otherwise materially changed.

6.11.2.5 Change in Local Government Tax Revenues and Expenditures

Municipal tax payments and fees to District of Squamish and SLRD from the Project (i.e., due to facility construction, floatel operation, and marine construction vessel operation) are expected to total approximately \$7.8 million during construction, with positive effects on local government finances, which is less than the 2014 estimate of \$10.0 million. No changes to local government expenditures are expected as a result of the new proposed Project changes. The change in local government revenues due to the Project still constitutes a positive potential effect. No material changes to this effect are considered likely, and this effect is not carried forward for further assessment.

6.11.2.6 Summary

There is no material change to the assessment of the adverse residual effect on sustainable economy as a result of the proposed Project changes in this Amendment. No new mitigation measures are required, and implementation of mitigation measures in the Project's EAAs constitute practical means of preventing or reducing potential adverse effects on the sustainable economy VC. Positive effects will be realized through enhancement measures such as preferential local procurement by Woodfibre LNG. As such, there are no material changes to the effects in the sustainable economy assessment from that in the Application, and the Amendment will not result in a change in the determination of significance for the sustainable economy, as described in Section 6.3 of the Application.

6.12 Infrastructure and Community Services

The infrastructure and community services assessment in the Application considered the potential for the Project to affect subcomponents for housing and accommodation, infrastructure and community services (including health and social services, education services, road infrastructure and vehicle traffic, and community services (sewer, waste, and water services)) and emergency services (police, fire protection, ambulance, marine rescue). Potential effects arise from servicing the in-migrating Project workforce.

With mitigation, the Application concluded negligible residual effects to demand on housing and temporary accommodation through increased population associated with the construction workforce; negligible residual effects from increased demand on traffic services and infrastructure due to a commuting workforce; and negligible residual effects on increased demand for emergency services due to onsite emergencies. The Assessment report identified only an adverse residual effect of low magnitude for increased demand on housing and accommodation with an associated decrease in affordability and availability (emergency services were considered elsewhere). The Application assumed that the majority of construction jobs would be taken up by workers who have their primary residence in the LAA (Squamish, Whistler, and Greater Vancouver areas) and would commute daily via supplied bus services or private vehicles to Squamish and by ferry from Darrell Bay to the Project site. However, some construction workers with residences in Metro Vancouver may decide to relocate temporarily closer to the ferry in Squamish, using either rental housing accommodation or short-term arrangements, such as hotels and motels in the Squamish area. The assessment relied on available rental housing and temporary accommodation in the Metro Vancouver and Squamish areas as short-term accommodation options for the Project's non-local construction workers.

The floatel accommodation has been proposed to address changing conditions in the LAA, which have reduced availability of housing and accommodation for non-local construction workers. These activities will change the level of in-migration to the LAA, as well as the commuting traffic volumes on the Sea to Sky Highway 99, and therefore may change the assessment of the residual effects for this VC.

6.12.1 Potential Interactions between Project Changes and Infrastructure and Community Services

The potential interactions between the subcomponents for the Infrastructure and Community Services VC and the proposed Project-related changes are outlined in **Table 6-15**. With several exceptions, potential effects on housing, community infrastructure and services, and emergency services subcomponents are generated from Project workforce requirements and associated population in-migration largely in response to the totality of the Project and not to individual Project works and activities; therefore, the table addresses combined activities.

Table 6-15 Potential Project Interactions with Infrastructure and Community Services VC

New Project Activities and Physical Works	Housing and Accommodation Interaction	Infrastructure and Community Services (Traffic Services)	Emergency Services
Construction Phase			
All activities (addition of the floatel and associated shore access trail, accommodating workers onboard the marine construction vessel, and treatment of water for domestic purposes).	Minor interaction (positive direction): The decision to accommodate workers on the floatel and the construction vessel will decrease the predicted demand for housing and accommodation assessed in the Application.	Minor interaction (positive direction): Use of the floatel and construction vessel will decrease the predicted daily commuter traffic volumes on the Sea-to Sky Hwy and the predicted residual effects to overall traffic volumes.	No new interaction: Demand for emergency services due to Project area emergencies is not likely to change. No new interaction: Reduced in-migration may reduce the demand for emergency services by construction employees in the local area.

Notes:

- No interaction: No interaction is likely between a Project component and a VC or IC.
- No new interaction: No new interaction is identified beyond those already included in the Application.
- Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.
- Carried forward: Interactions have the potential to result in an adverse effect.

Minor positive interactions of housing and accommodation and traffic services with the Amendment activities are likely. No new interactions with emergency services were identified.

6.12.1.1 Housing and Accommodation

Use of the floatel and marine construction vessel for accommodation will reduce the demand for accommodation of in-migrants in the LAA. The Application estimated an annual average of 400 FTE jobs (in-migrants) to supplement workers sourced from the LAA. With this Amendment, the number of employees requiring local accommodation will decrease because they will be housed on the floatel, which will have a positive effect on the availability of accommodation in the LAA. The floatel is anticipated to accommodate 250 to 630 construction workers per month, an average of 87% of the construction workers (between 82% to 100%), between May 2021 and February 2024.

The population increase in the LAA would be of workers only, since the short construction period would deter family members from temporarily moving to the LAA. The Application prediction for a predominantly male workforce is also not anticipated to change. The demand for the type of accommodation (single person) for those not in the floatel and construction vessel is therefore not anticipated to change. With respect to the demographic characteristics of a temporary workforce for construction of an industrial facility in Canada, the Application noted a survey of mobile workers in Alberta found that, on average, 92% were male with a median age of 35 years (Nichols Applied Management 2007). A more recent review of the construction labour force in Canada concluded that 12% of the workforce were female and only 3% to 7% of field-oriented roles were female (Chang et al. 2018, Weir 2019).

With the demand for and scarce supply of housing and accommodation in the LAA, particularly in Squamish, the assessment of negligible effects in the Application is no longer current. The new floatel accommodation addresses the change in the conditions, such that the determination of effects for housing and accommodation remains negligible; it also addresses the concerns of Squamish that the Project would adversely affect an already tight housing market.

Under the EAC Condition 14, during construction, Woodfibre LNG is required to prepare a Community Services and Infrastructure Plan, provide local information packages, and require the Project's engineering procurement and construction management to provide a housing and accommodation adviser. With the floatel and marine construction vessel, it is anticipated that the role of the housing and accommodation adviser will include coordination of accommodation for the floatel and construction vessel, as well as supporting employees who cannot be accommodated on the floatel when the workforce exceeds the floatel capacity. Woodfibre LNG considers that the current mitigation for the housing and accommodation adviser encompasses these tasks and does not need to be revised.

6.12.1.2 Transportation (Traffic Services)

The following summarized changes to existing conditions for the traffic on the Sea to Sky Highway in the period since the Application was approved are intended to inform the assessment of changes to previously identified effects or any new effects.

Average daily traffic volumes have been increasing at the Eagle Ridge traffic monitoring point on the Sea to Sky Highway, from 15,273 in 2011 (post-Olympics) to 19,890 in 2018. Average volumes for July and August, with tourist traffic, increased from 20,164 to 25,230 over the same period (MOTI 2019).

In 2013, the average daily traffic counts on the Sea to Sky Highway 99 northbound between Metro Vancouver and Squamish were highest on Fridays and lowest on Tuesdays (MOTI 2019). Although higher levels of traffic are associated with the weekend days (i.e., Thursday through Sunday), the traffic count station where this data originates is located before the Horseshoe Bay Ferry Terminal, and not all vehicles counted travelled as far as Squamish. By comparison, over the same period, average daily traffic counts

on the Sea to Sky Highway between Squamish and Whistler were also highest on weekend days (MOTI \ 2019). This traffic increase during weekends coincides with the tourism focus of the Sea to Sky corridor, including Squamish and Whistler. Southbound traffic patterns of vehicles travelling from north of Squamish also involved higher traffic counts on weekend days, but higher counts were observed on Sundays and Mondays, which coincides with the pattern of travellers returning to Squamish area or Metro Vancouver at the end of the weekend.

The Application estimated that approximately 400 to 800 additional vehicles per day would travel on the Sea-to-Sky Highway 99 at the peak of the construction phase. With the floatel and shift work (expected to be weekly), single occupancy vehicles would be replaced by weekly buses from identified pick-up locations. Assuming full occupancy of the floatel (up to approximately 600 employees), and 100-person buses, a maximum of approximately six buses in and six buses out of Darrell Bay would be required every week, substantially reducing daily Project-related traffic from the estimates that were provided in the Application, and a minimal proportion of the estimated peak traffic flows in July and August. In addition, Woodfibre LNG is exploring the option of subcontracting the transport of employees directly from the Vancouver Airport to the site via ferry (maximum 350 persons capacity), which would further reduce Sea to Sky Highway traffic.

Prior to completion of infrastructure upgrades by Woodfibre LNG at Darrell Bay, when a smaller number of personnel will be required onsite, construction personnel will be transported by bus to the Squamish Harbour, located in downtown Squamish on Loggers Lane. The draft Traffic Control Management Plan (EAC Condition 15) (August 2019) includes procedures for transportation to the ferry sites for the interim period prior to the upgrades, and the period during the operation of the Darrell Bay site. Buses for shift changes will be used to drop off and pick up personnel, thereby limiting traffic and parking congestion at Squamish Harbour and in the downtown area in general. Parking at the harbour will not be permitted; personnel will arrive at the designated worker ferrying location via the Sea to Sky Highway from either Squamish, Vancouver, or Vancouver Airport. Shift changes will be scheduled to avoid peak travel periods on the Sea to Sky Highway.

With implementation of the Traffic Control Management Plan, which includes bussing employees for their shifts on the floatel and marine construction vessel, the changes to the CPD included in this Amendment are likely to decrease the Project-related effects to traffic on the Sea to Sky Highway 99. The Amendment complies with the condition to "Identify measures to reduce the number of vehicles of Project employees commuting on Highway 99 and at the Darrell Bay ferry location" (EAC Condition 15). The Amendment is unlikely to result in a change in the characterization of residual effects for traffic services or a change in the determination of negligible effects for traffic, as described in Section 7.1 of the Application, however the effects are likely to be less than previously assessed.

6.12.1.3 Emergency Services

The Application considered effects related to an increased demand in emergency services due to Project area emergencies, and increased demand on emergency services due to changes in population (in-migration of Project employees).

Woodfibre LNG continues to plan for self-sufficiency for all emergency situations and is developing an Emergency Response Plan (ERP) for Project construction. As identified in the conditions (EAC Condition 14, M7.2-5), the ERP is being developed with input from local, regional, and provincial emergency response authorities, such as Squamish Fire Department, the Squamish RCMP, Vancouver Coastal Health, and BC Ambulance Service. The ERP will be communicated to emergency response authorities and service providers and will address all Project-related construction emergencies, including those that may be associated with the floatel and the construction vessel.

The Application assessed a relatively small number of in-migrants (approximately 400 annually) associated with Project construction and did not identify changes to demand for related municipal services. Floatel accommodation as per the Amendment is likely to reduce the demand for emergency services from the construction employees in the local area. Minor health emergencies for floatel and construction vessel residents will be addressed onsite; however, some emergencies will likely require transport by Woodfibre LNG to local health services. The potential for effects will be monitored as per the requirements of the Infrastructure and Community Services Plan (EAC Condition 14).

Implementation of mitigation measures identified in the Application will constitute practical means of preventing or reducing potential adverse effects. The Amendment is unlikely to result in a change in the characterization of residual effects for emergency services or a change in the determination of negligible effects for emergency services, as described in Section 7.1 of the Application.

6.12.1.4 Summary

No new mitigation measures are required, implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on infrastructure and community services as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance to infrastructure and community services from changes in housing and accommodation, transportation, and emergency services as described in Section 7.1 of the Application.

6.13 Marine Transport

The marine transport assessment in Section 7.3 of the Application included consideration of potential Project-related effects on the transport of cargo or passengers, marine fisheries, and recreational and tourism activities within the navigable waters of Howe Sound. The LAA and RAA were defined in the

Application as the marine portion of the Project area, a 500 m wide area extending from the shoreline, the shipping route with a 1 km assessment area in the marine environment on either side, and the worker ferry direct route and water taxi direct route with 0.5 km assessment area in the marine environment on either side. The LAA includes the Project area, including all current and proposed marine infrastructure, Control Zone, and the preliminary vessel turning circles. Project-related vessel traffic will be restricted in the Control Zone.

The new proposed Project changes described in this Amendment apply only to the construction phase of the Project; therefore, only interactions with key indicators relevant to Project construction are included in this section and are listed as follows:

- Proportion of navigable channel affected by construction of marine infrastructure, including the Control Zone around the Project area
- Location of fisheries, including fishing vessel access routes overlapping with Project infrastructure and construction-related vessel routes
- Marine recreational and tourism activities, destinations, and access routes overlapping with Project infrastructure and construction-related vessel routes.

The Application considered the potential effects to the marine transport VC resulting from construction-related vessel traffic, including transportation of construction crews, equipment, and materials and construction of the floating storage and offloading jetty (FSO) jetty and other facility components. One adverse residual effect was identified: interference with commercial transport, fisheries, recreational activities, and tourism. It was determined in the Application that the residual effect was likely, due to the passage of certain Project-related vessel traffic transiting through areas used intensively for marine-based tourism and recreational activities. Following application of mitigation to co-develop, with local groups, a Squamish Harbour Vessel Traffic Plan (now incorporated into the draft Marine Transport Plan) in compliance with EAO Condition 16 and Squamish Nation Condition 4 to minimize displacement of marine activities, the residual effect was anticipated to be not significant.

The following section presents a discussion of the potential for the floatel, marine construction vessel(s), and related new proposed components and activities to result in new and additional effects to the marine transport VC.

6.13.1 Potential Interactions between Project Changes and Marine Transport

Potential interactions between marine transport resulting from the proposed Project changes are limited to floatel and accommodation on the marine construction vessel (**Table 6-16**).

Table 6-16 Potential Project Interactions with Marine Transport

New Project Activities and Physical Works	Marine Transport Interaction
Construction Phase	
Floating worker accommodation (floatel)	No new interaction: Operation of the floatel as worker accommodation will require marine transport services to ferry construction workers and workers involved with floatel operations (e.g., cooks, cleaners) and transport waste, equipment, and materials. Personnel, equipment, and materials transport were assessed in the Application. In addition, the transport of the floatel accommodation itself to the site is included in the assessment of the transport of barges to and from the site.
Accommodation onboard marine construction vessel	No new interaction: Operation of a marine construction vessel as worker accommodation will include transporting the vessel itself in Howe Sound, ferrying construction workers, and transporting materials and equipment for workers on supply boats. Transport of personnel, equipment and materials and the marine construction vessel itself was assessed in the Application.
Treatment of water for domestic purposes	No interaction: There is no interaction with water treatment from Woodfibre Creek and the marine transport VC. Water withdrawal from Woodfibre Creek was previously approved.
Shore access	No interaction: the implementation and use of shore access for the floatel is not likely to interact with the marine transport VC.

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

No new interactions with marine transport were identified for the vessel activity associated with the floatel and the accommodation onboard the construction vessel. The following interactions from the proposed Project changes on marine transport have been identified and are discussed below:

- Interference with navigation from Project-related infrastructure; and
- Interference with commercial transport, fisheries access routes, recreational and tourism activities.

6.13.1.1 Interference with Navigation from Project-Related Infrastructure

The floatel will be towed to the Woodfibre Project area and will be moored for a total of approximately 35 months. The floatel will be approximately 125 m in length and will be situated entirely within the CPD. Marine construction vessels will be active within the CPD and Marine Transport LAA during construction of the FSO jetty.

No additional interactions with navigation or navigation safety are anticipated as a result of the new proposed Project changes. As such, no material changes to the assessment of this effect are considered likely.

