



*Analysis on Woodfibre LNG Limited's
Report Pursuant to Conditions 2.10 and 2.11 of
the Decision Statement*
Woodfibre LNG Project

February 2018

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1 Introduction

Woodfibre LNG Limited (the proponent) proposed the development and operation of a liquefied natural gas (LNG) production facility with marine storage and off-loading facility at the former Woodfibre Pulp and Paper Mill site (the Project) approximately 7 kilometres (km) west-southwest of Squamish, British Columbia (B.C.).

The Project was subject to an environmental assessment (EA) pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and B.C.'s *Environmental Assessment Act*. The federal EA was conducted by means of substitution in accordance with the *Memorandum of Understanding between the Canadian Environmental Assessment Agency (the Agency) and the British Columbia Environmental Assessment Office (EAO) on Substitution of Environmental Assessments (2013)*. As part of the substituted process, the EAO submitted to the Agency an Assessment Report that informed the federal Minister's EA decision.

The proponent and Squamish Nation had entered into an agreement to conduct a separate Project review process (Squamish Nation Process) to discuss the potential effects of the Project on Squamish Nation's interests.

On October 14, 2015, Squamish Nation issued an Environmental Certificate to the proponent, allowing the Project to proceed in accordance with a set of conditions. One of the conditions is that Squamish Nation will select the cooling method the Project employs. On October 26, 2015, B.C. issued an Environmental Assessment Certificate (EAC), accompanied by a Certified Project Description and conditions. On March 18, 2016, the Minister of Environment and Climate Change issued a Decision Statement with 122 legally binding conditions for the Project. The Decision Statement includes two conditions that pertain to change(s) to the Project:

2.10 The proponent 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).

2.11 In notifying the Agency pursuant to condition 2.10, the proponent 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.

On October 19, 2016, Squamish Nation sent a letter to the proponent, advising of their decision for the proponent to use air cooling as the cooling method for the Project. On January 20, 2017, Squamish Nation issued a letter to the proponent, indicating their support for submitting an EAC amendment application to EAO; and on January 27, 2017, the proponent submitted to the EAO an application to amend the EAC issued for the Project. EAO issued an EA Certificate Amendment on July 12, 2017.

As required by conditions 2.10 and 2.11 noted above, on February 1, 2017, the proponent submitted to the Agency the *Report Pursuant to Conditions 2.10 and 2.11 of the Decision Statement – Woodfibre LNG Project* (the Report). The Report discussed proposed changes to the Project design and assessed

potential adverse environmental effects in association with these changes, as well as the results of the consultation with Indigenous groups. On the same day, the EAO also accepted an EAC amendment application from the proponent for review.

On May 24, 2017, the Agency requested additional information from the proponent to further the Agency's understanding of potential adverse environmental effects associated with the proposed project changes. The proponent responded to the information requests on June 7, June 29, and July 6, 2017.

As part of the EAO's process to consider the EAC amendment application, based on the scope of the proposed project changes, the EAO conducted public consultation and engagement with a technical working group, which included provincial, federal, and local government agencies, and Indigenous groups. The Agency considered comments from federal authorities and Indigenous groups submitted during the EAO's comment period.

In addition, on October 27, 2016, the proponent applied to the National Energy Board (NEB) for a 40-year term License to Export Liquefied Natural Gas, extending the original 25-year license. The 40-year export license was issued to the proponent on June 9, 2017. EAO's Certified Project Description does not describe the duration of the operation of the Project, and EAO's Assessment Report prepared during the substituted environmental assessment process adopted a temporal boundary of 25 years in its assessment of the Project's operation. EAO also noted in its report that it considered Woodfibre LNG would be operational for a minimum of 25 years. As the Certified Project Description does not place a temporal limit on the operational period of Woodfibre LNG, EAO determined that a 40-year export licence is in compliance with the EA Certificate.

The Agency considered the proposed project changes and assessed the potential adverse environmental effects of the proposed project changes and is of the view that the proposed project changes do not constitute a new or different designated project that may require a new EA. However, the Agency is of the view that changes to some mitigation and follow-up requirements included as conditions in the federal Environmental Assessment Decision Statement issued in March 2016 would be required to address these effects or to address the fact that some of the effects identified in relation to the initial project's design would no longer occur because some project components would no longer be built.

The Agency considers that the remainder of the conditions included in the March 2016 Decision Statement would remain relevant to the Project. The Agency is not contemplating making recommendations on changes to other conditions that fall outside of the scope of the proposed project changes.

This Analysis provides a summary and discussion of the information provided by the proponent, as well as an analysis of whether existing mitigation measures and follow-up requirements are still applicable, or if modified requirements would be necessary.

1.1 Structure of the Document

This Analysis examines potential adverse environmental effects caused by the proposed project changes as described by the proponent in their submission to the Agency. Individual Valued Components (VCs) are discussed with respect to each of the potential project changes. VCs discussed in this Analysis are listed as follows:

- Fish and fish habitat;
- Migratory birds;
- Greenhouse gas emissions;
- Human health;
- Current use of lands and resources for traditional purposes and socioeconomic conditions for Aboriginal peoples;
- Physical and cultural heritage, and structures, sites, or things of historical, archaeological, paleontological or architectural significance for Aboriginal peoples;
- Listed species at risk; and
- Impacts to Aboriginal rights.

2 Proposed Project Design Changes

The Report discusses the following proposed changes to the Project:

- A change of cooling technology from seawater to air cooling;
- The use of an existing Mill Creek water intake, including screenhouse, flume, and penstock, as an alternative to constructing a new water intake at Mill Creek, with the possibility of upgrading or replacing the existing intake; and
- A new water intake at Woodfibre Creek for short-term water needs during construction.

The Agency also considers an extension of operation from 25 to 40 years a project change.

2.1 Change from Seawater to Air Cooling

In the EA, the proponent was proposing to use a seawater cooling system to cool the natural gas, which would then be liquefied utilizing a refrigeration system. The seawater cooling system was to draw water from Howe Sound, use it in the LNG facility, and then discharge back into Howe Sound.

As part of its proposed project changes, the proponent has indicated that instead of using the seawater cooling system, the Project would now employ an air cooling system using fin-fan coolers. Fin-fan coolers are air cooled heat exchange units that would force air over finned tubes carrying the natural gas and the cooled gas would enter a refrigeration / liquefaction process. As per the original design, a closed loop refrigerant system would then be used in the liquefaction process. Spill containment would be provided to mitigate the risk of leakage. The coolers would be arranged in banks, which would include tube bundles and fans in a cooler assembly mounted on top of the LNG process structure. The air coolers would be mounted on a structure that is approximately 21 metres (m) above grade, and the air cooling units would increase the height by approximately 3 m. The heated air would then be pumped out into the atmosphere.

The proponent noted that energy requirements (approximately 140 megawatt (MW) under normal conditions, and 185 MW under peak loading) are expected to be equivalent to or less than the energy consumption for seawater cooling at any time.

2.2 Mill Creek Water Intake

Freshwater would be used during construction and operation of the Project. Freshwater uses during construction include dust control, concrete batching, and worker facilities; and freshwater uses during operation include firefighting, service water for the Project facility, and domestic use. The water would be drawn under an existing provincial water license from Mill Creek.

During the EA, the proponent included an assessment of the construction and operation of a new water intake constructed on Mill Creek, approximately 1 km upstream of Howe Sound. Water from the new intake would be transported to the fire water and raw water tanks via a buried pipe.

As part of the proposed project changes, the proponent indicated that instead of constructing a new water intake on Mill Creek as per its original design, it may upgrade an existing water intake, located approximately 2 km upstream of Howe Sound.

If upgrading of the existing water intake is not feasible, the proponent indicated that it may construct a new water intake at the existing water intake location, or return to its original proposal to construct a new water intake 1 km upstream of Howe Sound. The proponent indicated that regardless of the water intake location, water would be diverted into a pipe and then stored in a raw water tank in the Project area and would be used for construction and operation, as proposed during the EA. The proponent did not provide information on whether the existing pipe at the existing water intake location would be used or, if a new pipe is required, whether such a pipe would be buried or above-ground.