6.13.1.2 *Interference with Commercial Transport, Fisheries Access Routes, and Recreational and Tourism Activities*

Marine areas in Howe Sound are used for commercial, traditional, government, and recreational activities. Commercial and government vessels identified in Howe Sound include passenger ferries, tugs and barges, deep sea cargo ships, Canadian navy and other government ships, fishing boats, and water taxis. Squamish Nation members and other Aboriginal groups pursue marine-based activities throughout Howe Sound. Recreational vessels identified include yachts, pleasure boats, and self-propelled craft. Associated marine recreational activities identified include fishing, diving, waterskiing and wakeboarding, windsports (kiteboarding and windsurfing), kayaking, and paddle-boarding. Commercial shellfish fisheries in Howe Sound include prawn, shrimp, and crab. No commercial fisheries for finfish species currently occur in Howe Sound. No specific updated information on marine transport is identified as materially changed from the Application.

Vessel traffic generated by the Project during construction is expected to be relatively low, given the level of current and historical traffic in Howe Sound; however, a residual effect of low magnitude was predicted for Project construction, due to transport of workers, materials, and equipment via crew boats, ferries, and barges. As a result of the new proposed Project changes, fewer transits of ferries and/or crew boats will be required from Darrell Bay and/or the Squamish Government Dock, since workers will be living aboard the floatel and construction vessels during their shifts, rather than requiring daily transport. Service vessels will transport crew, supplies and food to the floatel and marine construction vessels, and transport waste from the vessels and floatel to approved waste facilities in the LAA when required.

The current mitigation to develop a Squamish Harbour Vessel Traffic Plan (now incorporated into the draft Marine Transport Plan) is considered to be effective. Overall, no material change to the assessment of this effect is anticipated as a result of the new proposed Project changes.

6.13.1.3 *Summary*

No new mitigation measures are required, and implementation of mitigation measures in the Project's EAAs constitute practical means of preventing or reducing potential adverse effects on the marine transport VC. No material change is anticipated to the assessment of the adverse residual effect on interference with commercial transport, fisheries access routes, and recreational and tourism activities as a result of the proposed Project changes in this Amendment. The operation of the floatel and the marine transport vessel will require the transport of construction workers to and from the floatel for weeklong shifts, as well as transporting floatel operation workers, materials and equipment, and waste to designated landfills. The floatel will provide accommodation for the majority of construction workers (an average of 87% over an approximate 35-month period) for the duration of their weeklong shift, thereby reducing the frequency of ferry transits required during construction, although service vessels will be needed approximately weekly to remove solid waste and sewage from the floatel for disposal at a licensed offsite facility. However, the reduction in frequency of ferry transits due to the floatel is not considered sufficient to change the

assessment of the residual effect or the characterization of significance. As such, there are no material changes to the effects in the marine transport assessment from that provided in the Application, and the Amendment will not result in a change in the determination of significance (not significant) for the marine transport VC, as described in Section 7.3 of the Application.

6.14 Land and Resource Use

The land and resource use assessment in the Application (Section 7.4) considered the potential for the Project to affect parks and protected areas, trapping and guide outfitting, linear infrastructure, energy and mineral development, forestry, recreational hunting and fishing, and other outdoor recreation activities. The assessment reviewed the potential for effects to these uses through:

- Changes to access.
- Displacement of use.
- Changes in harvest quantities in the marine environment.
- Changes in the quality of the experience of recreation and tourism users and hunters due to changes in environmental conditions (e.g., noise and visual resources).
- Increase in demand for use through temporary or permanent in-migration to the area.

With mitigation, two non-significant residual effects were identified, namely: changes to access for timber harvesting, and displacement of marine-based recreation uses in Squamish Harbour and at the Project area.

Timber harvesting companies (Black Mount and BC Timber Sales) previously had agreements to access Crown land for timber harvesting through the Project area and for use of Project water lots for log storage. Woodfibre LNG committed to discussing opportunities for alternate access routes along the southern portion of the Project area.

The assessment anticipated a net increase in marine vessel activity due to the Project in Squamish Harbour, which could interact with recreational and tourist watercraft, including kiteboarders and windsurfers. The Project will also displace a limited amount of recreational activities in the marine portion of the Project area. Woodfibre LNG committed to developing a Squamish Harbour Vessel Traffic Plan (now incorporated into the draft Marine Transport Plan).

A potential interaction with the changes to the CPD included in this Amendment was identified for freshwater and marine resources, which could affect the availability of harvested resources (**Table 5-1**). No interactions were identified in **Table 5-1** with respect to displacement of activities (footprint effects), access, change in environmental conditions for users, and change in in-migration that would cause changes in the demand for recreational activities; however, the potential for changes as a result of the Amendment activities is reviewed in this section to confirm this prediction. Changes in marine vessel traffic due to an anticipated reduction in ferry transport trips associated with the new proposed Project changes (see **Section 6.13**) may reduce displacement / disturbance effects to marine recreational users.

6.14.1 Potential Interactions between Project Changes and Land and Resource Use

The potential interactions along the pathways to effects for land and resource use and the proposed Project changes are outlined in **Table 6-17**. Because the Project changes are within the previously assessed Project area, no displacement of activities is anticipated in the Project area and this effects pathway is not considered further. The analyses for individual VC and IC sections that support this section, including potential Project interactions, are included in the individual sections for the Amendment and are not reproduced herein (see Sections 6.5 Freshwater Fish and Fish Habitat, 6.6 Marine Benthic Habitat, 6.8 Forage Fish and Other Fish, and 6.9 Marine Mammals of this Amendment).

Table 6-17 Potential Project Interactions with Land and Resource Use

New Project Activities and Physical Works	Land and Resource Use Interaction
Construction Phase	
Floating worker accommodation (floatel)	<p>No new interaction: Non-Project-related access through the Project area was and continues to be constrained for safety reasons. Woodfibre LNG has been consulting with forestry companies regarding access to forestry tenures (Condition 19 of the EAC; Squamish Nation Environmental Condition 4.5).</p> <p>Minor interaction: The floatel has the potential to affect marine and freshwater fish resources and thus may affect harvests of those resources.</p> <p>No interaction: Environmental conditions affecting the quality of the land use experience are not anticipated to substantially change and affect land and water users (see Table 5-1 of this Amendment)</p> <p>No interaction: Accommodation of construction workers on the floatel is likely to decrease recreational demands during construction (workers will not be resident and will have limited time for recreational activities) (See Section 6.10 Infrastructure and Community Services). Mitigation measures in the Construction Environmental Management Plan (CEMP) will prohibit hunting and fishing by employees during their shifts on the floatel.</p> <p>Minor interaction (positive): Accommodation on the floatel will reduce the daily employee transport vessel traffic and is likely to reduce potential interactions with marine recreational traffic.</p>
Accommodation onboard marine construction vessel	<p>No new interaction: Access for forestry companies to tenures will not be affected. Woodfibre LNG's consultation with companies has identified potential access and log dumping areas to the south of the floatel.</p> <p>Minor interaction: Accommodation on the vessel will reduce daily ferry trips, which may in turn affect marine and freshwater fish resources, and thus affect harvests of those resources.</p> <p>No new interaction: Environmental conditions affecting the quality of the land use experience are not anticipated to substantially change and affect land and water users (see Table 5-1 of this Amendment).</p> <p>No to no new interaction: Accommodation of construction workers on the marine construction vessel is not likely to change the previously estimated in-migration that would affect recreational demands during construction (workers accommodated at the construction vessel are not anticipated to be in-migrants and will have limited time for recreational activities at the Project site). Mitigation measures in the CEMP will prohibit hunting and fishing by employees during their shifts on the construction vessel.</p> <p>Minor interaction (positive): Accommodation on the vessel will reduce daily vessel traffic to transport employees and will likely reduce potential interactions with marine recreational traffic.</p>

New Project Activities and Physical Works	Land and Resource Use Interaction
Treatment of water for domestic purposes	No interaction: Treatment of water is not anticipated to interact with land use. There will be no additional water withdrawal above that already assessed and approved in Amendment #1 and therefore no linked changes to land and resource use.
Shore access	No new interaction: Shore access for the floatel is not likely to change access for land users or change environmental conditions, nor will it likely affect marine and freshwater resources.

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

The Amendment is not anticipated to materially change the assessment of effects to land and resource uses from those identified and assessed in the Application and Amendment #1. No interactions that should be carried forward for further assessment were identified in the review of potential pathways for new and changed effects in **Table 6-17**. The rationale for the identified minor interactions is further discussed below.

6.14.1.1 Harvest Quantities in the Marine Environment

Assessments of the potential for changes to the CPD included in this Amendment to affect freshwater and marine resources did not identify substantial changes to residual effects that would in turn affect harvest quantities in the marine environment (see Sections 6.5 Freshwater Fish and Fish Habitat, 6.6 Marine Benthic Habitat, 6.8 Forage Fish and Other Fish, and 6.9 Marine Mammals of this Amendment); thus, there are no changes to the effects in the land and resource use assessment from those described in the Application and Amendment #1. Implementation of mitigation measures identified in the EAC for freshwater and marine resources and FDS Condition 7.2 will continue to constitute practical means of preventing or reducing potential adverse effects on land and resource use from the original and proposed new activities.

6.14.1.2 Displacement of Marine-based Recreation Uses in Squamish Harbour

Because accommodation on the floatel and marine construction vessel will reduce the daily employee transport vessel traffic from Darrell Bay (or Squamish in the first year of construction) to weekly transits, potential interactions with marine recreational traffic are likely to be reduced adjacent to the marine portion of the Project area. In addition, Woodfibre LNG is exploring the option of subcontracting the transport of employees directly from the Vancouver Airport to the site via ferry (maximum 350 persons capacity), which would further reduce ferry traffic from Darrell Bay. However, the anticipated net increase in non-ferry marine vessel activity due to the Project in Squamish Harbour that could interact with recreational and tourist watercraft will not be changed, and Woodfibre LNG will continue to implement the mitigation to develop a Squamish Harbour Vessel Traffic Plan (now incorporated into the draft Marine Transport Plan) as per EAC Condition 16.

6.14.1.3 Summary

No new mitigation measures are required; implementation of mitigation measures identified in the Project's EAAs will constitute practical means of preventing or reducing potential adverse effects on land and resource use from changes to the CPD included in this Amendment. The Amendment is unlikely to result in a change to the characterization of residual effects and will not result in a change in the determination of significance (i.e., not significant) to harvest quantities in the marine environment, and displacement of marine-based recreation uses in Squamish Harbour as described in Section 7.4 of the Application.

The management and monitoring plans currently in progress for the Project will be amended to include the changes to the CPD included in this Amendment.

6.15 Visual Quality

The visual quality assessment in the Application considered the potential Project effects on visibility of the Project and predicted scenic values (Section 7.5 of the Application). During construction, the potential effects to visual quality were from the addition of Project components as construction proceeded, from the temporary addition of potentially visible construction activities or components, and from changes in vegetation. During construction, the residual change in visual quality was assessed as likely to be not significant.

The potential for the changes described in the Amendment to result in new and additional effects to visual quality are discussed in the following section.

6.15.1 Potential Interactions between Project Changes and Visual Quality

Potential interactions between visual quality and the proposed Project changes are presented in **Table 6-18**.

Table 6-18 Potential Project Interactions with Visual Quality

New Project Activities and Physical Works	Visual Quality
Construction Phase	
Floating worker accommodation (floatel)	Minor interaction: The floatel will be an additional temporary component of construction infrastructure inside the CPA, which may be visible from select viewpoints.
Accommodation onboard marine construction vessel	No interaction: A marine construction vessel was included in the Application. The addition of a worker accommodation module on the vessel will not be perceivable from the viewpoints and does not result in any additional interactions not already assessed in the Application.
Treatment of water for domestic purposes	No interaction: The proposed changes to the CPA will not be perceivable because the self-contained water treatment system will be housed in a shipping container and will be low to the ground (less than 5 m tall) requiring minimal clearing. Once infrastructure is in place, it will be screened by vegetation.
Shore access	No interaction: The proposed changes to the CPA will not be perceivable because the infrastructure from the floatel to land will be low to the ground (less than 5 m tall) and screened by the floatel, and the access trail will be screened by vegetation.

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

The addition of accommodation onboard the construction vessel, water treatment, and shore access are not anticipated to result in any interactions with visual quality because the changes will be small and screened by vegetation for terrestrial Project components.

Minor interactions with visual quality were identified for the visibility of the floatel from selected viewpoints. The Application considered the change in the visual condition from the baseline of the two visually sensitive units that overlap the CPA from seven viewpoints. Considering the baseline existing visual condition, high attraction to viewers, high sensitivity to visual alteration, moderate to high absorption capacity, and regional social value, the context for residual adverse effects in these two visually sensitive units is likely to be high sensitivity. Baseline visual quality classes ranged from partial retention⁸ (PR) (1.5% to 7% alteration) to modified⁹ (M) (7% to 20% alteration) from all viewpoints. Change in the visual condition was analyzed in detail for the Project's operation phase only; since the construction and operation footprints are very similar (although activities are not); the operation assessment is considered sufficient to estimate effects from the

⁸ PR (Partially Retained) - Alteration, when assessed from a significant public viewpoint, is (i) easy to see; (ii) small to medium in scale; and (iii) natural and not rectilinear or geometric in shape.

⁹ M (Modified) - Alteration, when assessed from a significant public viewpoint, is (i) very easy to see and is either a) large in scale and natural in its appearance or b) small to medium in scale but with some angular characteristics.

Amendment. During operation, with the addition of the Project, the altered area from the Project alone ranged from 0.42% to 2.29%, and the visual condition was unchanged for all but one viewpoint (Watts Point), where the condition changed from PR to M.

With the temporary addition of the floatel, the construction footprint will be extended in a short (approximately 300 m) narrow band from Woodfibre Creek, of which only the floatel (125 m length) is likely to be visible as other components will be screened behind vegetation. This is expected to temporarily increase the total altered area closer to the 7% threshold to change a PR to an M classification for one viewpoint (beach near Furry Creek); the classification for other viewpoints is not anticipated to change (see Table 7.5-11 in the Application). This temporary, reversible, minor change from this Amendment for one viewpoint will not change the assessment in the Application. All areas disturbed for the purposes of construction but not required for operation will be reclaimed when construction is complete, including areas disturbed for the trail and the floatel.

The Amendment is considered unlikely to result in a change to the characterization of residual effects and will not result in a change in the determination of significance (i.e., not significant) for visual quality, as described in Section 7.5.5 of the Application.

6.15.1.1 Summary

No new mitigation measures are required; implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on visual quality as a result of the proposed changes to the CPD. The proposed Project changes are minor and do not change the characterization of residual effects or determination of significance (i.e., not significant) to visual quality as described in Section 7.5.5 of the Application.

6.16 Current Use of and Land and Resources for Traditional Purposes

The current use of land and resources for traditional purposes (current use) VC assessment in the Application considered the potential for the Project to affect the existing conditions of current use, the surrounding environment, and the factors influencing current use for the Tsleil-Waututh Nation. The same scope is assessed in this amendment Application. The assessment of the potential for the Project to affect the existing conditions for the Squamish Nation was assessed separately.

LNG carriers and supporting marine vessels such as escort tugs will pass through areas of Howe Sound within the Tsleil-Waututh Nation's Consultation Area, as well as through several other Aboriginal groups' asserted traditional territories (see **Section 3.0**).

Current use activities assessed in the Application included harvesting of marine resources, harvesting of terrestrial resources, use of marine waterways, and traditional use locations (landing sites, settling locations, culturally significant sites and resources). The Application reviewed the potential for pathways of effects to these uses through changes in access to the environment and resources, the amount and quality of resources (including marine harvest resources), and sensory disturbance (e.g., noise) during the current

use activity. The assessment of current use relied on the assessments of physical changes (i.e., air quality, sound, light, and water quality) for sensory disturbance, the biophysical assessments for the amount and quality of resources, and socio-economic assessments for the assessment of access, as shown in Table 7.6-5 of the Application. This assessment of current use also relies on the linked IC and VC assessments.

A potential interaction with the changes to the CPD included in this Amendment was identified for freshwater and marine resources, which could affect the availability of harvested resources (**Table 5-1**). Interactions with access, and sensory disturbance changes in environmental conditions for users were not identified in **Table 5-1**.

6.16.1 Potential Interactions between Project Changes and Current Use of Land and Resources for Traditional Purposes

The potential interactions between the pathways to effects for current use and the proposed Project changes are outlined in **Table 6-19**. The analyses for individual VC and IC sections that support this section, including potential Project interactions, are included in the individual sections for the Amendment, and are not reproduced herein (see Sections 6.5 Freshwater Fish and Fish Habitat, 6.6 Marine Benthic Habitat, 6.8 Forage Fish and Other Fish, and 6.9 Marine Mammals of this Amendment).

Table 6-19 Potential Project Interactions with Current Use of Land and Resources for Traditional Purposes

New Project Activities and Physical Works	Current Use Interaction
Construction Phase	
Floating worker accommodation (floatel)	<p>No new interaction: Access to environment and resources will not be affected. New infrastructure remains within the restricted access area of the CPA.</p> <p>Minor interaction: The floatel has the potential to affect the amount and quality of resources (including marine harvest resources)</p> <p>No new interaction: Environmental conditions for sensory disturbance are not anticipated to substantially change and affect current use activities (e.g. noise).</p>
Accommodation onboard marine construction vessel	<p>No new interaction: Changes in access to the environment and resources will not be affected. New infrastructure remains within the restricted access area of the CPA.</p> <p>Minor interaction: Accommodation on the vessel will reduce daily ferry trips, which may in turn affect marine and freshwater fish resources, and thus affect harvests of those resources.</p> <p>No new interaction: Environmental conditions for sensory disturbance are not anticipated to substantially change and affect current use activities (e.g. noise).</p>

New Project Activities and Physical Works	Current Use Interaction
Treatment of water for domestic purposes	No interaction: With the Project measures to manage treated water (Section 2.3), no interaction with current use has been identified. There will be no additional water withdrawal above that already assessed in Amendment #1.
Shore access	No new interaction: Shore access for the floatel will not likely change access for land users or environmental conditions or affect marine and freshwater resources. New infrastructure remains within the restricted access area of the CPA.

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

No new interactions were identified for access, as non-Project-related access through the Project area was and continues to be constrained for safety reasons. The interaction for access for current use is not further considered.

Assessments of the potential for the changes to the CPD included in this Amendment to affect freshwater and marine resources did not identify substantial changes to residual effects that would in turn affect harvest quantities in the marine environment (see Sections 6.5 Freshwater Fish and Fish Habitat, 6.6 Marine Benthic Habitat, 6.8 Forage Fish and Other Fish, and 6.9 Marine Mammals of this Amendment); thus, there are no changes to the effects in the current use assessment from that in the Application and Amendment #1.

Similarly, the new proposed activities are not anticipated to change the analyses for air quality, atmospheric sound, light, visual quality, and water quality effects on sensory conditions for current use (see **Table 5-1**). Potential effects on air quality and water quality were not carried forward for assessment in this Amendment. The analysis for atmospheric sound concluded that the predicted changes to atmospheric sound as a result of the proposed Project changes would be negligible, with minor interactions for the floatel and water treatment, and that measures in the EAC would be sufficient to manage potential changes. Similarly, new lighting on the floatel and shore access would be designed to reduce glare and skyglow while maintaining worker safety. While the floatel will be visible from Howe Sound, the temporary, reversible, minor change is likely to have a negligible effect on visual quality within the context of the entire Project. Thus, there is no change to the assessment of changes to sensory conditions affecting current use from that in the Application and Amendment #1.

6.16.1.1 Summary

The new proposed activities are not anticipated to materially change the pathways for effects to current use from those identified and assessed in the Application. No new mitigation measures are required. The implementation of mitigation measures for the ICs and VCs that support the assessment of current use

identified in the Project's EAAs will constitute practical means of preventing or reducing potential adverse effects from the proposed Amendment activities, and no changes are proposed. The Amendment is therefore unlikely to result in a change to the characterization of residual effects and will not result in a change in the determination of significance (i.e., negligible) for all assessed effects for current use, as described in Section 7.6 of the Application.

6.17 Community Health and Well-Being

The CHWB assessment in the Application (Section 9.2.1) included consideration for the potential for the Project to affect social determinants of health, namely:

- Employment and income (higher incomes are generally associated with higher life expectancy)
- Education (higher levels of education are also linked to better health and life expectancy outcomes)
- Affordable housing (e.g., affordable housing affects both physical and social health and well-being)
- Smoking, drug and alcohol use (considered detrimental to individual and community health)
- Community connectedness (employee shift schedules may decrease availability to participate in community events and decrease community connectedness)
- Accidents and mortality (associated with the Project)
- Increased demand for health services (leading to decreased capacity to serve communities)
- Increased crime (often associated with influx of temporary workers to a community)
- Leisure and recreation (Project may limit area available for recreation).

The assessment of CHWB in the Application was informed by other sections of the assessment, including the economic and social assessments. Spatial boundaries (both LAA and RAA) for the assessment of CHWB were the District of Squamish, Resort Municipality of Whistler (Whistler), SLRD Electoral Area D, Squamish First Nation communities, and Metro Vancouver.

During construction, the Application considered that the Project would interact with employment and income, smoking, drug and alcohol use, community connectedness, and accidents and mortality, and these interactions were carried forward for assessment. A minor interaction with leisure and recreation access was also predicted. After implementation of mitigation measures, including healthy living programs and policies, consultation on shift scheduling, employee buses and other measures, no detectable residual effects for CHWB were identified.

The potential for the floatel, marine construction vessels, and related new proposed components and activities to result in new and additional effects to CHWB is discussed in the following sections. The management and monitoring plans currently in progress for the Project will be amended to include the changes to the CPD included in this Amendment.

6.17.1 Potential Interactions between Project Changes and Community Health and Well-being

The potential interactions between the pathways to effects for CHWB and the proposed Project changes are outlined in **Table 6-20**.

Table 6-20 Potential Project Interactions with Community Health and Well-being

New Project Activities and Physical Works	Community Health and Well-being Interaction
Construction Phase	
Floating worker accommodation (floatel)	Minor interaction (positive): Operation of the floatel as worker accommodation will have a minor positive interaction with employment, since employees will be required to operate the floatel. Since the majority of workers for peak construction (approximately 35 months) will be housed on the floatel, Project-related demand for housing and health services (see Section 6.12) will likely be further reduced (and negligible or no interactions, respectively, were considered likely in the Application). The use of the floatel for accommodation is not considered likely to contribute to employee smoking or drug or alcohol use, since company healthy living policies and programs listed in the Application will apply. There will also be a gym on board to support worker health and fitness. No alcohol will be permitted onsite. Use of the floatel may reduce worker fatigue and stress and the potential for accidents related to commuting, since no commuting will be needed during shifts.
Accommodation onboard marine construction vessel	Minor interaction (positive): Operation of the marine construction vessels as worker accommodation will create a positive interaction in terms of employment in the LAA.
Treatment of water for domestic purposes	Minor interaction (positive): Construction and maintenance of the water treatment facility will require labour, representing a positive interaction in terms of employment.
Shore access	Minor interaction (positive): the construction of the shore gantries, pedestrian walkway and clear span bridges to connect the floatel to the LNG facility will require labour for construction, representing a positive interaction in terms of employment.

Note:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

Review of the potential interactions identified minor interactions with determinants of health related to employment, housing, and health services due to the accommodation of most workers on the floatel rather than in the LAA. No interactions with other determinants of health were identified.

6.17.1.1 Changes in Determinants of Health Related to Employment, Housing, and Health Services

Existing conditions for employment and affordable housing since the Application was approved have changed. The population in the LAA is increasing: for example, Squamish increased by 13.7% between 2011 and 2016, and Metro Vancouver population increased by 6.5%. The unemployment rate in both Squamish and Metro Vancouver declined to 5.4% in 2016, likely indicating near full employment (Statistics Canada 2017). Housing has emerged as a critical community issue in Squamish, with median housing price increasing from \$600,000 to \$950,000 in the last three years, and with the rental vacancy rate near 1% and long wait lists for non-profit housing (District of Squamish 2019b). Existing conditions for other social determinants of health may also have changed since the Application was approved; however, with respect to the potential for interactions with the new proposed Project changes, it is assumed that conditions described in the Application are still generally applicable.

Accommodation on the floatel and the construction barge is not anticipated to adversely affect pathways to CHWB through changed employment and income, and the estimated increase in employment (although less than in the Application) may result in minor positive effects. No substantial change to the trends in Squamish for decreased unemployment is anticipated and no change to the assessment of negligible residual effects is anticipated as a result of the Amendment activities.

The proposal to provide accommodation on the floatel and the construction barge is anticipated to reduce the demand for housing in the LAA from Project employment, and therefore would not contribute to higher housing costs, which would in turn be expected to affect CHWB. No change to the assessment of negligible residual effects is anticipated as a result of the Amendment activities.

6.17.1.2 Summary

No new mitigation measures are required; implementation of mitigation measures identified in the Project's EAAs will continue to constitute practical means of preventing or reducing potential adverse effects on CHWB as a result of the proposed changes to the CPD. The proposed Project changes are not materially changed and do not change the characterization of residual effects or determination of significance (i.e., not negligible) to CHWB as described in Section 9.2.1 of the Application.

7.0 REPORT ON FEDERAL DECISION STATEMENT

Woodfibre LNG is submitting this report to IAAC to satisfy Conditions 2.10 and 2.11 of the FDS, as follows:

- Condition 2.10 The Proponent [Woodfibre LNG] shall consult with Aboriginal groups prior to initiating any material change(s) to the Designated Project that may result in adverse environmental effects and shall notify the Agency in writing no later than 60 days prior to initiating the change(s).
- Condition 2.11 In notifying the Agency pursuant to Condition 2.10, the Proponent [Woodfibre LNG] shall provide the Agency with an analysis of the adverse environmental effects of the change(s) to the designated Project, as well as the results of the consultation with Aboriginal groups.

A summary of the Amendment sections pertaining to the IAAC interests is presented below in **Table 7-1**.

Table 7-1 Sections in the Amendment outlining IAAC Interests

IAAC Interest	Section Addressing Interest in Amendment
Atmospheric sound	Section 6.2 Atmospheric Sound
Atmospheric environment	<i>Scoped out of Amendment in Table 5-1</i>
Surface water quality	<i>Scoped out of Amendment in Table 5-1</i>
GHG emission	<i>Scoped out of Amendment in Table 5-1</i>
Fish and fish habitat	Section 6.5 Freshwater fish and fish habitat Section 6.8 Forage fish and other fish
Migratory birds	Section 6.7 Marine birds
	<i>Avifauna was scoped out of Amendment in Table 5-1</i>
At-risk bats	<i>Scoped out of Amendment in Table 5-1.</i>
Visual quality	Section 6.15 Visual Quality
Physical and cultural heritage, and structure, site or thing of historical, archaeological, paleontological, or architectural significance	Section 8.0 Aboriginal interests
Human health	Section 6.17 Community health and well-being
	<i>Human health risk assessment scoped of Amendment in Table 5-1</i>
Current use of lands and resources for traditional purposes and socio-economic conditions	Section 6.16 Current use of lands and resources for traditional purposes

8.0 ABORIGINAL INTERESTS

Aboriginal Interests are defined in Part A, Section 1 of the EAO's Section 11 Order as "asserted Aboriginal rights, including title, or such determined Aboriginal or treaty rights". Section 35 of the *Constitution Act, 1982*, 30 & 31 Victoria, c. 3 (UK), provides constitutional protection to the Aboriginal Interests of Aboriginal peoples in Canada. Section 35 of the *Constitution Act* states:

RIGHTS OF THE ABORIGINAL PEOPLES OF CANADA

35. (1) The existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed.
- (2) In this Act, "aboriginal peoples of Canada" includes the Indian, Inuit and Métis peoples of Canada.
- (3) For greater certainty, in subsection (1) "treaty rights" includes rights that now exist by way of land claims agreements or may be so acquired.
- (4) Notwithstanding any other provision of this Act, the aboriginal and treaty rights referred to in subsection (1) are guaranteed equally to male and female persons.

Aboriginal rights protect the activities, practice, custom, or traditions that are integral to the distinctive culture of the Aboriginal group claiming the rights and have existed prior to European contact. Examples of Aboriginal rights include but are not limited to activities such as hunting, fishing, gathering, and trapping, and include Aboriginal title. The Canadian legal system recognizes Aboriginal title as a "unique collective right to the use of and jurisdiction over a group's ancestral territories" (Hanson 2009). Aboriginal title is a result of the occupation of and relationship with Aboriginal ancestral territories by Aboriginal groups, as well as their ongoing social structures and political and legal systems. Treaty rights protect and enforce agreements between the Crown and Aboriginal groups.

This section assesses the potential effects to Aboriginal rights and title for the Aboriginal groups identified in the FDS and the provincial EAC in accordance with the required level of engagement.

8.1 Background

As described in **Section 7.0**, the FDS defines Aboriginal groups as Squamish Nation, Tsleil-Waututh Nation, Musqueam Indian Band, Cowichan Tribes First Nation, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe, Stz'uminus First Nation, and the Métis Nation BC.

The proposed activities included in this report fall within the asserted traditional territory of Squamish Nation. The property on which the facility will be constructed (the CPA) does not fall within the asserted traditional territories of any other Aboriginal group. LNG carriers and supporting marine vessels such as escort tugs will pass through areas of Howe Sound within the Tsleil-Waututh Nation's Consultation Area, and several other Aboriginal groups' asserted traditional territories.

Squamish Nation has conducted its own process to assess the potential Project effects on their Aboriginal Interests. Woodfibre LNG has engaged with Squamish Nation with respect to the potential effects of the Project on Squamish Nation Aboriginal Interests through the Squamish Nation Assessment Process and the Squamish Nation Working Group. Discussions regarding the Squamish Nation Aboriginal Interests were conducted confidentially through the Squamish Process and were not included in the Application and are not included in this Amendment application

As indicated in **Section 3.0**, Woodfibre LNG continues to engage with Squamish Nation regarding all Project components and with Tsleil-Waututh Nation regarding marine-related Project effects. Woodfibre LNG continues to meet the requirements of Schedule D of the Section 11 Order (Refer to **Section 3.0** for consultation activities conducted for the Amendment Application) to notify the listed Aboriginal groups of any changes related to the Project.

8.2 Squamish Nation

The Squamish Nation Process for the Project was created to assert Squamish Nation's rights and title and protect its traditional lands and waters. On October 14, 2015, Squamish Nation issued an Environmental Certificate for the Project, which included conditions to be met by Woodfibre LNG. The Squamish Nation is a regulatory authority for the Project. The Squamish Nation, to Woodfibre LNG's knowledge, is the first Aboriginal group in Canada to conduct an environmental assessment resulting in an agreement with legally binding conditions in the absence of a treaty.

The Squamish Nation Environmental Working Group was established to coordinate matters arising from Squamish Nation Environmental Assessment Agreement, as well as to review and discuss technical information. Through this Working Group, Woodfibre LNG has requested feedback on the Amendment scoping document in advance of submitting the document to the EAO and IAAC; and has discussed the Amendment at Working Group meetings.