2.3 Water Extraction at Woodfibre Creek

The proposed project changes include the use of a new single temporary pump to extract water from Woodfibre Creek, in order to meet short-term water requirements for construction, when constructing or upgrading works are being conducted at the Mill Creek water intake. The temporary pump would be located approximately 150 metres (m) upstream from Howe Sound. The temporary pump may be either submersible or shore-based, and would be located within the Project Area as described in EAO's Certified Project Description. The proponent indicated that this pump would incorporate best management practices (BMPs) for approach velocities and screen spacing, as outlined in the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995). No instream construction activities would be required to install the pump.

The proponent indicated that the maximum amount of water to be diverted from Woodfibre Creek would be consistent with the construction phase diversion rate of 70 litres per second identified during the EA for Mill Creek.

2.4 Extension of Operation from 25 to 40 Years

On October 27, 2016, the proponent applied to the NEB pursuant to section 117 of the *National Energy Board Act* for a license to export natural gas, in the form of LNG, for 40 years. On April 6, 2017, the NEB decided to issue a 40-year license to the proponent, subject to the Governor in Council's approval. On June 9, 2017, following the Governor in Council's approval, the NEB issued the 40-year export license.

EAO's Certified Project Description does not indicate the lifetime of the Project. EAO's Assessment Report adopted a temporal boundary of 25 years in its assessment of the effects of the Project's operation. The Agency considers this extension of operation from 25 to 40 years as a project change and asked the proponent to analyze whether any adverse environmental effects or impacts to Aboriginal rights may be caused by this change.

3 Potential Adverse Environmental Effects from Proposed Project Changes

3.1 Fish and Fish Habitat

Fish and fish habitat is included in the definition of environmental effects under section 5 of CEAA 2012, and was assessed during the EA. The Decision Statement issued for the Project included conditions in relation to fish and fish habitat.

3.1.1 Change from Seawater to Air Cooling

3.1.1.1 Proponent's Assessment

The proponent anticipated that potential adverse environmental effects to marine fish and fish habitat would be reduced as a result of switching from seawater cooling to air cooling as the following effects on marine fish and fish habitat would be eliminated:

- Direct loss of habitat from construction of the seawater cooling system infrastructure and adverse change in habitat quality due to seabed disturbance and siltation;
- Direct or indirect fish mortality from impingement or entrainment for both juvenile and adult benthic invertebrates at the cooling system intake;
- Indirect loss of fish habitat from avoidance of warm water at the cooling system diffuser;
- Physical disturbance and loss of benthic habitat from the placement of intake, outlet, and diffuser pipes on the seafloor; and
- Effects on marine benthic communities from changes in marine sediments (e.g., smothering).

The proponent did not anticipate any adverse environmental effects on marine or freshwater fish and fish habitat as a result of the installation and operation of the air cooling system.

3.1.1.2 Agency's Analysis and Conclusions

The Agency agrees with the proponent that switching from seawater cooling to air cooling would eliminate potential adverse environmental effects caused by the seawater cooling system on marine fish and fish habitat previously assessed during the EA, and that the air cooling system would not cause additional adverse environmental effects on marine or freshwater fish and fish habitat.

The Agency notes that Musqueam Indian Band indicated in a letter to the Agency dated March 17, 2017 that it was satisfied with and supportive of the change from seawater cooling to air cooling, as this change would address many of its concerns regarding negative impacts to the fish and shellfish species harvested by Musqueam Indian Band in Howe Sound.

The Agency concludes, with consideration of Musqueam Indian Band's letter, that mitigation measures, previously proposed by the proponent related specifically to the seawater cooling system's marine intake and discharge diffuser would no longer be applicable. However, the proponent noted to the Agency, following review of the draft Analysis, that the Project would continue to include minor

marine intakes for firefighting purposes or for ballast for the floating storage and offloading unit. Therefore, the following mitigation measure remains applicable for these other marine intakes:

- Design, install and operate any marine water intake to avoid or reduce the incidental capture of fish through entrainment and impingement, including the risk of entrainment of Pacific herring (*Clupea pallasii*) larvae.

In addition, the proponent also noted to the Agency that the Project would continue to have various marine discharges, including for small volumes of treated process water, leachate, domestic wastewater and storm water. Therefore, the following mitigation measure would also remain applicable for these other marine discharges, aside from the references to residual chlorine concentrations and water temperature, which would no longer be relevant given the types of marine discharges proposed:

- Design, install and operate any marine discharge diffuser to prevent the deposit of a deleterious substance in water frequented by fish and taking into consideration the Canadian Council of Ministers of the Environment's *Water Quality Guidelines for the Protection of Aquatic Life* for residual chlorine concentrations and water temperature.

3.1.2 Mill Creek Water Intake

Potential effects from the construction and operation of a new water intake at Mill Creek had been assessed during the EA. Those effects include a loss of fish habitat from the footprint of those works, fish mortality resulting from the use of construction equipment in and around Mill Creek, the reduction of fish habitat through the extraction of water, and potential for entrainment or impingement at the intake site.

In the EA, the proponent concluded that during construction, proposed water withdrawals are not expected to result in substantial changes to surface water quantity based on average, average low, and extreme low-flow estimates for Mill Creek. The Report also stated that Mill Creek is habitat-limited; it is not expected to contribute significantly to the overall fish production within Howe Sound, which relies on inputs from many small nursery streams.

In the Report, the proponent committed to ensuring that the water supply infrastructure (e.g. new water intake, modifications to the existing water intake) design for Mill Creek would meet Best Management Practices (BMPs) for instream works, approach velocities, and screen spacing as outlined in DFO's *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995) and *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2013). Taking into account the application of these same BMPs and mitigation measures for the original project design, the conclusion from the EA was that the residual adverse effects to freshwater fish and fish habitat are likely to be negligible.

Lyackson First Nation indicated that water intake at Mill Creek could result in a loss of fish habitat through the footprint of related works, fish mortality through the use of construction equipment, reduction of fish habitat through the extraction of water, and potential for entrainment at the intake site.

Tsleil-Waututh Nation indicated that a more thorough assessment should be completed for the new water intake location, as it is located one kilometre upstream of the previous location.

3.1.2.1 Proponent's Assessment

The proponent indicated that any proposed water intake from Mill Creek could have the following potential effects to fish and fish habitat, as previously identified in the EA:

- Reduced flow at Mill Creek;
- Entrainment or impingement of fish;
- Potential for dewatering of habitat and a reduction in the wetted width of the channel, thereby reducing benthic invertebrate habitat and the transport of leaf litter from the riparian vegetation; and
- Decrease in the food and nutrient content of the creek which could result in a downstream reduction of productive capacity in the creek.

The proponent was of the view that construction of a new water intake structure at the existing Mill Creek water intake location would have the same effects as upgrading the existing Mill Creek water intake, as each would require similar, or the same, types of work. In addition, the nature of the interaction¹ or rating² identified and considered during the EA for the construction of a new Mill Creek intake would apply to the proposed project change. The proponent indicated that extraction of water from Mill Creek at the new location (2 km upstream of Howe Sound) could pose potential adverse environmental effects over a longer distance than those already identified in the EA (1 km upstream of Howe Sound). The proponent, however, did not identify any additional adverse environmental effects as a result of moving the water intake location upstream.

The primary mitigation measure related to surface water quantity would be the establishment of minimum Instream Flow Releases (IFRs). The proponent determined that water diversions would be interrupted or reduced to maintain IFRs downstream of any potential intake locations. The proponent committed to apply the same mitigation measures, as identified during the EA, that it is required to implement for Mill Creek. The proponent concluded that after the incorporation of the mitigation measures identified, changes to surface water quantity are expected to be of low magnitude, local in effect, and reversible.

The proponent stated adverse residual environmental effects identified for fish and fish habitat during the EA would not change, and therefore, additional mitigation measures are not required.

3.1.2.2 Agency's Analysis and Conclusions

A need to replace any buried pipes as a result of upgrading the existing water intake, or constructing a new water intake at the existing location was not identified by the proponent. Replacing the pipes

¹ Interaction refers to the interaction between project activities and the selected indicators of each VC.