Squamish Nation interests will continue to be addressed through the process agreed with Squamish Nation following established confidentiality requirements.

8.3 Tsleil-Waututh Nation

The Application (Section 17) considered the potential effects of the Project to Tsleil-Waututh Aboriginal interests through consideration of the effects to their Aboriginal harvesting rights (marine mammal, wildlife, vegetation); their Aboriginal fishing rights (marine fish) and their rights to use heritage and cultural significant sites. The Application concluded that there were no residual effects resulting from Project activities to the Tsleil-Waututh's ability to pursue their identified Aboriginal rights.

The CPA is located outside the Tsleil-Waututh's consultation area and hence does not interact with the Tsleil-Waututh Aboriginal interest. Offsite Project effects could interact with the Tsleil-Waututh Aboriginal interests on the Howe Sound area and were considered in the Application.

8.3.1 Tsleil-Waututh Nation Interests

Per Section 7.6 and Section 17.0 of the Application, and the June 16, 2015 Tsleil-Waututh Nation Current Use Addendum, Woodfibre LNG understands that the Tsleil-Waututh Nation has identified Aboriginal Interests relevant to the Amendment as described in **Table 8-1**.

Table 8-1 Tsleil-Waututh Identified Aboriginal Interests

Aboriginal Interest	Description of Interest
Aboriginal harvesting rights (marine mammals, wildlife and vegetation)	Members of the Tsleil-Waututh Nation traditionally accessed the foreshore and marine waters of their territory for subsistence, spiritual, and cultural activities, and for a complex seasonal round cycle of harvesting seasonably available resources (Millenia Research Ltd. 1997, Tsleil-Waututh Nation 2014). Marine mammals, including seals, sea lions, and porpoises were also historically hunted by the Tsleil-Waututh Nation. Marine mammal harvests were prized and considered a delicacy, and the oil produced from each animal was used for dipping other food items such as dried berries and roe (Fediuk and Thom 2003). The Tsleil-Waututh Nation also hunted terrestrial wildlife and gathered terrestrial items for food, ceremonial, and social purposes.
Aboriginal fishing rights (marine fish)	Marine resources were and remain central to the Tsleil-Waututh Nation for subsistence and cultural life (Tsleil-Waututh Nation 2015). Salmon remains a food staple and is supplemented by the harvest of a full range of shellfish (including crabs, oysters, and prawns), and a variety of forage and other marine fish (including halibut, flounder, and smelt) (Tsleil-Waututh Nation 2015). Under a Comprehensive Fisheries Agreement with DFO, the Tsleil-Waututh Nation holds a communal licence to provide for food, social, and ceremonial (FSC) fishery for sockeye, pink, chum, chinook, and coho salmon (DFO 2012). The area in which the FSC salmon fishery may take place includes the eastern aspect of DFO subarea 29-3, which does not extend into the Howe Sound and does not overlap with the scope of the Project assessment as outlined in the Section 11 Order. The Tsleil-Waututh Nation also holds FSC allocations for crab and prawns under the Salish Seas joint venture with the Musqueam Indian Band and the Sliammon First Nation. Harvest of prawns occurs around the entrance to Howe Sound in the vicinity of Bowen Island, although much of southern Howe Sound has been identified as a priority harvest area for prawns (Tsleil-Waututh Nation 2015). Tsleil-Waututh Nation members are also permitted to fish for FSC purposes under communal licences issued by DFO in fisheries subareas 28-11, 28-12, 28-13, 28-14, 29-3, 29-4, 29-6, 29-7, 29-9, 29-10, 29-11, 29-12, 29-13, 29-14, and 29-17 (DFO 2012). These subareas are not located in Howe Sound and are not within the scope of assessment for the Project; however, the absence of an established DFO agreement for areas within Howe Sound does not preclude the Tsleil-Waututh Nation from harvesting or obtaining new licences for fisheries resources from the waters of Howe Sound.
Aboriginal right to exercise Tsleil-Waututh Nation cultural practices and beliefs	According to other Coast Salish literature, all areas used for traditional purposes, such as fishing, hunting, or gathering, are considered sacred (Thom 2005). Features associated with culturally significant landscapes include named places, transformer sites, village sites, travel routes, and wild spirit places. The Tsleil-Waututh Traditional Land Use Report indicates that there are several smaller areas of low to moderate use to settlement and destination sites, numerous registered archaeological and cultural sites, and specific areas used as traditional travel routes. Woodfibre LNG acknowledges that these sites and locations have been identified through the Tsleil-Waututh Nation traditional land use data gathering process, and that this is an ongoing process. Woodfibre LNG respects the sensitivity and confidentiality of traditional use information and the context and particular use for which it was provided. Accordingly, Woodfibre LNG has agreed to disclose such information only to the extent agreed by the Tsleil-Waututh Nation.

8.3.2 Potential Interactions Between Project Changes and Aboriginal Interests

The CPA is located outside the Tsleil-Waututh’s consultation area; hence, proposed activities in the CPA do not directly interact with the Tsleil-Waututh Aboriginal interest. However, effects to harvested marine resources that extend into the Consultative Area may affect the Tsleil-Waututh Aboriginal interests. Ferry routes for worker transit to the floatel and the construction vessel are within the Tsleil-Waututh Consultative Area, and proposed changes to the CPD included in this Amendment resulting in decreased vessel traffic may interact positively with marine resources and marine traffic related to Tsleil-Waututh traditional use. The proposed changes will not interact with known harvesting sites, registered heritage sites, and place names identified by Tsleil-Waututh Nation in the offsite Project area.

The potential interactions between Tsleil-Waututh Aboriginal Interests and the Amendment are outlined in **Table 8-2**.

Table 8-2 Potential Project Interactions with Tsleil-Waututh Aboriginal Interests

New Project Activities and Physical Works	Tsleil-Waututh Aboriginal Interest Interaction
Construction Phase	
Floating worker accommodation (floatel)	<p>Minor interaction: The floatel has the potential to affect marine resources and thus affect harvest quantities of those resources available to the Tsleil-Waututh Nation.</p> <p>Minor interaction (positive): Accommodation on the floatel will reduce the daily employee transport vessel traffic and is likely to reduce potential interactions with the exercise of Tsleil-Waututh Nation cultural practices and beliefs (such as use of canoe routes, use of cultural sites, and harvesting and fishing rights).</p>
Accommodation onboard marine construction vessel	<p>No new interaction: A marine construction vessel was included in the Application. The addition of worker accommodation on the vessel does not result in any additional interactions to marine harvesting not already assessed in the Application.</p> <p>Minor interaction (positive): Accommodation on the vessel will reduce daily ferry trips, which may in turn reduce interaction with exercise of Tsleil-Waututh Nation cultural practices and beliefs (such as use of canoe routes, use of cultural sites, and harvesting and fishing rights).</p>
Treatment of water for domestic purposes	<p>No interaction: Treatment of water will not interact with marine resources. There will be no additional water withdrawal above that already assessed and approved in Amendment #1; therefore, no additional interaction is anticipated within Tsleil-Waututh Aboriginal interests.</p>
Shore access	<p>No interaction: Shore access for the floatel is not likely to change environmental conditions or affect marine and freshwater resources; thus, no interaction is anticipated with Tsleil-Waututh Aboriginal interest.</p>

Notes:

No interaction: No interaction is likely between a Project component and a VC or IC.

No new interaction: No new interaction is identified beyond those already included in the Application.

Minor interaction: An adverse effect may result from an interaction, but standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be reduced to negligible. Interaction may be discussed further to provide rationale for the clarification; however, it is not carried forward to a consideration of potential effects.

Carried forward: Interactions have the potential to result in an adverse effect.

Assessments of the potential for the Amendment activities to affect freshwater and marine resources did not identify changes to residual effects that would in turn affect harvest quantities in the marine environment (see Sections 6.5 Freshwater Fish and Fish Habitat, 6.6 Marine Benthic Habitat, 6.8 Forage Fish and Other Fish, and 6.9 Marine Mammals of this Amendment); thus, there are no anticipated adverse changes to the effects on Tsleil-Waututh hunting and fishing rights. Moreover, reduction in daily employee transport vessel traffic from Darrell Bay will reduce interactions with Tsleil-Waututh Aboriginal interests.

Based on available information, as well as the VC effects summary provided in **Table 6-1** for the Amendment, the Amendment report concludes that the proposed Project-related changes will result in no material change on marine mammals or freshwater fish and fish habitat. The Amendment related changes to the Project are not anticipated to materially change the pathways for effects to Tsleil-Waututh Aboriginal interests from those identified and assessed in the Application. Implementation of mitigation measures for the ICs and VCs, the EAC conditions, and the Conditions in the FDS will constitute practical means of preventing or reducing potential adverse effects from the proposed Amendment activities, and no changes are proposed. The Amendment is therefore unlikely to result in a change to the residual effects on Tsleil-Waututh Aboriginal interests, as described in Section 17 of the Application.

8.3.3 Other Aboriginal Groups listed in the Federal Decision Statement

Given that potential effects to the marine environment are not substantial, with the implementation of mitigation measures already included in the Application, the EAC conditions and the conditions in the FDS, the interests of other Aboriginal groups are not expected to be adversely affected by the Project changes. Furthermore, the proposed reduction in employee transport vessel traffic will reduce interactions with Aboriginal Interests.

9.0 CONCLUSION

Woodfibre LNG is proposing this Amendment for construction workforce accommodation in response to changing accommodation availability and local community feedback on land-based work camps. The Amendment proposes the addition of temporary self-contained floating worker accommodation (floatel) with approximately 400 - 600 beds and associated mooring infrastructure, workforce accommodation onboard a marine construction vessel, onshore drinking water treatment, and a pedestrian access path to the floatel.

The Amendment considered the valued and intermediate components with the potential to interact with the proposed amendments (**Table 5-1**). The assessment of the potential interactions determined that the proposed amendment activities do not change the characterization and determination of significance of the residual adverse effects from those assessed and presented in the EAC Application (**Table 6-1**), that no new mitigation is required, and a reassessment of the cumulative effects is not required.

Woodfibre LNG concludes that after taking into account Project design, implementation of management plans, and mitigation described in the Application, the residual Project-related effects for ICs and VCs assessed in this document are unchanged. Woodfibre LNG requests an amendment to the EAA's.

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APPENDIX A
Mitigation Measures Referenced in Amendment

Appendix A Mitigation Measures Referenced in Amendment

Mitigation Number	Mitigation Name	Proposed Mitigation	Project Phase	Timing of Implementation
5.9 Surface Water Quantity				
M5.9-2	Minimize Vegetation Clearing	Woodfibre LNG Limited will limit clearing of native vegetation communities to the extent required for construction of Project facilities. Where feasible, temporary construction features, such as laydown areas, will be located on paved or previously disturbed areas to reduce clearing. In addition, areas to be cleared will be delineated to help limit clearing to what is planned. Reducing the clearing area to the minimal amount required to accommodate the Project footprint will reduce the direct loss of vegetation communities and wildlife habitat. Monitoring will be conducted to ensure that mitigation measures are properly implemented and effective.	Construction	Construction
5.10 Marine Water Quality				
M5.10-1	Marine Works Management Plan	<p>Woodfibre LNG Limited will prepare and implement a Marine Works Management Plan to minimize sediment disturbance during construction and prevent discharge or runoff containing high TSS, concrete wash water and fuel from entering the marine environment. The plan will contain (but not be limited to) the following measures:</p> <ul style="list-style-type: none"> • All construction operations will be monitored by a qualified Environmental Monitor who will be onsite during the high risk construction and demolition activities to determine whether the works are resulting in any adverse effects on marine environment. Frequency of monitoring will be detailed in a monitoring plan. Any adverse effects will be reported to DFO. • Marine works will be conducted during the least risk fisheries work window specific by DFO for the region if practical. If the work window cannot be followed, additional mitigation measures including the advice provided by DFO (Measures to Avoid Causing Harm to Fish and Fish Habitat (2013b)) will be implemented. The work window for Howe Sound is currently August 16 - January 31 (DFO 2014). • Work activities will cease and DFO will be contacted, if aggregations of herring (e.g., herring spawn) and salmonids (e.g., smolts) are observed within the work area. • Marine works will be avoided during weather that may increase sediment suspension. • All works will be conducted in a manner to prevent the discharge or introduction, either direct or indirect, of soil, sediment or sediment laden water, turbid water or any other deleterious substance into the marine environment. All discharges from construction activities shall meet BCWQGs. • Construction materials, excavation wastes, overburden, sediment, or other substances potentially deleterious to marine life shall be disposed of off-site in accordance with regulatory requirements, or placed in such a manner by the contractor, to prevent their entry into the marine environment. • The contractor shall follow <i>Best Management Practices for Pile Driving and Related Operations</i> (DFO 2012). • Vessels and other equipment involved in pile driving and construction activities will be positioned in a manner that will prevent damage to the seafloor and shoreline. • Where required, turbidity monitoring will be implemented during all pile drilling/driving activities, to determine that turbidity levels in the marine environment do not exceed established water quality regulatory criteria during Project works. • The following water quality criteria will be applied based on BCWQGs (MOE 2009) with regards to discharge or introduction of sediment or sediment- laden water in the marine environment: <ul style="list-style-type: none"> ▫ Turbidity: <ul style="list-style-type: none"> § Change from background of 2 NTU when the background level is less than 8 NTU. § Change from background of 5 NTU when background is 8-50 NTU. § Change from background of 10% when background is more than 50 NTU. ▫ TSS: <ul style="list-style-type: none"> § Change from background of 5 mg/L when background is less than 25 mg/L. § Change from background of 10 mg/L when background is 25-100 mg/L. § Change from background of 10% when background is more than 100 mg/L. • If the criteria outlined above is exceeded as a result of Project-related activities, these works or activities will be halted until measures that will result in compliance with the criteria outlined above are put in place. • Where the sediment control criteria cannot be practically met, the work areas and activities contributing to these conditions will be isolated from tidal and flowing waters. This may include use of silt curtains and other silt control measures. • For dredging activities the following mitigation measures will be followed: <ul style="list-style-type: none"> ▫ Prior to dredging, the perimeter of the dredge area will be identified, so that work occurs within the confines of the project area. Tools such as real-time kinematic positioning controls (e.g., differential GPS) may be used to assist in positioning. ▫ Employ sediment containment and water filtering devices on the barge to meet the TSS and turbidity criteria outlined above. This may require containment and treatment of barge dewatering effluent that exceeds the criteria. ▫ Water quality monitoring will be implemented during dredging works to verify that the turbidity and TSS criteria are being met and enable management decisions to be made in the event that the performance criteria are not met. ▫ The contract specifications will include operational controls to minimize disturbance of substrates (e.g., making additional dredge passes rather than dragging a bucket or beam to level the dredge surface, not stockpiling material underwater, controlling the rate of ascent and descent of the bucket). ▫ The dredged material barge will not be overloaded beyond the top of the side rails to minimize loss of dredged material from the barge and to prevent barge listing or instability. ▫ The barge will not come to rest on the seafloor (no grounding) (spuds may be used to anchor the barge). 	Construction Decommissioning	Pre-construction