² The proponent defined ratings for each of the significance determination criteria during the EA for each VC. For example, in the Freshwater Fish and Fish Habitat chapter, the proponent defined the ratings “negligible”, “low”, “medium”, and “high” for the significance criteria “magnitude”.

could have the potential to cause adverse environmental effects that have not already been assessed by the proponent.

The proponent noted that effects to fish and fish habitat previously identified in association with the water intake works would extend for an extra kilometre, but did not provide further analysis of the effects over that distance.

The Agency is of the view that moving the proposed Mill Creek water intake location upstream by one kilometre does not alter the analysis previously conducted. The Agency accepts the proponent's determination that the conclusions of the EA would apply to the modification proposal. By maintaining the minimum flow in Mill Creek, and implementation of mitigation measures required in the Decision Statement, the Agency concludes that adverse environmental effects in relation to fish and fish habitat on Mill Creek would be mitigated. The Agency is therefore not proposing any changes to the mitigation measures previously identified in the EA.

3.1.3 Water Extraction at Woodfibre Creek

During the EA, the proponent confirmed fish presence in Woodfibre Creek. Woodfibre Creek is documented to include rainbow trout (*Oncorhynchus mykiss*) and cutthroat trout (*Oncorhynchus clarkii*). Rainbow trout, sculpin (*Cottus sp.*), and one juvenile chinook salmon (*Oncorhynchus tshawytscha*) were captured during baseline surveys. The proponent suggested that presence of this juvenile chinook is likely the result of non-natal use, although the potential that chinook salmon spawn within this limited segment in some years cannot be ruled out.

The proponent also indicated that as Woodfibre Creek is habitat-limited, it is not expected to contribute significantly to the overall fish production within Howe Sound, which relies on inputs from many small nursery streams.

Lyackson First Nation noted that water extraction would have the potential to result in dewatering of habitat and a reduction in the wetted width of the channel, reducing benthic invertebrate habitat and the transport of leaf litter from the riparian vegetation.

3.1.3.1 Proponent's Assessment

The proponent expected that water withdrawal in Woodfibre Creek would have effects similar to those predicted for Mill Creek. These effects are described above in section 3.1.2.

The proponent indicated that the new water intake in Woodfibre Creek, like the water intake at Mill Creek, would incorporate BMPs for approach velocities and screen spacing as outlined in DFO's *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO, 1995).

The proponent indicated that the primary mitigation measure to reduce effects to fish related to water withdrawals is the establishment of IFRs for Woodfibre Creek. Similar to Mill Creek, the proponent expects to be required to maintain minimum flow in Woodfibre Creek and that when required, water diversions would be interrupted or reduced to maintain IFRs downstream of the water intake on Woodfibre Creek. The proponent determined that the proposed changes to Woodfibre Creek would be subject to the same mitigation measures as Mill Creek.

The proponent predicted that effects to fish and fish habitat in relation to changes to surface water quantity in Woodfibre Creek would be negligible, after the incorporation of the mitigation measures described above. The proponent did not identify any potential for adverse environmental effects downstream of water withdrawal at Woodfibre Creek.

3.1.3.2 Agency's Analysis and Conclusions

It is the Agency's view that the maintenance of minimum flow in Woodfibre Creek would attenuate the adverse environmental effects of water withdrawals on freshwater fish and fish habitat. Given the similar nature of activities to be conducted in Mill Creek and Woodfibre Creek, mitigation measures to be implemented at Mill Creek would also be applicable and should be required to be implemented at Woodfibre Creek.

3.1.4 Extension of Operation from 25 to 40 Years

3.1.4.1 Proponent's Assessment

The proponent reviewed the assessment methodology applied during the EA and concluded that this methodology was also valid to assess environmental effects for an operation of 40 years. The proponent concluded that there would be no changes to the assessment and conclusions in relation to the extension of operation to 40 years.

3.1.4.2 Agency's Analysis and Conclusions

Based on the information provided by the proponent, the Agency accepts the proponent's determination that there are no new adverse environmental effects to fish and fish habitat are anticipated based on a change of duration from 25 to 40 years. The duration and reversibility of residual effects to fish and fish habitat are still considered as "long term" and "reversible" as was determined during the EA.

3.2 Migratory Birds

Migratory birds is included in the definition of environmental effects under section 5 of CEAA 2012, and was assessed during the EA. The Decision Statement issued for the Project included conditions in relation to migratory birds.

3.2.1 Change from Seawater to Air Cooling

3.2.1.1 Proponent's Assessment

During the EA, the proponent identified potential effects of the seawater cooling system on marine birds, including the direct loss of foraging habitat due to the placement of the structure during construction and an indirect loss of habitat caused by a potential reduction of food availability (forage fish) during operation.

As a result of changing from a seawater cooling system to air cooling, previously identified effects of the seawater cooling system on marine birds, including migratory birds, are no longer expected.

The proponent indicated that installation of the air cooling system during construction is within the scope of interactions for Project activities and physical works assessed during the EA. No additional footprint would be required for the cooling system, so there would be no additional loss of foraging and nesting habitat. There is no change to the nature of the interaction or rating assessed during the EA for the construction of land-based civil works.

The proponent indicated that operation of the air cooling system could have additional interaction with migratory birds through increased sensory disturbance due to noise and heat from the operation of the fans. The proponent also indicated that the cooling fans are shrouded and oriented horizontally, which would help protect migratory birds from collision with the fans.

Noise

Noise levels modeled during operations would be greatest in the immediate vicinity of the LNG facility, where they may reach a maximum of 85 A-weighted decibels (dBA)³. Outside of the Project area, the maximum sound levels are expected not to exceed 60 dBA. Although an increase in sound level from the use of fans in the air cooling system was identified as a potential adverse environmental effect, detailed noise modelling has shown that the sound levels would be within the range assessed during the EA. Therefore, the proponent concluded that no additional mitigation measures related to noise would be required.

Heat

Heat exhaust from the air cooling fans was identified by the proponent as having the potential to cause sensory disturbance to migratory birds. However, the proponent predicted that heat would not be a cause of direct mortality. The proponent anticipated that species sensitive to increased temperatures would already avoid the area of the air cooling system as there is a lack of suitable habitat in the immediate vicinity of the LNG facility. Air expelled from the cooling system is expected to return to ambient temperatures within approximately 32 m of the air cooling system.

It is the proponent's view that the predicted effects to foraging and nesting habitat and sensory disturbance from the Project design changes are within the range assessed during the EA. Therefore, the proponent stated that no additional mitigation measures would be required, and the assessment of the residual environmental effects inclusive of the air cooling system during the EA would continue to apply.

The proponent committed to include wildlife monitoring for migratory birds in the wildlife management and monitoring plan required for the operation phase in order to confirm its conclusion that noise and warm air from the air cooling system does not have any meaningful adverse interactions with migratory birds.

³ Decibel is the unit for sound level; A-weighted decibel is a unit for relative loudness of sounds in air as perceived by the human ear, as the human ear is less sensitive at low audio frequencies than at high audio frequencies.

3.2.1.2 Agency's Analysis and Conclusions

Noise

The Agency is of the view that the installation of the air cooling system on top of the LNG train would not substantially increase the number of noise sources or extend the construction phase of the Project. The Agency accepts that the construction noise assessment conducted during the EA would remain valid.

The Agency accepts that the revised noise modelling results, which show noise level at receptor locations, did not change from the noise levels predicted during the EA. The Agency notes, however, that the proponent did not provide predicted sound levels within the Project area. The Agency is of the view that migratory birds would avoid areas with high sensory disturbance where sound levels could reach over 85 dBA.

Heat

The Agency notes that Lyackson First Nation provided comments during the comment period held by the EAO, indicating a need for wildlife monitoring to confirm that warm air and noise do not have any adverse interactions with birds. Tsleil-Waututh Nation agreed with the proponent's view that wildlife monitoring would be required, and noted that such monitoring plan should be developed in consultation with Aboriginal groups.

The Agency concurs with Tsleil-Waututh Nation, Lyackson First Nation and the proponent's commitment that wildlife monitoring would be required during operation to validate the prediction that the noise and warm air from the air cooling system do not adversely affect migratory birds. Environment and Climate Change Canada (ECCC) agreed that the shrouded and horizontally-oriented cooling fans would help protect birds from being struck by the cooling fans. ECCC also agreed monitoring would be required to confirm the effectiveness of the mitigation measures. Taking into account that wildlife monitoring should be conducted to confirm the predictions of the EA, the Agency accepts that changes to noise or heat will not have any additional adverse environmental effects on Migratory birds.

Tsleil-Waututh Nation disagreed with the use of an indicator species to represent a wider range of species, and expressed concerns of any sensory disturbance on migratory birds. This methodology was adopted during the EA, and was accepted by ECCC. Therefore, the Agency is of the view that this methodology is acceptable for the purposes of the Analysis, and that the proponent's commitment to conduct wildlife monitoring would be sufficient to verify the conclusions made during the EA and in this Analysis.

3.2.2 Mill Creek Water Intake

3.2.2.1 Proponent's Assessment

The proponent expects that the proposed changes to Mill Creek would not change the interactions with migratory birds that were identified and assessed during the EA. The mitigation measures identified during the EA would remain valid to avoid or reduce adverse environmental effects to migratory birds as a result of the proposed project changes in Mill Creek.

Western screech-owl, spotted owl, and marbled murrelet were selected as indicator species for the purpose of the proponent's assessment. The habitat suitability index for Western screech-owl is the same at the proposed and existing Mill Creek intake locations. Spotted owl wildlife habitat areas do not overlap with either the proposed or existing Mill Creek intake. Marbled murrelet wildlife habitat areas do not overlap with either the proposed or existing Mill Creek intake sites. Marbled murrelet nesting habitat was assessed in 2014 through a Geographic Information System-based assessment and a helicopter-based low-level aerial assessment. The assessment of available suitable marbled murrelet nesting habitat indicated that marbled murrelet is unlikely to occur in the Project area.

3.2.2.2 Agency's Analysis and Conclusions

The Agency agrees with the proponent's assessment, and agrees that no new mitigation measures would be required to avoid or reduce adverse environmental effects to migratory birds as a result of the proposed project changes in Mill Creek.

3.2.3 Water Extraction at Woodfibre Creek

3.2.3.1 Proponent's Assessment

The proponent did not identify any new interactions with migratory birds due to the extraction of water from Woodfibre Creek.

3.2.3.2 Agency's Analysis and Conclusions

Extraction of water from Woodfibre Creek has a potential to cause sensory disturbance to migratory birds and affect their foraging and nesting habitat. However, given that only one temporary pump would be used to extract water from Woodfibre Creek, effects from sensory disturbance and on foraging and nesting habitats are expected to be limited. Mitigation measures in relation to water extraction at Mill Creek to avoid or reduce adverse environmental effects to migratory birds would also be applicable at Woodfibre Creek.

3.2.4 Extension of Operation from 25 to 40 Years

3.2.4.1 Proponent's Assessment

The proponent reviewed the assessment methodology applied during the EA and concluded that this methodology was also valid to assess environmental effects for an operation of 40 years. The proponent concludes that there would be no changes to the assessment and conclusions in relation to the extension of operation to 40 years.

3.2.4.2 Agency's Analysis and Conclusions

Based on the information provided by the proponent the Agency accepts the proponent's conclusion that there are no new adverse environmental effects to migratory birds anticipated based on a change of duration from 25 to 40 years. The duration and reversibility of residual effects to migratory birds are still considered as "long term" and "reversible" as identified during the EA.

3.3 Greenhouse Gas Emissions

On January 27, 2016, the Government of Canada announced an interim approach and principles for federal environmental assessments wherein direct and indirect (upstream) greenhouse gas (GHG) emissions are to be considered. This section discusses the direct and upstream GHG emissions linked to the proposed Project design changes.

3.3.1 Proponent's Assessment

The proponent does not expect changes to Project-related GHG emissions due to the proposed project changes. The proponent indicated that energy consumption for air cooling is expected to be equivalent to or less than the energy consumption for seawater cooling at any given time and that the mitigation measures previously identified during the EA to reduce GHG emissions would still be applicable.

The proponent provided an updated estimate of upstream greenhouse gas emissions associated with the Project's operation changing from 25 to 40 years. The proponent adopted an annual emission rate of 0.740 million tonnes of carbon dioxide equivalent (CO₂e) per year, the same as the rate used during the EA. The Project would emit, with an operation of 40 years, a total of 29.6 million tonnes of CO₂e.

3.3.2 Agency's Analysis and Conclusions

During the EA, the Project's direct GHG emissions were stated to be 44,700 tonnes (t) of CO₂e during the 24-month construction of the Project. The Project's direct emissions during operation were estimated to be approximately 129,400 t CO₂e annually mainly from stationary and mobile combustion, flaring, and fugitive sources.

The proponent did not provide an updated construction GHG emission rate as a result of the proposed project changes. While it can be reasonably assumed that GHG emissions associated with the Mill Creek Water Intake would not change since only the location changed, no emission information was provided with regard to the installation of the Woodfibre Creek Water Intake. The difference in emission, if any, between constructing a seawater cooling system and installing an air cooling system was also not provided. However, the Agency is of the view that any of such difference would be insignificant compared to the overall Project construction emissions.

The proponent indicated the proposed changes, during operation, would consume equal or less energy than what was assessed during the EA. Based on this, the annual emission rate of greenhouse rate would be equal to or less than the emission that was assessed during the EA. With an extension of operation from 25 to 40 years, the proponent did not indicate this annual emission rate would change. However, instead of 25 years, such emission would now be occurring over a 40-year period. The Agency accepts that the direct GHG emissions during operation would continue to be approximately 129,400 t CO₂e annually. The Agency is also of the view that mitigation measures established in the EA would continue to apply.

The lower and upper limits of the annual upstream GHG emission rates adopted in ECCC's *Woodfibre Liquefied Natural Gas Project – Review of Related Upstream Greenhouse Gas Emission Estimates* were

0.70 megatonnes (Mt) CO₂e and 0.88 Mt CO₂e, respectively. Using these emission rates, total upstream GHG emission for an operation of 40 years would be in the range of 28.0 to 35.2 Mt CO₂e.

Tsleil-Waututh Nation does not agree with the methodology adopted in the assessment of GHG emissions. Tsleil-Waututh Nation's view is that GHG emissions resulting from the construction of the air cooling system, potential construction/upgrade of the Mill Creek water intake, and any works associated with water extraction at Woodfibre Creek should be computed. In addition, Tsleil-Waututh Nation reiterated their views that the upstream GHG estimate is insufficient. The Agency is of the view that GHG emissions from construction would be less than that from the operation of the Project, and changes in GHG emissions as a result of the proposed project changes would be minute. Upstream GHG estimates were also computed based on best available information at the time this Analysis was prepared. The proponent is required by B.C. and ECCC to report Project-related GHG emissions annually, as this Project would exceed the reporting requirement of 10,000 and 50,000 t CO₂e per year for B.C. and ECCC, respectively. Therefore, the Agency is of the view that the assessment presented above is sufficient for the purpose of this Analysis.

3.4 Human Health

An effect of any change that may be caused to the environment on health with respect to Aboriginal peoples is included in the definition of environmental effects under section 5 of CEEA 2012 and was assessed during the EA. The Decision Statement issued for the Project included conditions in relation to human health.

During the EA, the proponent took into consideration air quality, atmospheric sound, light, site contamination, surface water quality, marine water quality, infrastructure and community service, and visual quality in their human health risk assessment (HHRA). The proponent indicated that proposed project changes have a potential to have an adverse effect on atmospheric sound, visual quality, and air quality. Therefore, only these three environmental components were brought forward for further analysis of their potential effects on human health.

Construction and operation noise was not included in the proponent's assessment of human health during the EA, as atmospheric sound predictions provided adequate confidence to the proponent that changes in the acoustic environment in the vicinity of the Project would not result in adverse health effects.

Acute and chronic inhalation assessments were included in the HHRA during the EA, based on predicted air quality concentrations for the operation phase. Soil deposition modeling was also carried out to predict how soil concentrations compared to screening criteria.