Mitigation Number	Mitigation Name	Proposed Mitigation	Project Phase	Timing of Implementation
5.11 Vegetation Communities				
M5.11-1	Invasive Plant Management Plan	Woodfibre LNG Limited will develop an Invasive Plant Management Plan to mitigate the introduction, transport, and extent expansion of invasive plant species (including noxious weeds) to and from the project area during construction and operation. The objectives of this plan will be to detect, control (i.e., remove), and monitor invasive plant species in the Project footprint area. Part of this plan will include mapping invasive plant extent and tracking this extent over the life of the Project to record invasive species proliferation. Monitoring will be conducted to make sure that mitigation measures are properly implemented and effective.	Construction Operation	Pre-construction
M5.11-2	Minimize Clearing of Sensitive and Important Ecosystems	Woodfibre LNG Limited will, where possible, design the Project to avoid the riparian area along Mill Creek (outside of the Green Zone) and the mature forest adjacent to the Creek.	Construction	Construction
5.12 Avifauna				
M5.12-1	Wildlife Management Plan	Woodfibre LNG Limited will develop and implement a Wildlife Management Plan prior to initiation of the construction phase of the project. The Wildlife Management Plan will provide the following information: <ul style="list-style-type: none"> Details regarding any required pre-construction surveys and wildlife monitoring. <ul style="list-style-type: none"> Call-playback surveys prior to clearing that specifically focus on western screech-owl at night to ensure the cleared areas are not being used as post-fledgling areas. Pre-construction surveys to assess potential western screech-owl nesting habitat in the potential corridors for the gas and water pipeline ROWs, and avoidance of such habitat in the final design for the Project Surveys will also be conducted in areas to be cleared to confirm that natural mineral sites (i.e., mineral water springs) that may be used by band-tailed pigeon are not impacted by the Project. Information on how to report and record wildlife conflicts, including wildlife mortality due to vehicles and equipment. A database of wildlife mortality associated with construction and operation of the project should be maintained through the construction and operation phases. Observations of Red and Blue-listed species will be conveyed to the CDC. Limit speed on roadways within the Project area to 30 km/h. Measures to identify amphibian crossings (if any). Details regarding posting signage and educating workers to ensure vigilance for amphibians during peak movement periods (i.e., rainy nights in April and September). 	Construction Operation	Pre-construction
M5.12-2	Retain Snags and Wildlife Trees	Woodfibre LNG Limited will retain wildlife habitat features, including those for avifauna and bats, such as snags and wildlife trees (mature trees are included in M5.9-2) wherever possible and safe to do so. Prior to site clearing, wildlife habitat features to be retained will be demarcated with no-go fencing and signage. Habitat features to be field identified and retained will be included on Project Environmental Management Plan mapping.	Construction	Pre-construction Construction
M5.12-3	Establish and Retain Vegetative Buffers around Raptor Nests	Woodfibre LNG Limited will establish and retain vegetative buffers around raptor nests to mitigate sensory disturbance in accordance with <i>Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia</i> (MOE 2013). These guidelines suggest that a 100-m vegetated buffer be retained around osprey and bald eagle nests and a 200-m vegetated buffer be retained around western screech-owl nests. An additional 100-m no-disturbance buffer for each species nests is recommended during the nesting season.	Construction Operation	Pre-construction
M5.12-4	Avoid Clearing during Nesting Season	Where possible, Woodfibre LNG Limited will avoid vegetation clearing during the nesting season for bald eagles, osprey and western screech-owl in accordance with MOE (2013). The least risk periods for development outlined in MOE's Develop with Care 2014 guidelines (MOE 2014) are identified as follows: <ul style="list-style-type: none"> bald eagle - September 1 to December 31. osprey - September 15 to March 31. other raptors - October 1 to February 28. Woodfibre LNG Limited will avoid clearing during nesting season for passerines in accordance with least risk development windows to passerines (September 1 to February 28) provided in MOE (2014). Pre-clearing bird nest surveys will be undertaken if the aforementioned least risk windows cannot be maintained. Appropriate, species-specific setback buffers will be established and maintained around any confirmed or suspected active nests that are detected.	Construction	Construction
M5.12-5	Light Management	Subject to safety and operational requirements, Woodfibre LNG Limited will use blue or green lighting rather than red or white lighting in order to reduce attractiveness to birds.	Construction Operation	Final Design
M5.12-6	Blasting Management Plan	Woodfibre LNG Limited will develop and implement a blasting management plan as part of the CEMP to mitigate effects of blasting to freshwater and marine aquatic life and marine birds. Monitoring of effects should be incorporated into the plan so that corrective mitigation measures can be undertaken if necessary. Blasting activities will conform to the <i>Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters</i> (Wright and Hopky 1998). Where feasible, underwater blasting will be scheduled to occur during periods when the number of birds in the area is lowest (likely the summer), with a maximum of one underwater blast per day, or at intervals of several hours (Cooper 1982). In addition, noises or blasts (e.g., "thunderflashes") to scare birds away from the immediate vicinity of the blast site will be emitted immediately prior to detonation (Cooper 1982; Demarchi and Bentley 2004).	Construction	Pre-construction
M5.12-7	Reduce Electrocution Potential	Woodfibre LNG Limited will design powerlines and conductor layout to reduce potential bird strikes. The new powerlines will be small extension to the Project area with short spans of lines between poles and are expected to be visible to birds. If larger spans of line are installed, conductors will be placed far apart to avoid electrocution, and powerlines will be marked to enhance visibility for avian VCs.	Construction Operation	Final Design Construction
M5.12-8	Install Nesting Structures	Woodfibre LNG Limited will install western screech-owl and barn swallow nesting structures at suitable locations in the LAA once construction is complete to compensate for the removal of (possible) nesting habitat during construction. Artificial nest structures for barn swallows include nesting shelves or nesting cups attached to an appropriate surface.	Operation	Post-construction

Mitigation Number	Mitigation Name	Proposed Mitigation	Project Phase	Timing of Implementation
M5.12-9	Design Buildings to Reduce Bird Strikes	Woodfibre LNG Limited will design building facilities to reduce the potential for bird strikes and bird mortality. Design features will include minimizing the amount of glass and applying tints or facades where glass is required to provide visual cues.	Construction	Final Design Pre-construction
M5.12-10	Work with BC Hydro and FortisBC to minimize effects to wildlife	Woodfibre LNG Limited will meet with BC Hydro (i.e., Woodfibre Substation project) and FortisBC (i.e., Eagle Mountain – Woodfibre Gas Pipeline Project) to identify further measures to minimize potential adverse cumulative effects on wildlife.	Construction Operation	Final Design
5.16 Marine Benthic Habitat				
M5.16-1	Minimize Marine Shading	Woodfibre LNG Limited will employ the following measures to minimize shading associated with the installation of marine structures: <ul style="list-style-type: none"> Where possible, ramps and gangways used to access floating facilities will be installed at an elevation of at least 2 m above the highest high water mark to allow ambient light to reach the seafloor. Where possible, docks, ramps and gangways will be surfaced with aluminum grating (or other light permeable material), allowing ambient light to reach the benthic communities below. 	Operation	Construction
5.17 Marine Birds				
M5.17-1	Avoid Clearing During Marine Bird Breeding Season	Woodfibre LNG Limited will follow guidelines for restricted activity periods to protect nesting marine birds to comply with the federal <i>Migratory Birds Convention Act</i> and the provincial <i>Wildlife Act</i> . The site is located within the A1 bird nesting zone in Canada, which has a regional nesting period of March 19 to August 17 (EC 2014b); however, the breeding season for colonial waterbirds extends from March into September (EC 2013a). Based on the locations of recorded colonial waterbird nesting habitat, colonial waterbirds are unlikely to be affected by clearing activities associated with the Project; therefore, the A1 bird nesting zone period (March 19 to August 17) will be followed and the clearing activities will be avoided during the nesting season where feasible. When clearing is required during the nesting season, pre-clearing surveys for nesting birds will be conducted and appropriate, species-specific setback buffers will be established and maintained around any confirmed or suspected active nests to reduce potential mortality. This mitigation measure is predicted to be effective in reducing potential marine bird mortality.	Construction	Pre-construction
M5.17-2	Establish and Maintain Bird Nest Setbacks	Project activities will maintain a minimum 30 m setback distance from active marine bird nests identified in the Project area. Larger setbacks may be established for listed species and will be considered on a species-by-species case.	Construction Operation	Pre-construction
M5.17-3	Establish and Maintain Marine Bird Breeding Colony Setbacks	Woodfibre LNG Limited will comply or require its contractors to comply with the recommended 300 m minimum setback from waterbird colonies (see Figure 5.17-2) for Project – related marine vessel traffic, and subject to safety concerns, refrain from blowing horns or whistles and maintain constant engine noise while passing near the colonies (EC 2013a).	Construction Operation	Construction
M5.17-5	Minimize the Duration of Activities in Intertidal Zone	Woodfibre LNG Limited will minimize the duration of necessary activities, including both dismantling and construction of structures, that must occur within the intertidal zone to the extent possible to reduce the disturbance of marine birds and marine bird habitat. Where practicable, activities will be scheduled during low tide.	Construction	Construction
M5.17-6	Underwater Noise Management Plan	Woodfibre LNG Limited will prepare and implement an Underwater Noise Management Plan as a component of the Marine Works Management Plan (M5.10-1) to mitigate potential mortality and behavioural changes to birds, fish and marine mammals. The plan will reference DFO's BMP for Pile Driving and Related Operations (DFO 2003), and will contain the following measures:	Construction	Pre-construction
		<u>Pile Driving and Related Activities:</u> <ul style="list-style-type: none"> Multiple underwater noise generating activities will be minimized when practicable (e.g., avoid multiple pile driving activities at the same time). Where multiple underwater noise generating activities are planned, they will be sequenced to minimize construction duration. Works in the marine environment will be conducted during the least risk fisheries work window specified by DFO for the region unless otherwise agreed upon by DFO. The prescribed work window for Howe Sound is August 16 - January 31 (DFO 2014b). Where possible, pile driving activities will avoid impacting hard substrates to prevent disturbance to fish habitat. The use of vibrational pile driving will be used where practical and feasible as impact pile driving is associated with louder sound pressure levels underwater. The use of vibro-hammers for pile installation minimizes the effects on fish by decreasing the anticipated noise levels. A ramp up or soft start technique will be used. Where equipment allows, power will be built up slowly from a low energy start-up to give adequate time for marine wildlife to leave the vicinity before exposure to the maximum sound pressure level. There will be a soft start every time pile driving is resumed following an interval of no pile driving. Underwater noise from pile driving activities will be monitored in accordance with the following: <ul style="list-style-type: none"> Sound will not exceed 30 kPa at a distance of 1 m to 2 m from pilings; or If the sound exceeds 30 kPa at a distance of 1 m to 2 m from pilings, measures will be taken to reduce either the intensity of the sound generated or the level of sound propagation through the water column. The appropriate measures will be chosen based on practicality to the Project and effectiveness and may include: <ul style="list-style-type: none"> § silt curtains around pile driving activities. § bubble curtains around pile driving activities. § a vibratory hammer in place of an impact hammer for pile driving. Prior to pile driving, the perimeter of the pile driving area will be identified, so that work occurs within the confines of the pile driving area. 		

Mitigation Number	Mitigation Name	Proposed Mitigation	Project Phase	Timing of Implementation
		<p><u>Monitoring:</u></p> <ul style="list-style-type: none"> The Environmental Monitor will be responsible for monitoring underwater noise and potential effects to wildlife, and implementing corrective mitigation measures if necessary (e.g., establishing safety zones in the event underwater noise levels exceed injury thresholds (180 and 190dB re 1 µPa)). 		
M5.17-7	Reduce Moored Vessel Underwater Noise	To the extent possible, vessel engines and propellers will be shut down while moored at the FSO to reduce unnecessary underwater noise during LNG transfer operations during construction and operation.	Operation	Operation
M5.17-8	Development of a Marine Bird Management Plan	<p>Woodfibre LNG Limited will develop and implement a Marine Bird Management Plan (MBMP) prior to the initiation of the construction phase of the Project. This MBMP will be part of an overall Wildlife Management Plan document. This plan will include:</p> <ul style="list-style-type: none"> Pre-construction surveys within mapped (but not field-verified) marbled murrelet critical nesting habitat to be cleared as part of the Project will be undertaken following appropriate standards developed by the Resource Information Standards Committee for marbled murrelet inventory (MELP 2001). These surveys will determine if marbled murrelets are currently nesting in these areas (if timing of Project construction allows for these surveys to be conducted during nesting season), or if these areas provide suitable nesting habitat (if timing of Project construction prevents surveys of during active nesting activity). Provision of information and training to all workers (contractors, staff, and employees) on how to report and record marine bird conflicts in the Project area, specifically vessel strikes (bird species, location of carcass on vessel, weather conditions) in a database during construction, operation and decommissioning. Should regular review of the database identify areas of persistent conflict or mortality rates that would affect populations, the Project operations will be reviewed to identify potential mitigation measures. Pre- and post-construction (operation-phase) monitoring of marine birds in the Project area. If the monitoring identifies high levels of marine bird attraction and collision-related mortality associated with the project on-shore infrastructure, lighting, weather or migration periods, additional mitigation measures will be explored, including: turning off unnecessary lights (exterior and interior), especially during periods of high marine bird migratory flight activity in the area, wider light shut-down periods during migratory periods and inclement weather events (overcast, cloudy and/or hazy and foggy conditions), avoidance of continuous red or flashing red incandescent lights, use of blue jelly-jar LED lights on suspension cables and rectangular blue LED lights on bridge decks (Golder et al. 2010). Survey methods may include stand watches during migratory periods (spring and fall) in an adaptive management approach. 	Construction Operation	Pre-construction
M5.17-9	Coordinate with BURNCO to share information from marine bird monitoring studies	Woodfibre LNG Limited will coordinate with BURNCO to mutually share results of marine bird monitoring studies to contribute to the knowledge base for marine bird interactions.	Construction Operation	Construction
6.3 Sustainable Economy				
M6.3-1	Squamish Harbour Vessel Traffic Plan	Woodfibre LNG Limited will develop and implement strategies, best management practices, and guidelines to avoid and minimize Project-related disruption of marine-based recreational activities in the Squamish Harbour area during construction and operation. In developing this plan, WLNG will consult with key marine user groups (e.g., Squamish Terminals, yacht clubs, kiteboard clubs, and kayaking operators) to identify the routes of all Project-associated marine traffic (e.g., ferries and water taxis) and discuss strategies to manage the interaction of Project vessel traffic with recreational and tourism areas during the high season months. Woodfibre LNG Limited's use of the Darrell Bay terminal for the worker ferry is part of this plan as it minimizes interaction with recreationists and tourists who are using the marine waters of Squamish Harbour and the head of Howe Sound. This traffic plan will include a procedure for marine stakeholders to consult with WLNG regarding special events such as yacht races, regattas, and marine-based festivals to ensure that additional passage planning and scheduling can be reviewed.	Construction Operation	Pre-construction
7.2 Infrastructure and Community Services				
M7.2-2	Housing and Accommodation Advisor	For the construction period and the initial stage of operations, WLNG require its EPCM contractor(s) to contract with a person or a firm that will canvass and identify housing and temporary accommodation units and make incoming workers aware of this potential accommodation, and generally act as a one-window housing resource for the Project's non-local workers and as a liaison with housing and accommodation providers in the LAA. During construction, when feasible, this person will also pre-book hotel and motel spaces within reasonable commuting distance of the Project during periods when a higher number of short-term temporary accommodation units are required.	Construction Operation	Pre-construction
7.5 Visual Quality				
M7.5-1	External Surface Finishing	Woodfibre LNG Limited will reduce the level of contrast by finishing new buildings' external surfaces or re-finishing existing buildings' external surfaces and structures as appropriate for required functional utility. Finish with low glare and natural colours to reduce contrast with the qualities of the surrounding landscape features.	Construction	Construction
M7.5-2	Screening of land-based infrastructure	Woodfibre LNG Limited will provide, where possible, additional screening of land-based infrastructure not currently screened by existing vegetation through temporary or permanent planting.	Construction	Construction
M7.5-3	Initiation of planting programs	Woodfibre LNG Limited will initiate decommissioning and maintenance planting programs during the construction phase, recognizing that results will not be realised until the operation or decommissioning phases of the Project.	Construction Decommissioning	Construction
M7.5-4	Monitor and maintain natural screening	Woodfibre LNG Limited will monitor and maintain natural screening to ensure minimal visibility of infrastructure and activity in operational areas by establishing vegetation and avoiding surface and root disturbance.	Operation	Construction

Mitigation Number	Mitigation Name	Proposed Mitigation	Project Phase	Timing of Implementation
M7.5-5	Re-finish and maintain external surfaces	Woodfibre LNG Limited will preserve the level of contrast for Project infrastructure by re-finishing and maintaining external surfaces as required. As part of the integrity management program, or other maintenance program, WLNG will establish re-finishing and maintenance schedules for site buildings and infrastructure external surfaces.	Operation	Operation
M7.5-6	Re-vegetate and treat disturbed areas	Woodfibre LNG Limited will re-vegetate or treat exposed slopes throughout the operation phase (where possible) to reduce contrast and ensure blending with the existing landform. This mitigation can include planting ground covers and colour treatment. WLNG will promote successful establishment of vegetation screening and minimize visibility of infrastructure and activity in operational areas.	Operation Decommissioning	Operation
M7.5-7	Re-contour disturbed areas	Woodfibre LNG Limited will re-contour disturbed areas not required for the future operation or maintenance of the Project area to approximate natural slopes and reduce form contrast between disturbed and natural environments. As part of the Decommissioning Environmental Management Plan, WLNG will prepare and implement an Earth Works and Grading Plan, with drainage and planting plans, to guide re-shaping and re-vegetation of disturbed slopes.	Decommissioning	Pre-decommissioning
M7.5-8	Coordination with FortisBC and BC Hydro	Woodfibre LNG Limited will consult with BC Hydro and FortisBC to determine construction areas and operation design options so that additional mitigation measures can be identified to avoid and minimize potential cumulative effects on visual quality from both development projects.	Construction Operation	Final Design

APPENDIX B

Floatel Terrestrial Site Assessment Report



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September 24, 2019
File No. 989232-05

Woodfibre LNG
900-1185 West Georgia Street
Vancouver, BC V6E 4E6

Attention: James Wilkinson, Manager of Environment

Dear James,

Re: Floatel Terrestrial Site Assessment Report

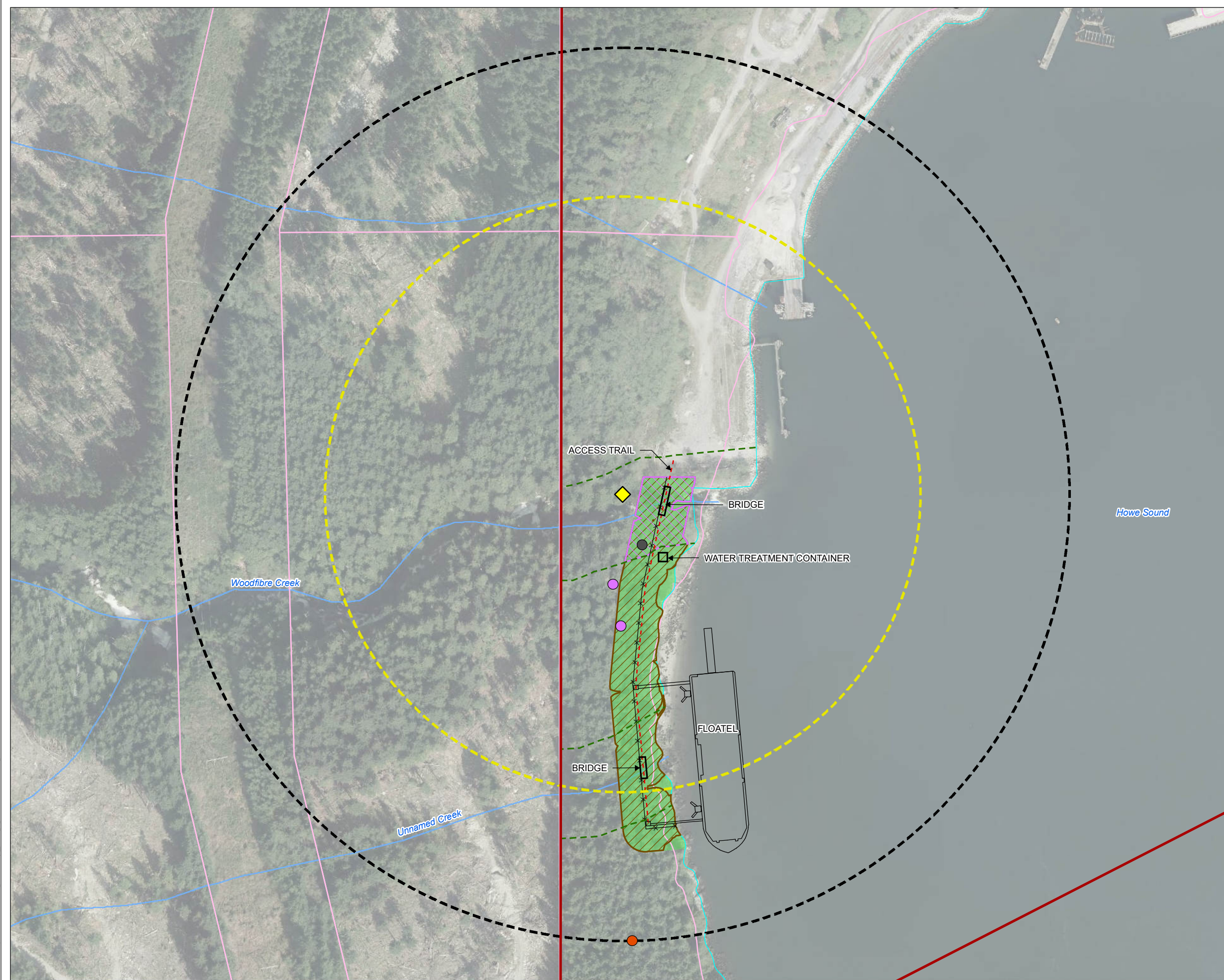
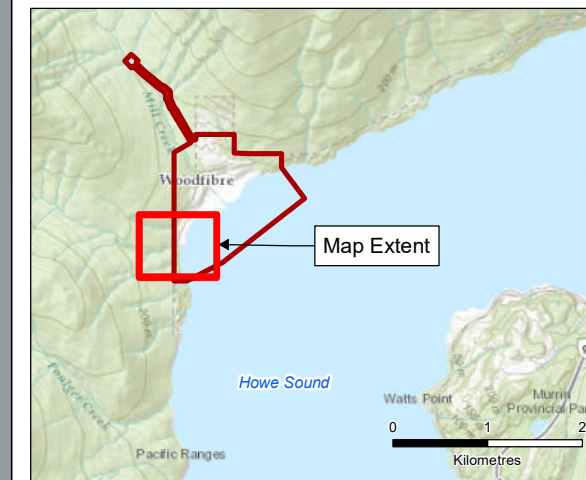
1.0 INTRODUCTION

Woodfibre LNG Limited (Woodfibre LNG) is proposing a liquefied natural gas (LNG) production facility with marine storage and off-loading at the former Woodfibre Pulp and Paper Mill site. This site is located on the northwestern shore of Howe Sound approximately seven kilometres west-southwest of the District of Squamish (**Figure 1**). The Woodfibre LNG Project (Project) comprises construction and operation of a gas processing and liquefaction facility to produce approximately 2.1 million metric tonnes of LNG per annum, associated LNG storage capacity of 250,000 m³, and export infrastructure.

Construction of the Project is anticipated to begin in 2020. Due to the remote and inaccessible nature of the Project location and large number of laborers required for construction, Woodfibre LNG is proposing to moor a floating worker accommodation vessel (floatel) within the Project footprint to alleviate site access and transportation challenges. The construction of the floatel will include a land-access trail to provide a safe method of transportation for workers between the Woodfibre LNG site and the floatel.

The construction of the land-access trail for the floatel required a terrestrial site assessment of the proposed location. The purpose of this assessment was to account for vegetation and wildlife features, such as forest age/structure, the presence of stick nests, and other potential wildlife habitat features (e.g., dens, tree cavities). Non-native vegetation and signs of human inhabitation were also assessed as these activities have historically had varying degrees of impact on the area. Additionally, during the desktop review, an unnamed creek in the proposed Project area was identified; this creek was investigated to determine its current activity status.

Floatel Amendment - Field Results



Legend

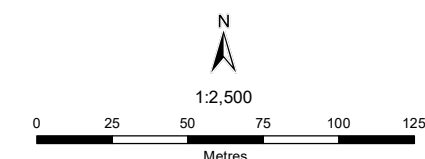
Surveyed Shoreline	200 m Radius No development without additional mitigation from Jan 5 to August 31
Watercourse	300 m Radius Avoid construction or any sudden or unusual noise or land activities from Jan 5 to June 25
Certified Project Area	300 m Radius Avoid construction or any sudden or unusual noise or land activities from Jan 5 to June 25
Dominant Invasive Plant Cover	300 m Radius Avoid construction or any sudden or unusual noise or land activities from Jan 5 to June 25
Parcel Boundary	300 m Radius Avoid construction or any sudden or unusual noise or land activities from Jan 5 to June 25
Survey Waypoint	Floatel Project Features
Cavity Tree	30 m Riparian Buffer
Oil Tank	Access Trail
Potential Den	Project Feature
Bald Eagle Nest Windows	Terrestrial Construction Footprint
Bald Eagle Nest Nest afforded year-round protection	Searched Area within Terrestrial Construction Footprint

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licences - British Columbia & District of Squamish
- Aerial Image: ESRI World Imagery
- Inset Basemap: ESRI World Topographic Map



NAD 1983 UTM Zone 10N
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2.0 METHODS

A Hemmera biologist (Kyle Routledge, BSc, RP Bio) and field technician (Alexander Hook) visited the Project area on June 3, 2019 to conduct a terrestrial site assessment survey. The two workers surveyed the proposed Project construction area on foot to identify characteristics of interest to the construction of a land-access trail. The survey involved documenting all observations of wildlife and potential wildlife habitat features, and recording the extent of all non-native vegetation observed.

Native vegetation and physical attributes of the site (e.g., slope, aspect) were also identified in order to properly assess the habitat in the proposed access trail route. Wildlife was assessed similarly, observing the active wildlife at the time and potential denning habitat such as large snags or rocks and tree cavities. The unnamed creek that was potentially in the proposed Project construction area was investigated, with current condition described, using photographs and video to indicate flow and volume.

Anthropogenic characteristics were handled similarly as they were observed during the survey. Each characteristic was photographed and documented to ensure proper follow-up could be implemented, if necessary.

3.0 RESULTS

Vegetation observed during the terrestrial site assessment was predominantly composed of medium to large sized trees and native shrub/herb understory. Tree species observed were western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*). The understory shrub and herb layer included bracken fern (*Pteridium aquilinum*), spiny wood fern (*Dryopteris expansa*) (**Photo 1**), deer fern (*Blechnum spicant*) (**Photo 1**), sword fern (*Polystichum munitum*), red huckleberry (*Vaccinium parvifolium*), salmonberry (*Rubus spectabilis*) (**Photo 1**), and thimbleberry (*Rubus parviflorus*). Moss covered much of the ground layer.

In the forested area adjacent to Woodfibre Creek, the vegetation composition was largely non-native species, such as English ivy (*Hedera helix*), English holly (*Ilex aquifolium*) (**Photo 2**), Himalayan blackberry (*Rubus armeniacus*), mullein (*Verbascum Thapsus*), and common periwinkle (*Vinca minor*) (**Photo 2**). English ivy and common periwinkle covered the entire ground layer and were starting to climb trees along Woodfibre Creek. Tree species composition also started to change towards more western redcedar and red alder (*Alnus rubra*). This vegetation change was abrupt towards Woodfibre Creek and the Woodfibre site (**Photo 3**). The overall structural stage¹ of the forest was a 5, possibly maturing towards a 6 in some areas. The vegetation distinctly thinned out towards the west making the understory closer to the water very dense in comparison (**Photo 4**).

¹ Structural stage 5 defined as **Young Forest** (i.e., self-thinning is evident, forest canopy has begun differentiation into distinct layers, vigorous growth and a more open stand than in the pole/sapling stage, time since disturbance is generally 30–80 years but may begin as early as age 30, depending on tree species and ecological conditions). Structural stage 6 defined as **Mature Forest** (i.e., trees established after the last disturbance have matured, understories develop as the canopy opens up, time since disturbance is generally 80–250 years).
Source: <http://www.env.gov.bc.ca/wld/documents/identified/App05-Interim.pdf>

Wildlife observed were two blacked-capped chickadees (*Poecile atricapillus*) and a single observation of a least chipmunk (*Neotamias minimus*). There was evidence of American black bear (*Ursus americanus*) in the area from several piles of scat around the proposed Project construction area. Potential denning habitat was observed throughout the proposed Project construction area, from either fallen trees, rocks (**Photo 5**), or large snags with cavities (**Photo 6**). None of these potential dens observed had any evidence of wildlife occupying them. No stick nests were observed in the forested areas although there was an observation of a large raptor, suspected to be an osprey (*Pandion haliaetus*), flying just outside the forest above the water.

The unnamed creek was observed as active and flowing, and was documented with photographs (**Photo 7**) and video. The creek was full of larger boulders and masses of woody debris, with a low, slow flow. The width of the creek was approximately one metre (1 m) and the headwaters extend past the proposed Project construction area. The actual location of the creek was offset by a few metres from where it was identified during desktop review.

Closer to Woodfibre Creek, evidence of anthropogenic activities, including rusted metal pipes, various types of metal debris, and a punctured oil tank (**Photo 8**) were observed. All metal debris was documented and photographed.

4.0 DISCUSSION

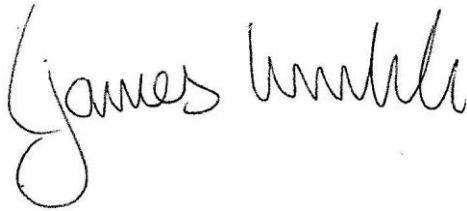
The overall land structure of the proposed Project area was steep, approximately 45° (**Photo 9**). The proposed Project construction area access was difficult by boat and the coast was lined with riparian habitat and large boulders (**Photo 10**). The ground layer was covered in moss, large roots and boulders making the hike treacherous and difficult. The forested area was representative of a second growth forest with a structural stage of 5 maturing towards a 6 in areas south of Woodfibre Creek. No unique habitat was observed, and two cavity trees of moderate value to wildlife were documented (**Figure 1**). There were no observed at-risk wildlife or vegetation, and no stick nests observed, although an existing active bald eagle (*Haliaeetus leucocephalus*) nest is known to occur just north of Woodfibre Creek (**Figure 1**). The land access trail construction should avoid sensitive nesting periods to prevent negative impacts to potential nesting birds (i.e., breeding bird window for the area is late March through mid August (ECCC 2019), the bald eagle breeding window is early January through late August (BC MOE 2013)). There was evidence of mammalian wildlife in the area although none of the potential denning habitats observed were currently occupied.

The condition of vegetation from the south end of the proposed access trail to approximately 30 m south of Woodfibre Creek was native with no signs of human development or disturbance documented. Close to Woodfibre Creek, the ground layer was covered in non-native species; an invasive species management plan is recommended for the area around Woodfibre Creek. There was evidence of human disturbance at Woodfibre Creek and north of the creek as the workers observed multiple piles of metal debris and a punctured oil tank, which will require additional considerations (beyond the scope of this assessment).