During the EA, it was concluded that the Project would result in reduced visual quality due to site clearing, infrastructure development, and the mooring of LNG carriers; and there would not be significant adverse effects on visual quality.

Tsleil-Waututh Nation expressed concern that the effects of noise on cultural health were not given sufficient consideration.

3.4.1 Change from Seawater to Air Cooling

3.4.1.1 Proponent's Assessment

The proponent did not re-assess construction noise related to the installation of the air cooling system, as it was determined that there is no change to the nature of interaction or rating identified and considered during the EA. Equipment and activities used to install the air cooling system would be the same or similar to what was already contemplated during the EA. The proponent, however, anticipated that operation of the air cooling system would increase sound level due to operation of the fans.

Through noise modelling, operation sound levels from the air cooling system were predicted to remain within applicable guidelines. The conclusions of the EA would not change, and public health would not be affected by noise. The proponent stated that mitigation measures related to noise identified during the EA would still be applicable. The proponent also committed to carry out atmospheric sound monitoring during operation to verify the predicted sound levels.

The proponent is of the view that operation of the air cooling equipment would not have any interactions with visual quality. The proposed air cooling system would not extend beyond the height of the tallest building (heat exchangers) within the Project Area. There would be no change in visual quality and, therefore, there are no additional effects to human health as a result of change in visual quality. The proponent stated that mitigation measures identified during the EA would still be applicable and no new mitigation measures would be required.

The proponent noted that installation of the air cooling system would not change the air emissions identified and assessed during the EA. The nature and rating of the interaction would be the same as what was assessed during the EA because the equipment and activities to install air cooling system would be the same or similar to what was already contemplated during the EA. Cooling fans are electrically driven and so there would be no additional air emissions due to operation of the air cooling system. The proponent determined that no additional emissions of nitrogen dioxide, sulphur dioxide, carbon monoxide, total suspended particulates, inhalable particulate matter, and respirable particulate matter from the Project would occur. There would be no need for changes to air quality mitigation measures proposed during the EA.

Based on the above, the proponent concluded that proposed project changes would not affect the conclusions of the HHRA that was conducted during the EA, and mitigation measures previously identified during the EA would remain applicable.

3.4.1.2 Agency's Analysis and Conclusions

The Agency agrees with the proponent's conclusion that the air cooling system would not cause significant adverse environmental effects on human health. Mitigation measures previously identified during the EA would remain applicable. No changes to the mitigation measures would be required.

3.4.2 Mill Creek Water Intake

3.4.2.1 Proponent's Assessment

The proponent determined that construction noise associated with the upgrading of the existing Mill Creek Water Intake would not change regardless of the intake location because the equipment and activities to upgrade or replace the existing intake would be the same or similar as what would be used to build a new intake.

The proponent concluded that the EA conclusion would not change, and public health would not be affected by noise. Mitigation measures related to noise identified during the EA would still be applicable. The proponent also committed to carry out atmospheric sound monitoring during operation to verify the predicted noise levels.

It is the view of the proponent that extraction of water from Mill Creek would not have any interactions with visual quality. The proponent concluded that upgrading the existing Mill Creek water intake would have no new interaction with visual effects compare to what was assessed during the EA. There would be no change in visual quality and, therefore, no additional effects to human health as a result of change in visual quality. Mitigation measures identified during the EA would still be applicable and no new mitigation measures would be required.

The proponent noted that construction and operation of the proposed Mill Creek water intake would not change the air emissions identified and assessed during the EA as the equipment and activities to upgrade or replace the existing intake will be the same or similar to what would be used to build a new water intake. The proponent determined that no additional emissions of nitrogen dioxide, sulphur dioxide, carbon monoxide, total suspended particulates, inhalable particulate matter, and respirable particulate matter from the proposed project changes would occur. There would be no changes to air quality mitigation measures proposed during the EA.

3.4.2.2 Agency's Analysis and Conclusions

The Agency agrees with the proponent that equipment and activities required to upgrade or replace an existing water intake would be the same or similar to what would be used to build a new water intake. The proponent did not identify any differences in sound levels and air pollutant concentrations at the receptor locations associated with the change in water intake locations, and the Agency is of the view that this would not alter the previous conclusions reached in the EA.

The Agency agrees with the proponent that upgrading or construction of a new water intake at the existing Mill Creek water intake location would not cause significant adverse effects to visual quality.

Based on the above, the Agency agrees with the proponent that no significant adverse environmental effects to human health are expected as a result of the proposed changes to the Mill Creek water intake.

3.4.3 Water Extraction at Woodfibre Creek

3.4.3.1 Proponent's Assessment

The proponent did not anticipate sound levels in relation to water extraction at Woodfibre Creek to materially change from the noise levels predicted during the EA.

The proponent concluded that the findings of the EA would not change, and public health would not be affected by noise. Mitigation measures related to noise identified during the EA would still be applicable. The proponent also committed to carry out atmospheric sound monitoring during operation to verify the predicted noise levels.

The proponent is of the view that extraction of water from Woodfibre Creek would not have any interactions with visual quality. Therefore, there would be no effects to human health. No new mitigation measures would be required.

The proponent noted that the proposed water extraction from Woodfibre Creek would not change the air emissions identified and assessed during the EA; only one temporary pump would be used and this pump would have the same nature and rating of the interaction as the other equipment to be used during construction. The proponent determined that no additional emissions of nitrogen dioxide, sulphur dioxide, carbon monoxide, total suspended particulates, inhalable particulate matter, and respirable particulate matter from the Project would occur. There would be no changes to air quality mitigation measures proposed during the EA.

3.4.3.2 Agency's Analysis and Conclusions

The Agency is of the view that, given only one temporary pump would be used at the Woodfibre Creek water intake during construction there would not be appreciable effects to sound level and visual quality. No additional air emissions were identified from the operation of the pump. The Agency concludes that there would be no additional effects to human health in relation to the Woodfibre Creek water intake.

3.4.4 Extension of Operation from 25 to 40 Years

3.4.4.1 Proponent's Assessment

The proponent reviewed the assessment methodology applied during the EA and concluded that this methodology was also valid to assess environmental effects for an operation of 40 years. The proponent determined that there would be no changes to the assessment and conclusions in relation to the extension of operation to 40 years.

3.4.4.2 Agency's Analysis and Conclusions

Based on the information provided by the proponent, and advice from federal authorities, the Agency accepts the proponent's determination that there are no new adverse environmental effects anticipated to human health based on a change of duration from 25 to 40 years. The duration and reversibility of residual effects identified are still considered as "long term" and "reversible" as identified during the EA. The Agency is of the view that existing mitigation measures and follow-up

requirements in relation to human health would remain applicable throughout the lifetime of the Project.

3.5 Current Use of Lands and Resources for Traditional Purposes and Socioeconomic Conditions for Aboriginal Peoples

The EA considered and assessed changes that may be caused to the environment on the current use lands and resources for traditional purposes and socioeconomic conditions for Aboriginal peoples due to the Project as required under section 5 of CEAA 2012. The Decision Statement issued for the Project included conditions in relation to the current use of lands and resources for traditional purposes.

The proponent noted that potential effects of the Project on current use of lands and resources for traditional purposes included potential effects to the amount and quality of resources, which would in turn affect current uses, as well as sensory disturbances during current use activities.

During the EA, the proponent concluded that the Project is not likely to result in any adverse residual effects to the abundance, distribution, or quality of freshwater fish and fish habitat resources for current use. No Project-related residual adverse effects were expected for the current use of forage fish, and Project-related effects on the current use of marine mammals were not likely. Potential changes to VCs such as abundance, distribution, or quality of vegetation resources, avifauna resources, marine benthic habitat resources, and marine bird resources are not likely to affect current use. Sensory disturbance such as sound emitted from Project activities was not likely to cause significant adverse effects to current use activities.

Lyackson First Nation has expressed that increased GHG emissions from the Project could threaten the security and way of life of Indigenous peoples, due to an increased risk of forest fires, droughts, floods, and elevated water temperatures impacting wild salmon and other fish.