5.0 CLOSURE

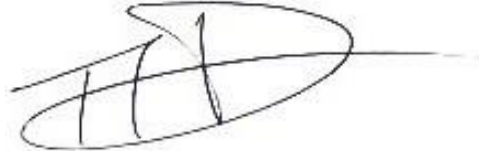
We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Hemmera Envirochem Inc.



per: Alexander Hook
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6.0 REFERENCES

BC Ministry of Environment (MOE). 2013. Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia. A companion document to Develop with Care 2012. < https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/best-management-practices/raptor_conservation_guidelines_2013.pdf>

Environment and Climate Change Canada (ECCC). 2019. General Nesting Periods of Migratory Birds in Canada. Environment and Climate Change Canada (ECCC) - General Nesting Periods of Migratory Birds in Canada. Government of Canada. < <https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html>>

APPENDIX A

Photographs



Photo 1 Native vegetation observed in the proposed Project construction area included spiny wood fern (left), deer fern (right) and salmonberry (right).



Photo 2 Non-native vegetation observed in the proposed Project construction area included English holly (left) and common periwinkle (right).



Photo 3 Structural stage and slope of the forest looking east.



Photo 4 The dense understory as you travel east, looking towards the shore.



Photo 5 Potential denning habitat seen in the south section of the proposed Project construction area.



Photo 6 Two large snags observed in the proposed Project construction area.



Photo 7 Looking upstream (right) and downstream (left) of the unnamed creek in the north section of the proposed Project construction area.



Photo 8 Pictured is the punctured oil tank found close to Woodfibre creek.



Photo 9 Looking north at the slope of the proposed Project construction area, note the slope angle.



Photo 10 Looking south at the shore of the proposed Project construction area, note the riparian habitat and large boulders.

APPENDIX C
2019 Floatel Marine Habitat Report

Woodfibre LNG Project: 2019 Floatel Marine Habitat Report

Prepared for:

Woodfibre LNG Limited
Suite 1020 – 1075 West Georgia Street
Vancouver, BC V6E 3C

Project No. 989232-05

September 18, 2019

Prepared by:

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APPENDICES

Appendix A	Photo Log
Appendix B	Survey Data

1.0 INTRODUCTION

Woodfibre LNG Limited (Woodfibre LNG) is proposing to build a liquefied natural gas (LNG) processing facility with marine storage and off-loading (the Project), located approximately seven kilometres southwest of Squamish, British Columbia within the District of Squamish municipal boundaries (**Figure 1**). The Project is located at the former Woodfibre Pulp and Paper Mill site; a fee simple, industrially zoned brownfield site with more than 100 years of industrial use and deep-water marine access. The site has marine only access via Howe Sound. In addition to Squamish, the Project is located close to other communities; Britannia Beach is approximately 5.5 km southeast; Darrell Bay is approximately 6.2 km to the east; Port Mellon is approximately 22 km southwest; and Vancouver is situated approximately 50 km southeast.

Woodfibre LNG is proposing the following marine changes to the Project and will request an amendment to Schedule A of the Certified Project Description (CPD) of EAC #E15-02, pursuant to Section 19(1) of the *BC Environmental Assessment Act* (SBC 2002, c. 43):

- Temporary floating worker accommodation (the floatel) and associated mooring infrastructure
- Workforce accommodation on marine construction vessels.

The proposed changes to the Project are entirely contained within the Certified Project Area (CPA) assessed in the Application and included in EAC #E15-02.

The approved CPD did not include accommodation because at the time of submission there was considered adequate accommodation options in the local area. Post submission the vacancy rates have decreased drastically, and alternative accommodation options are required to support the construction phase of the Project. The preferred accommodation option is a floating hotel with approximately 600 beds. There are several advantages to the floatel, which include increased worker efficiency, decreased marine and road traffic and increased employment opportunities. The floatel will be in operation for the duration of the construction period, which will be between 40 and 50 months. The proposed location of the floatel is shown on **Figure 1**.

Marine construction vessels will be used to support construction of the LNG jetty and mooring of the floating LNG storage as assumed in the Project description. The vessels will not be moored in a single location for long periods of time and will move frequently. Vessel movements will be contained in the CPA assessed in the application for an Environmental Assessment Certificate (EAC). Given the vessels frequent movement within the CPA there are not considered to be additional interactions with the marine environment that were not already assessed in the EAC. Additional surveys are not required, and construction vessels are not included in this assessment.

Hemmera was retained to provide an assessment of the marine fish and fish habitat located within and adjacent to the footprint of the proposed floatel.

2.0 METHODS

SCUBA surveys to assess intertidal and subtidal fish and fish habitat, and the presence/proximity of sensitive marine habitats were conducted on May 7, 2019. Sampling methods were based on the working draft Marine Foreshore Environmental Assessment Procedure (DFO 2004) using a three-person WorkSafeBC certified Commercial SCUBA team. SCUBA is a preferred method of assessment over remotely operated vehicle or drop camera as it allows for acquisition of detailed information on marine plant density, percent cover, fish presence (i.e., rockfish), and accurate identification of cryptic, mobile, and small invertebrate species.

Three transects were established perpendicular to the shoreline from the water line up to 90 m from shore, or to a maximum depth of -18 m chart datum (CD)¹ (**Photo 1, Figures 2 & 3**). Transects included the predicted floatel footprint and the habitat immediately adjacent to it. Perpendicular transect orientation was used to accurately determine transitions of subtidal habitat types and the corresponding depths and substrate types.

SCUBA surveys were conducted in two phases. A survey of fish and highly mobile invertebrates was conducted, which included divers swimming the full length of each transect, recording all fish and mobile invertebrates within 2 m of the transect line. Simultaneously, a diver recorded substrate type and composition (**Table 2.1**), depth, percent cover of marine vegetation and sessile invertebrates (e.g., kelp and bivalves), and presence and abundance of mobile species (e.g., fish, crabs, and sea stars) using a 1.0 m² quadrat at 5-m intervals. Poor visibility rendered underwater photo and video impossible while conducting the survey.

Table 2.1 Substrate Classification

Substrate Type	Size Range (Diameter)
Bedrock/ blocks	greater than (>) 256 millimetres (mm) angular
Boulder	>256 mm rounded
Cobble	64 – 256 mm
Gravel	2 – 64 mm
Sand	0.06 – 2 mm
Silt/clay/mud	<0.06 mm

Source: Wentworth 1922

¹ Elevations lower than 0 m CD will be indicated with by – m CD, while elevations higher than 0 m CD will be indicated with by m CD.

3.0 FISH AND FISH HABITAT

3.1 Physical Characteristics

The proposed floatel is located on the west side of Howe Sound, immediately to the south of the Woodfibre LNG facility and to the west of Woodfibre creek. Howe sound is a marine fjord, characterized by steep side slopes, bedrock substrates, with shallow deposits of soft substrates from glaciation and erosion in the subtidal zone (Hemmera 2014). The north end of Howe Sound is often characterized by a layer of turbid, fresh water discharged from the Squamish River, that sits on top of the salt water of Howe Sound. The study area consisted of the steep valley wall, that descended into the subtidal, to below – 18 m CD (the WorkSafeBC limit for a 3-person dive team).

3.2 Riparian Habitat

Within the proposed floatel footprint, the terrestrial geography consisted of a steep mountainside to the high-water mark (HWM). The riparian zone was vegetated by mature mixed forest of coniferous and deciduous trees with a well-established understory. The riparian vegetation was observed to colonize the riparian zone to the HWM (**Photo 2**).

3.3 Intertidal Habitat

The intertidal zone, also known as the foreshore, seashore, or littoral zone, is defined as the zone above the low-water mark (LWM), or 0 m CD, and below the HWM. It is inundated once or twice daily by marine waters. Within the study area, the intertidal zone demonstrated the physical assemblage and diversity common to relatively protected waters of the Pacific Northwest. The intertidal substrate within the study area consisted of bedrock, with areas of cobble, gravel, and sand (**Photo 2**).

A complete list of species observed during field surveys is included in **Table 3.1** below. Algal colonization was rare within the intertidal zone of the study area, only rockweed (*Fucus distichus*) and sugar kelp (*Saccharina latissima*) was observed. Rockweed was observed in 10% of quadrats and was limited to the intertidal and shallow subtidal zone on Transect 3. Where present, rockweed accounted for 5% of the quadrat surface area. Sugar kelp was similarly observed in 10% of the quadrats and was observed in the intertidal zone of Transects 1 and 2, and accounted for 5% of the quadrat surface area. Accumulations of diatoms were observed in 19% of quadrats, accounting for 31% of the quadrat surface area, where present. No other intertidal algae were observed in the study area.

The only invertebrate observed in the intertidal zone of the study area were acorn barnacles (*Balanus glandula*), observed in the intertidal zone of Transects 1 and 2, and accounting for 5% of the quadrat where present.

3.4 Subtidal Zone

The subtidal zone, located below the LWM, was characterized by soft substrates, generally sand in the shallow subtidal zone, transitioning to silt with increasing depth (**Figure 4**). Transect 3 was characterized by a rockfall, or fan of gravel and cobble that had migrated down to approximately -13.5 m CD and was overlaying the soft silt substrate. Algae and kelp were largely absent from the subtidal zone of the study area. Only a trace amount of cracked saucer (*Constantinea subulifera*) was observed in one quadrat on Transect 1.

Sessile and mobile invertebrates were rarely observed within the study area. Numerous holes were observed in the silt substrate, indicating that a community of bivalves, polychaete worms, and other invertebrates were utilizing the soft substrates within the study area. Additionally, graceful crab (*Cancer gracilis*) and blood star (*Henricia* spp.) were observed in the subtidal zone of the study area, associated with the soft sand and silt substrate. Green urchins (*Strongylocentrotus droebachiensis*) and blue mussels (*Mytilus trossulus*) were observed associated with the subtidal gravel and cobble substrates within the study area.

Only one unidentified sculpin species was observed on the soft substrate within the study area, however, during surveys conducted within the Woodfibre LNG facility footprint, striped perch, shiner perch, and pile perch were regularly observed and can be expected to be found within the footprint of the proposed floatel.

Table 3.1 Marine Species Observed within Study Area

Scientific Name	Common Name
<i>Constantinea subulifera</i>	cracked saucer
N/A	diatoms
<i>Fucus distichus</i>	rockweed
<i>Saccharina latissima</i>	sugar kelp
<i>Balanus glandula</i>	acorn barnacle
<i>Cancer gracilis</i>	graceful crab
<i>Henricia</i> spp.	blood star
<i>Mytilus trossulus</i>	blue mussel
<i>Strongylocentrotus droebachiensis</i>	green urchin
N/A	unidentified sculpin

4.0 SUMMARY

The fish habitat observed within the study area is common and not limiting within Howe Sound. The riparian vegetation likely provides a small amount of nutrient input to the marine environment through insect and leaf drop. The riparian vegetation within the study area is not anticipated to provide cover for fish due to the physical characteristics of the study area. Divers observed a strong halocline at approximate 2.5 m with turbid fresh water sitting above saline marine waters. The turbid fresh layer is likely to cause shading of the marine layer and reduce the potential for algal growth due to the reduced light penetration.

The intertidal algae (e.g., rockweed) provides a small amount of suitable spawning substrate for Pacific herring (*Clupea pallasii*). A small winter herring spawn has been regularly observed approximately 200 m to the north, within the Woodfibre water lot. Federal records indicate that in Howe Sound, herring spawn typically between mid-February to mid-April (DFO 2016).

The steep, soft substrates do not provide cover, rearing, or spawning habitat for finfish. They provide a small amount of foraging habitat for species that persist on soft, silt and sand substrates including English Sole and sculpins. The hard substrate observed in the shallow sections of the transects does not provide high quality attachment sites for algae or encrusting invertebrates, likely because of the strong fresh water influence of the Squamish River at the northern end of Howe Sound, 7 km north of the Project location.

5.0 CLOSURE

This Work was performed in accordance with Change Order WLNG/CAN/6320-01 to Contract No: WLNG/Can/6320 between Hemmera Envirochem Inc. ("Hemmera") and Woodfibre LNG Limited ("Woodfibre LNG"), dated 20-1-2016 ("Contract"). This Report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by Woodfibre LNG. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

We sincerely appreciate the opportunity to have assisted you with this project and if there are any questions, please do not hesitate to contact the undersigned by phone at 604.669.0424.

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6.0 REFERENCES

DFO, F. and O. C. 2004. Marine Foreshore Environmental Assessment Procedure - Working Draft.

DFO. 2016. Section 280, Howe Sound (North & South) Herring Spawn Records. <<http://www.pac.dfo-mpo.gc.ca/science/species-especies/pelagic-pelagique/herring-hareng/herspawn/280fig-eng.html>>.

Hemmera. 2014. Application for an Environmental Assessment Certificate - Screening - Woodfibre LNG.

FIGURES

Figure 1	Floatel Amendment
Figure 2	Project Details
Figure 3	Transect Profiles
Figure 4	Marine Habitat Map

**Temporary Floating Worker
Accommodation Amendment**

Legend

WNLNG Project Features

- Helipad
- Existing Water Line from Mill Creek
- Project Feature
- Certified Project Area
- Green Zone
- New or Upgraded Roadway
- Certified Marine Terminal Area

Floatel Project Features

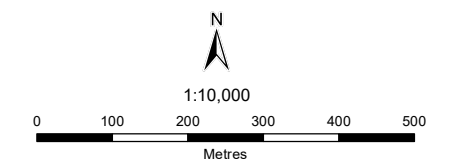
- 30 m Riparian Buffer
 - Access Trail and Utility Corridor
 - New Fence Line
 - Project Feature
 - Marine Construction Area¹
 - Terrestrial Construction Area²
- Basedata**
- Creek Shoreline
 - Contour (10 m interval)
 - Forestry Road
 - Watercourse
 - Parcel Boundary
 - Waterbody

Notes

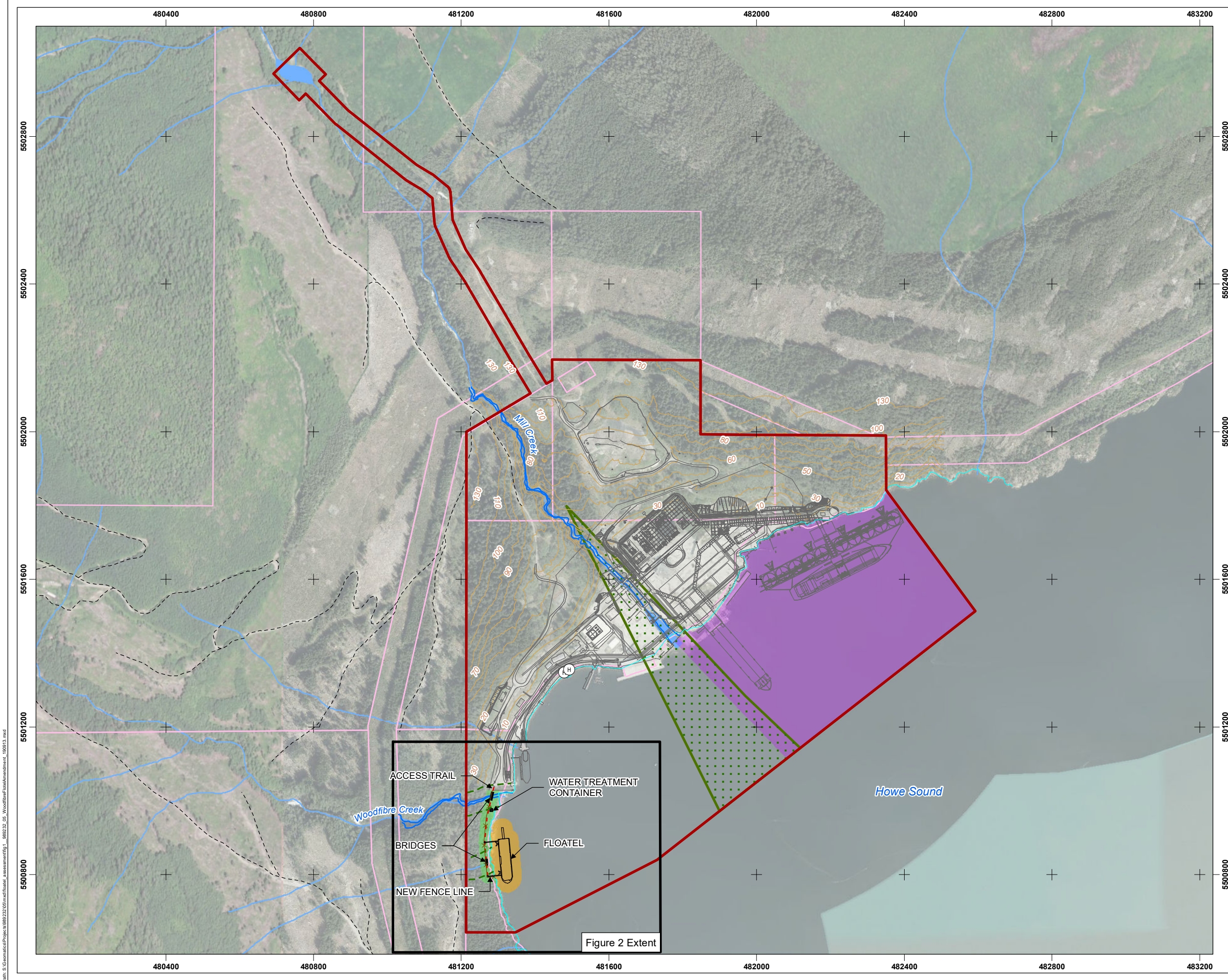
1. Marine construction footprint is a 25 m buffer of the marine footprint.
2. Terrestrial construction footprint is a 15 m buffer of the terrestrial footprint.
3. All mapped features are approximate and should be used for discussion purposes only.
4. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licences - British Columbia & District of Squamish
- Data courtesy of KBR Technical Services, Inc.
- Aerial Image: ESRI World Imagery



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Detailed Amendment Infrastructure

Legend

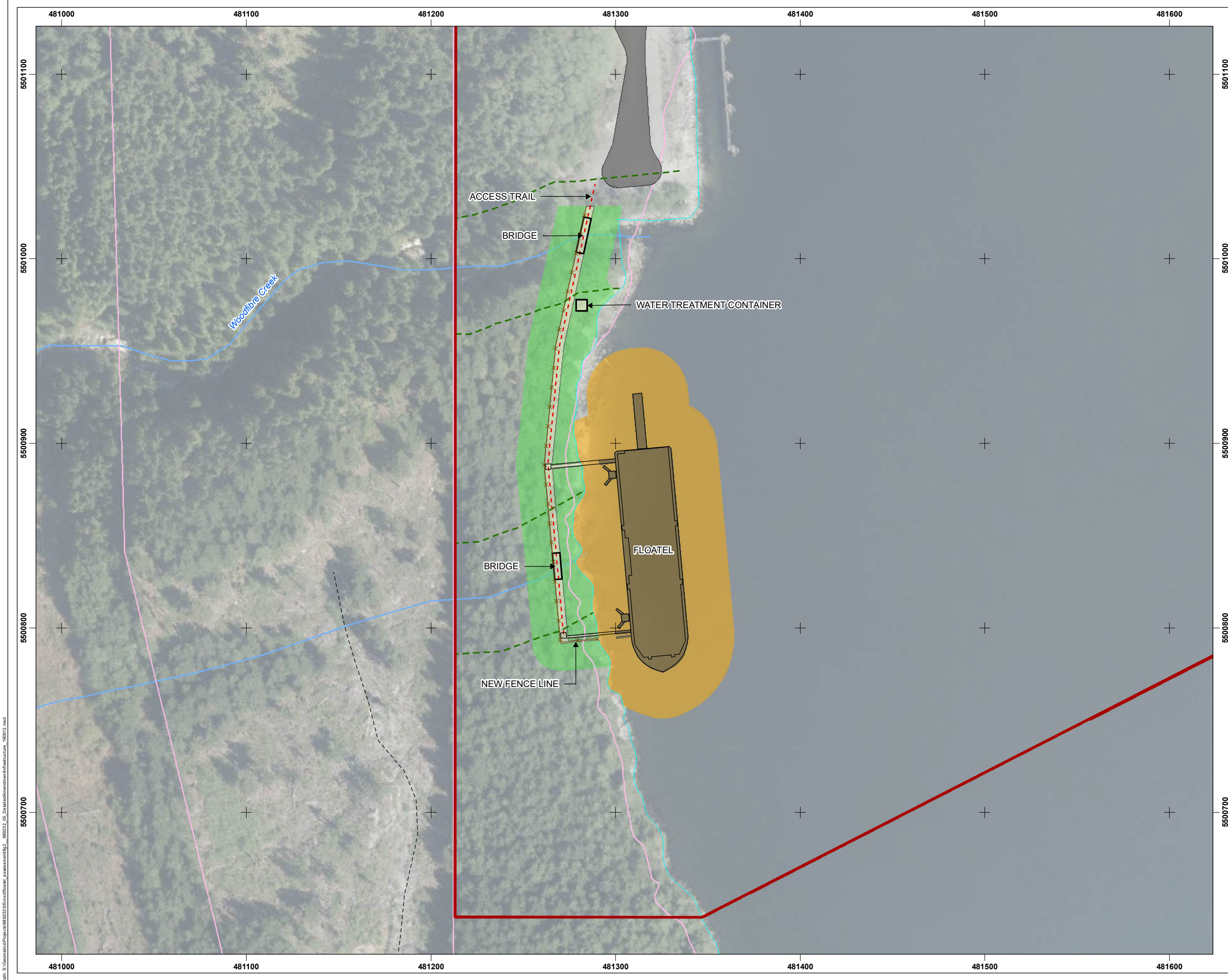
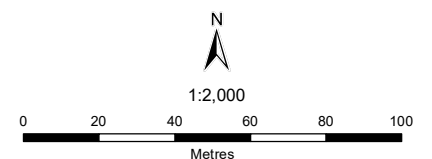
- Certified Project Area
- New or Upgraded Roadway
- Floatel Project Features**
- 30 m Riparian Buffer
- Access Trail and Utility Corridor
- New Fence Line
- Project Feature
- Marine Footprint
- Marine Construction Area¹
- Terrestrial Footprint
- Terrestrial Construction Area²
- Basedata**
- Forestry Road
- Watercourse
- Parcel Boundary

Notes

1. Marine construction area is a 25 m buffer of the marine footprint.
2. Terrestrial construction area is a 15 m buffer of the terrestrial footprint.
3. All mapped features are approximate and should be used for discussion purposes only.
4. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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- Data courtesy of KBR Technical Services, Inc.
- Aerial Image: District of Squamish, 2019 (10 cm)



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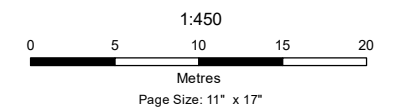
Transect Profiles

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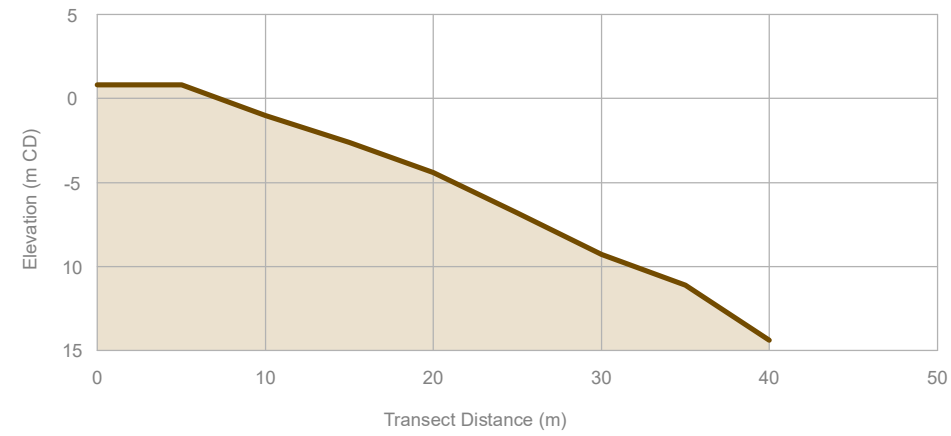
-  Transect Profile Elevation
-  Seabed

Notes

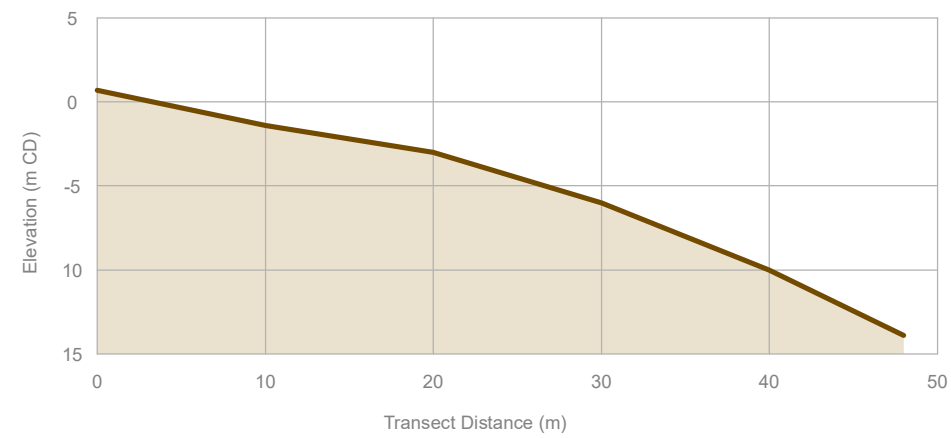
1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.



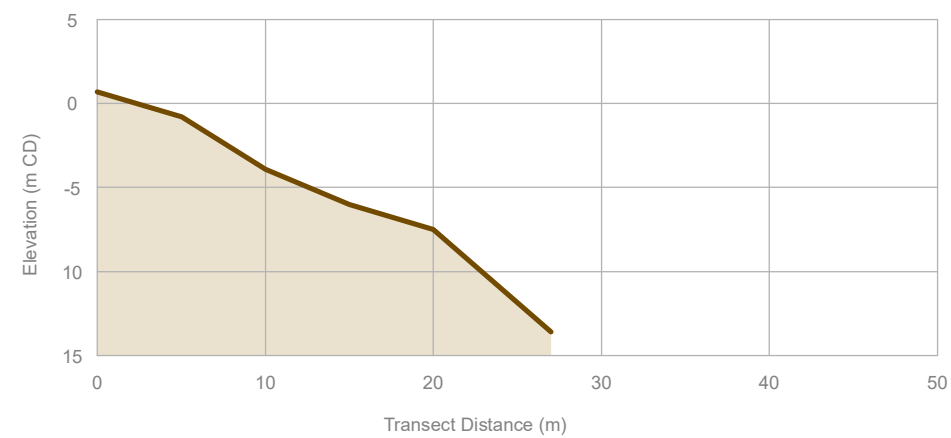
Transect 1



Transect 2






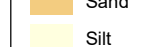
Transect 3



Marine Habitat Map

Legend

Approximate Habitat

-  Cobble
-  Gravel
-  Sand
-  Silt

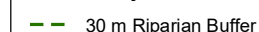

WLNG Project Features

-  Fence Line



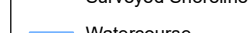
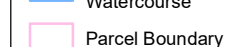
 **Certified Project Area**

 **New or Upgraded Roadway**

Floatel Project Features

-  30 m Riparian Buffer
-  Access Trail
-  New Fence Line
-  Project Feature

Basedata

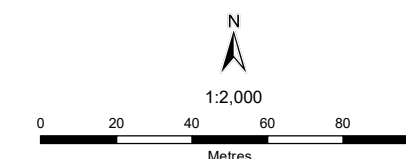
-  Forestry Road
-  Surveyed Shoreline
-  Watercourse
-  Parcel Boundary

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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Figure 4

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APPENDIX A

Photo Log



Photo 1 Divers commencing subtidal habitat survey. Photo taken March 7, 2019.



Photo 2 General view of intertidal habitat of the Floatel study area. Photo taken March 7, 2019.

APPENDIX B

Survey Data

Appendix B - Survey Data

	Date	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019
	Time	1335	1335	1335	1335	1335	1335	1335	1335	1335	1350	1350
	Transect	1	1	1	1	1	1	1	1	1	2	2
	Quadrat	1	2	3	4	5	6	7	8	9	1	2
	Station (m)	40	35	30	25	20	15	10	5	0	48	40
	Depth gauge (m):	15.2	11.9	10.1	7.6	5.2	3.4	1.8	0.0	0.0	14.6	10.7
	Depth gauge (ft):	50	39	33	25	17	11	6	0	0	48	35
	Tide (m):	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7
	Depth m CD:	14.4	11.1	9.3	6.8	4.4	2.6	1.0	-0.8	-0.8	13.9	10.0
Silt	Silt	100	100	100	100	100					100	100
Sand	Sand						100	100	70			
Gravel	Gravel											
Cobble	Cobble									100		
Boulder	Boulder											
Bedrock	Bedrock									30		
Shell	Shell					5			10			
Wood waste	Wood waste		100	100	50						80	20
Bare	Bare											
Debris	Debris											
Detritus	Detritus											
<i>Constantinea subulifera</i>	cracked saucer				1							
<i>Diatoms</i>	diatoms									60		
<i>Fucus distichus</i>	rockweed											
<i>Saccharina latissima</i>	sugar kelp								5			
<i>Balanus glandula</i>	acorn barnacle								1	5		
<i>Cancer gracilis</i>	graceful crab				1							
<i>Henricia spp.</i>	blood star						3					
<i>Mytilus trossulus</i>	blue mussel											
<i>Strongylocentrotus droebachiensis</i>	green urchin						1					
	Holes						12	10				
<i>Sculpin unknown</i>	sculpin unknown			1								
Fish	Fish											

Appendix B - Survey Data

	Date	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019	07/05/2019
	Time	1350	1350	1350	1350	1410	1410	1410	1410	1410	1410
	Transect	2	2	2	2	3	3	3	3	3	3
	Quadrat	3	4	5	6	1	2	3	4	5	6
	Station (m)	30	20	10	0	27	20	15	10	5	0
	Depth gauge (m):	6.7	3.7	2.1	0.0	14.3	8.2	6.7	4.6	1.5	0.0
	Depth gauge (ft):	22	12	7	0	47	27	22	15	5	0
	Tide (m):	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	Depth m CD:	6.0	3.0	1.4	-0.7	13.6	7.5	6.0	3.9	0.8	-0.7
Silt	Silt	50				25					
Sand	Sand	50	100	100	50					60	
Gravel	Gravel					50	100	100	100		
Cobble	Cobble				50	25				20	100
Boulder	Boulder									20	
Bedrock	Bedrock										
Shell	Shell										
Wood waste	Wood waste										
Bare	Bare										
Debris	Debris										
Detritus	Detritus										
<i>Constantinea subulifera</i>	cracked saucer										
<i>Diatoms</i>	diatoms				20					5	40
<i>Fucus distichus</i>	rockweed							5		5	
<i>Saccharina latissima</i>	sugar kelp				5						
<i>Balanus glandula</i>	acorn barnacle				10						
<i>Cancer gracilis</i>	graceful crab										
<i>Henricia spp.</i>	blood star										
<i>Mytilus trossulus</i>	blue mussel				5						
<i>Strongylocentrotus droebachiensis</i>	green urchin						2	5	40		
	Holes	3	25	1							
<i>Sculpin unknown</i>	sculpin unknown	1									
Fish	Fish										