3.5.1 Change from Seawater to Air Cooling

3.5.1.1 Proponent's Assessment

The proponent did not carry out an assessment of the environmental effects of the installation of the air cooling system on the current use of lands and resources for traditional purposes, as the proponent determined that there would be no change to the nature of the interaction or rating identified during the EA for construction.

The air cooling system would be mounted on top of the LNG train. The heat exchangers adjacent to the train would remain the tallest structures at the LNG processing structure. The proponent is of the view that visual quality would, therefore, not deviate from what was assessed during the EA.

The operation of the air cooling system has the potential to cause sensory disturbance due to an increase in sound level. Sound levels during operation, with consideration of the air cooling system, would remain within the range assessed during the EA as demonstrated by noise modelling. The proponent concluded that adverse residual effects on current use from sensory disturbance are not

likely to be significant. The proponent determined that mitigation measures previously identified would still be valid and will be implemented. The proponent committed to conducting noise monitoring during operation to confirm modeling results.

The proponent also confirmed there would be no adverse environmental effects anticipated on socioeconomic conditions due to switching from seawater cooling to air cooling. As presented in section 3.1.1.1, potential adverse environmental effects previously identified in relation to the seawater cooling would be eliminated by switching to an air cooling system.

3.5.1.2 Agency's Analysis and Conclusions

The Agency agrees with the proponent that residual adverse effects to the current use of lands and resources for traditional purposes would not be anticipated as a result of switching to the air cooling system, and that mitigation measures previously identified would still be valid. In addition, as presented in section 3.1.1.2, mitigation measures required to address potential adverse environmental effects caused by the seawater cooling system would no longer be required.

3.5.2 Mill Creek Water Intake

3.5.2.1 Proponent's Assessment

The proponent is of the view that there would be no new interaction related to modifications to the Mill Creek water intake. The proponent stated that there is no change to the nature of the interaction or rating previously identified during the EA.

The proponent also confirmed there would be no additional adverse effects anticipated for the proposed changes to the existing Mill Creek water intake. Mitigation measures previously identified would remain applicable.

3.5.2.2 Agency's Analysis and Conclusions

Musqueam Indian Band indicated concerns that elk, a species of high importance to Musqueam Indian Band, could be affected by the extended access road for the Mill Creek water intake location. The Agency notes that in EAO's response to Musqueam Indian Band, dated April 3, 2017, the Mill Creek water intake location has a pre-existing access and that no road construction is contemplated as a part of the proposed project changes.

The Agency accepts that constructing and upgrading a water intake would involve similar, or the same, types of work. It is anticipated that moving the water intake location upstream by one kilometre would not cause any additional adverse effects to the current use of lands and resources for traditional purposes and the socioeconomic conditions of Aboriginal peoples, and that previously identified mitigation measures would remain applicable.

3.5.3 Water Extraction at Woodfibre Creek

3.5.3.1 Proponent's Assessment

The proponent is of the view that extraction of water from Woodfibre Creek has the potential to interact with the amount and quality of resources available. However, the proponent noted that residual effects to abundance, distribution, or quality of vegetation resources, avifauna resources, marine benthic habitat resources, and marine bird resources would be the same as those previously described during the EA. The proponent concluded that there would be no likely significant adverse environmental effects to the current use of lands and resources for traditional purposes as a result of the water withdrawal at Woodfibre Creek.

The proponent committed to maintaining minimum flow in Woodfibre Creek and to conducting noise monitoring during operation to confirm modelling results.

The proponent also confirmed there would be no adverse effects anticipated for a change in socioeconomic conditions due to the water intake at Woodfibre Creek.

3.5.3.2 Agency's Analysis and Conclusions

Musqueam Indian Band indicated concerns that elk, a species of high importance to Musqueam Indian Band, could be affected by the extended access road for water extraction at Woodfibre Creek. The Agency notes that in EAO's response to Musqueam Indian Band, dated April 3, 2017, the Woodfibre Creek water intake location has a pre-existing access and that no road construction is contemplated as a part of the proposed project changes.

The Agency agrees with the proponent that residual adverse effects to the current use of lands and resources for traditional purposes would be similar to what was already assessed during the EA, and that previously identified mitigation measures would remain applicable.

3.5.4 Extension of Operation from 25 to 40 Years

3.5.4.1 Proponent's Assessment

The proponent reviewed the assessment methodology applied during the EA and concluded that this methodology was also valid to assess environmental effects for an operation of 40 years. The proponent determined that there would be no changes to the assessment and conclusions in relation to the extension of operation to 40 years.

3.5.4.2 Agency's Analysis and Conclusions

Tsleil-Waututh Nation disagreed with the proponent's assessment and requested a more thorough assessment be conducted. Specifically, Tsleil-Waututh Nation expressed concern with the potential environmental effects of the extended operation of the Project and the associated adverse effect this could have on their ability to transfer knowledge from one generation to the next, including knowledge related to traditional use and activities in the area of the Project. The Agency is of the view that no changes to the mitigation measures and follow-up requirements in relation to current use of lands and resources for traditional purposes and socioeconomic conditions for Aboriginal peoples

would be required. Existing mitigation measures and follow-up requirements, such as the development and implementation of a communication protocol, in consultation with Aboriginal groups, related to marine transport, and of a follow-up program to verify the accuracy of the environmental assessment as it relates to the effects of vessel wake; and consultation with Aboriginal groups to seek opportunities for marine and land access around the Project area for Aboriginal groups to practice their current use of land and resources for traditional purposes and to pursue socioeconomic opportunities would hold throughout the lifetime of the Project. With information available to the Agency at the time this Analysis was prepared, the Agency agrees that the assessments and conclusions made during the EA would remain valid when considering the change of operation to 40 years.

3.6 Physical and Cultural Heritage, and Structures, Sites, or Things of Historical, Archaeological, Paleontological or Architectural Significance for Aboriginal Peoples

Environmental effects to physical and cultural heritage, and structures, sites, or things of historical, archaeological, paleontological or architectural significance are included in the definition of environmental effects under section 5 of CEAA 2012. These effects were assessed as part of the EA and the Decision Statement issued for the Project included conditions in relation to physical and cultural heritage, and structures, sites, or things of historical, archaeological, paleontological or architectural significance.

3.6.1 Change from Seawater to Air Cooling

3.6.1.1 Proponent's Assessment

The proponent is of the view that there would be no changes to the potential environmental effects on cultural or heritage resources as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance due to switching from seawater cooling to air cooling as the amount of ground disturbance would not be increased from what was assessed during the EA. Changing from seawater cooling to air cooling would not affect the conclusions of the EA in relation to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance.

The proponent indicated that previously proposed mitigation measures related to physical and cultural heritage, and structures, sites, or things of historical, archaeological, paleontological or architectural significance, other than those in relation to seawater cooling, would remain applicable.

3.6.1.2 Agency's Analysis and Conclusions

The Agency accepts that since the air cooling system would be mounted on top of the proposed LNG facility, there would be no additional ground disturbance. The Agency agrees with the proponent that switching from seawater cooling to air cooling would not cause additional adverse environmental effects to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance. The Agency is of the view that mitigation measures previously proposed during the EA would continue to remain valid.

3.6.2 Mill Creek Water Intake

3.6.2.1 Proponent's Assessment

The proponent is of the view that there would be no changes to the potential effects on cultural or heritage resources as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance due to upgrading or re-constructing a new Mill Creek water intake as the amount of ground disturbance would be similar to what was assessed during the EA.

The proponent undertook an Archaeological Impact Assessment of the Project area in 2016 and did not identify any new archaeological sites. According to the proponent, previous industrial developments within the Project Area have disturbed the area and that the potential to identify intact archaeological materials is very low. However, the proponent would still implement a chance find procedure as a mitigation measure for any ground-disturbing works undertaken within the Project Area.

The proponent determined that upgrading or re-constructing a new Mill Creek water intake would not affect the conclusions of the EA in relation to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance.

The proponent indicated that previously proposed mitigation measures related to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance would remain applicable.

3.6.2.2 Agency's Analysis and Conclusions

The Agency agrees that the amount of ground disturbance caused by upgrading or re-constructing the existing water intake structure at Mill Creek would be similar to what was assessed during the EA. The proponent did not identify any additional adverse effects on physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance due to a change in water intake location.

As buried pipes would not require upgrades, and there is an existing mitigation measure that requires the implementation of a chance find protocol in the event that any structure, site or thing of historical, archaeological, paleontological or architectural significance was discovered by the proponent or brought to the attention of the proponent during any ground disturbance work, the Agency agrees with the proponent that the proposed project changes would not cause additional adverse effects to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance. Previously identified mitigation measures would remain valid and be sufficient.

3.6.3 Water Extraction at Woodfibre Creek

3.6.3.1 Proponent's Assessment

The proponent is of the view that there are no changes to the potential effects on cultural or heritage resources as well as structures, sites, or things of historical, archaeological, paleontological or

architectural significance due to water extraction at Woodfibre Creek, as the amount of ground disturbance would not be increased from what was assessed during the EA. Water extraction at Woodfibre Creek would not affect the conclusions of the EA in relation to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance.

The proponent indicated that previously proposed mitigation measures related to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance would remain applicable.

3.6.3.2 Agency's Analysis and Conclusions

It is the Agency's view that there would be minimal additional ground disturbance. As no construction works would be required, the Agency is of the view that adverse effects to physical and cultural heritage, as well as structures, sites, or things of historical, archaeological, paleontological or architectural significance would be negligible. Currently proposed mitigation measures, including one that requires the implementation of a chance find protocol in the event that any structure, site or thing of historical, archaeological, paleontological or architectural significance is discovered by the proponent or brought to the attention of the proponent during any ground disturbance work, are sufficient and additional mitigation measures would not be required.

3.6.4 Extension of Operation from 25 to 40 Years

3.6.4.1 Proponent's Assessment

The proponent reviewed the assessment methodology applied during the EA and concluded that this methodology was also valid to assess environmental effects for an operation of 40 years. The proponent determined that there would be no changes to the assessment and conclusions in relation to the extension of operation to 40 years.

3.6.4.2 Agency's Analysis and Conclusions

Based on the information provided by the proponent, and advice from federal authorities, the Agency accepts the proponent's determination that there are no new adverse environmental effects anticipated based on a change of duration from 25 to 40 years. The duration and reversibility of residual effects on physical and cultural heritage, and structures, sites, or things of historical, archaeological, paleontological or architectural significance are still considered as "long term" and "reversible" as identified during the EA.

3.7 Listed Species at Risk

Section 79(2) of the *Species at Risk Act* (SARA) requires the identification of the Project's adverse effects to SARA listed wildlife species and their critical habitat. If the Project is carried out, SARA requires that measures be taken to avoid or lessen those effects and that such effects be monitored. The Decision Statement issued for the Project included conditions in relation to species at risk, specifically the little brown myotis (*Myotis lucifugus*).

3.7.1 Change from Seawater to Air Cooling

3.7.1.1 Proponent's Assessment

During the EA, it was identified that adverse effects to bats during construction and operation of the Project would include indirect loss of roosting and foraging habitat due to sensory disturbance by noise and heat.

The proponent predicted that up to approximately 18.9% of the foreshore habitat in the Local Assessment Area and approximately 13.1% in the Regional Assessment Area would occur within the 70 dBA noise threshold during construction. Equipment and activities associated with installation of the air cooling system would be the same or similar to what was already assessed during the EA. The proponent stated that sound levels in the Project area, including the operation of the air cooling system, are predicted to be within the range assessed during the EA, and that there would be no additional effects to at-risk bat populations from the air cooling system due to noise.

The proponent indicated that the cooling fans would be shrouded and oriented horizontally, which would help protect bats from mortality caused by colliding with the fans.

The proponent committed to conduct noise and wildlife monitoring to confirm that there would be no meaningful adverse interactions with at-risk bats due to the operation of the air cooling system.

3.7.1.2 Agency's Analysis and Conclusions

ECCC agreed that the shrouded and horizontally-oriented cooling fans would help protect bats from being struck by the cooling fans. ECCC also agreed monitoring would be required to confirm the effectiveness of the mitigation measures. The Agency accepts the proponent's determinations and agrees that an additional follow-up measure of wildlife monitoring during operation of the air cooling system related to at-risk bats would be required.

3.7.2 Existing Mill Creek Water Intake

3.7.2.1 Proponent's Assessment

The proponent is of the view that proposed changes to Mill Creek would not change the interactions with at-risk bats that were identified during the EA, as there is no change to the nature of the interaction or rating identified during the EA.

The proponent predicted that indirect loss of at-risk bat species habitat due to sensory disturbance would be within the range assessed during the EA; therefore, additional mitigation measures are not required and residual effects inclusive of the proposed project changes do not change from those assessed during the EA.

The proponent noted that western toad is a pond-breeding amphibian, and any water intakes would be located in high-gradient creeks. The proponent indicated that mitigation measures implemented for fish would also protect amphibians.

Mitigation measures related to species at risk previously identified during the EA would remain applicable.

3.7.2.2 Agency's Analysis and Conclusions

The Agency accepts that the predicted indirect loss of at-risk bat species habitat due to sensory disturbance is within the range assessed during the EA. Additional effects to at-risk bat species habitats associated with moving the water intake location one kilometre upstream were not identified.

While the proponent did not assess other species at risk such as amphibians, which have the potential to occur at Mill Creek, ECCC agreed that mitigation measures implemented for fish would also protect amphibians. The Agency concurs with ECCC's advice.

The Agency concludes that, taking into account that there is already an existing water intake infrastructure at the proposed location, the operation of the new or upgraded water intake infrastructure is not expected to cause adverse effects to species at risk in the area.

3.7.3 Water Extraction at Woodfibre Creek

3.7.3.1 Proponent's Assessment

The proponent indicated there are no interactions identified with at-risk bats due to the use of water from Woodfibre Creek.

The proponent noted that western toad is a pond-breeding amphibian, and any water intakes would be located in high-gradient creeks. The proponent indicated that mitigation measures implemented to protect fish from entrainment and impingement, such as installation of screens on the pumps, would also protect amphibians.

3.7.3.2 Agency's Analysis and Conclusions

Water extraction at Woodfibre Creek would involve the use of only one temporary pump during the construction phase. The Agency is of the view that there would be limited sound and air emissions from the operation of the pump. The Agency also accepts that sensory disturbance to species at risk in the area would be limited and temporary.

Water extraction at Woodfibre Creek has the potential to cause incidental capture of amphibians through entrainment and impingement, including the risk of harm to amphibians such as western toad. The Agency agrees that mitigation measures to protect fish, such as installation of screens on the pumps, would mitigate adverse effects to at-risk amphibians.

3.7.4 Extension of Operation from 25 to 40 Years

3.7.4.1 Proponent's Assessment

The proponent reviewed the assessment methodology applied during the EA and concluded that this methodology was also valid to assess environmental effects for an operation of 40 years. The

proponent determined that there would be no changes to the assessment and conclusions in relation to the extension operation to 40 years.

3.7.4.2 Agency's Analysis and Conclusions

Based on the information provided by the proponent, and advice from federal authorities, the Agency accepts the proponent's determination that there are no new adverse environmental effects to species at risk anticipated based on a change of duration from 25 to 40 years. The duration and reversibility of residual effects to species at risk are still considered as "long term" and "reversible" as identified during the EA.

3.8 Impacts to Aboriginal Rights

3.8.1 Proponent's Assessment

The Project site is within the asserted traditional territory of Squamish Nation. The proponent and Squamish Nation have an agreement which allows Squamish Nation to choose the cooling technology to be adopted by the Project. The proponent proposed the change from seawater cooling to air cooling after Squamish Nation indicated that, after comparing various options, air cooling would be used for the Project. The proponent indicated that impacts to Squamish Nation's Aboriginal rights would be assessed under the Squamish Nation EA process and information pertaining to the process is confidential.

The proponent noted that the Local Assessment Area for the current use of lands and resources for traditional purposes is within Tsleil-Waututh Nation's consultation area, an area where there is a potential for direct Project-related effects to resources that are currently used by Tsleil-Waututh Nation. The proponent concluded that there would be no change to the impacts from the proposed project changes on Tsleil-Waututh Nation's Aboriginal rights as examined during the EA. The proponent concluded that effects from the proposed project changes on biophysical components, including avifauna, freshwater fish and fish habitat, atmospheric environment, atmospheric sound, surface water quantity and visual quality, are not likely to occur or would be negligible if they were to occur.

The proponent also identified no adverse effects to the marine environment from the proposed project changes, and concluded that it is accordingly not required to conduct an assessment of impacts to Aboriginal rights for 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 British Columbia, as these groups were consulted based on their asserted uses of the marine environment.

With regard to the extension of operation from 25 to 40 years, the proponent reviewed the assessment methodology adopted during the EA, and verified that the assessment conducted during EA remained valid. The proponent determined that there would be no changes to the assessment and conclusion.

3.8.2 Agency's Analysis and Conclusions

Tsleil-Waututh Nation did not agree with the methodology adopted for the assessment of the extension of operation from 25 to 40 years, and reiterated their position that the proponent and regulatory agencies failed to properly assess the Project's potential to cause adverse impacts to Tsleil-Waututh Nation's title, rights, and interests. The Agency met with Tsleil-Waututh via teleconference on December 1, 2017 to better understand their concerns. Concerns in relation to the proposed project changes were addressed by changes in mitigation measures where possible.

The change from seawater to air cooling would eliminate any impacts to marine harvesting and fishing, as identified during the EA, which would have resulted from the seawater cooling system. Since no additional adverse environmental effects on fish and fish habitat, migratory birds, human health, current use of lands and resources for traditional purposes, and physical and cultural heritage are anticipated from the proposed project changes, impacts to Aboriginal rights, including hunting, fishing, trapping, and gathering, are not anticipated to differ from what was assessed during the EA. With the implementation of previously identified mitigation measures and the proposed wildlife monitoring as described above, and taking into consideration the desire of Squamish Nation to have the seawater cooling system changed to air cooling, the Agency does not anticipate the proposed project changes would cause additional impacts to Aboriginal rights.

4 Consultation with Indigenous Groups

For the purpose of the Project, “Aboriginal groups” as defined in the Decision Statement includes the following Indigenous groups:

- 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
- Métis Nation British Columbia

The Project is located within the asserted traditional territory of Squamish Nation, and the Consultation, Accommodation, and Resources Access Boundary of Musqueam Indian Band. Marine activities associated with the Project would fall within the asserted traditional marine territory of Squamish Nation, the Consultation, Accommodation, and Resources Access Boundary of Musqueam Indian Band, and the consultation area of Tsleil-Waututh Nation. Proposed shipping routes to the mouth of Howe Sound also overlap the asserted traditional marine territories of Musqueam Indian Band, Cowichan Tribes First Nation, Halalt First Nation, Lake Cowichan First Nation, Lyackson First Nation, Penelakut Tribe, and Stz’uminus First Nations. Métis Nation British Columbia conducts consultation on behalf of its chartered communities and their citizens, and has indicated that Métis citizens practice harvesting rights in Howe Sound. The proponent sent a notification letter to Aboriginal groups on January 3, 2017, advising of the proposed project changes.

The proponent and Squamish Nation had entered into an agreement to conduct a separate Project review process (Squamish Nation Process) to discuss the potential effects of the Project on Squamish Nation’s interests. All discussions between the proponent and Squamish Nation under the Squamish Nation Process are considered confidential.

On October 14, 2015, Squamish Nation issued an Environmental Certificate to the proponent, allowing the Project to proceed in accordance with a set of conditions. One of the conditions is that Squamish Nation will select the cooling method to be used for the Project. On October 19, 2016, Squamish Nation advised the proponent of their decision to request the proponent to use air cooling as the cooling method for the Project. Furthermore, on January 20, 2017, Squamish Nation issued a letter to the proponent, indicating their support in submitting an EAC amendment application to EAO.

On February 3, 2017, the Agency sent out an email to all Indigenous groups to inform them and seek their views on the proposed project changes, as well as to offer participant funding to provide comments on the proponent’s analysis of adverse environmental effects due to the proposed project changes, and potential revision of federal conditions.

Tsleil-Waututh Nation, Musqueam Indian Band, Lyackson First Nation, and Métis Nation British Columbia applied for and received participant funding from the Agency to support their review and submission of written comments to the Agency on the proposed project changes and on the potential changes to conditions.

EAO conducted a public comment period from February 9, 2017 to March 11, 2017 on the proponent's application to amend the provincial EAC. Tsleil-Waututh Nation provided comments as a member of the EAO's Working Group for the amendment of the provincial EAC; Lyackson First Nation and Musqueam Indian Band submitted letters to the EAO and Agency on March 15 and 17, 2017, respectively, outlining their comments; the EAO responded to these letters on April 7 and 3, 2017, respectively. Métis Nation British Columbia provided comments to EAO during the public comment period. Comments from the public, Working Group, and Indigenous groups received during EAO's public comment period can be found at <https://projects.eao.gov.bc.ca/p/woodfibre-Ing/docs>.

4.1 Métis Nation British Columbia

Métis Nation British Columbia provided comments to the EAO on March 11, 2017, indicating that the proposed changes reflect an overall improvement to the Project: The change to an air cooling system would likely be better overall for the environment, particularly marine benthic organisms. Métis Nation British Columbia also indicated that water extraction at Woodfibre Creek would be of concern if it was to be utilized regularly throughout operations; however, since water would be extracted for a short term only, Métis Nation British Columbia was of the view that environmental effects would likely be negligible.

4.2 Tsleil-Waututh Nation

Tsleil-Waututh Nation submitted comments to EAO as a member of the Working Group for the provincial process, and submitted views to the Agency on November 1, 2017 and January 8, 2018 on the Analysis and potential changes to conditions.

Tsleil-Waututh Nation expressed concerns about the methodology applied to assess the environmental effects of the change of duration of operation from 25 to 40 years, and about gaps in the assessment of the effects of the proposed Project changes on migratory birds, greenhouse gas emissions, human health, the current use of lands and resources for traditional purposes and physical and cultural heritage and structures, sites or things of historical, archeological, paleontological or architectural significance for Aboriginal peoples. Tsleil-Waututh Nation stated that the proponent and federal and provincial regulatory authorities have failed throughout the EA process to properly assess the potential impacts of the Project on their title, rights, and interests, and that the Agency should recommend new or modified conditions to avoid, mitigate, or otherwise accommodate these impacts. These concerns are summarized in sections 3.2.1.2, 3.3.2, 3.4, 3.5.4.2, 3.6.2.2, 3.8.2, and 3.5.4.2 respectively.

4.3 Lyackson First Nation

Lyackson First Nation provided comments to EAO on March 15, 2017, which expressed concern related to cumulative impacts of large vessel traffic on their safety, health, and culture. Lyackson First Nations has also expressed concerns with regard to the Mill Creek water intake, water extraction and Woodfibre Creek, and their security and way of life as a result of increased GHG emissions. These concerns are summarized in sections 3.1.2, 3.1.3, and 3.5, respectively.

4.4 Musqueam Indian Band

Musqueam Indian Band submitted comments to the Agency on March 17, 2017 on the Report, and on October 16, 2017 on the Analysis. Musqueam Indian Band's comments on air cooling, Mill Creek water intake, and water extraction at Woodfibre Creek are summarized in sections 3.1.1.2, 3.5.2.2 and 3.5.3.2, respectively.

Musqueam Indian Band has also expressed concern about the lack of meaningful consultation by the federal government related to the Project. Musqueam Indian Band stated that the impacts of the Project on its Aboriginal rights and title had not been adequately assessed during the substituted EA and during the Agency's consideration of the proposed project changes, including changes to the duration of operation. The Agency met with Musqueam Indian Band on November 22, 2017 to discuss Musqueam Indian Band's overarching views on EA and consultation that are beyond the scope of this Project. The Agency has prepared a written response to Musqueam Indian Band's overarching views.

5 Conclusion

Considering the potential adverse environmental effects caused by the proposed project changes, and in light of expert advice and views received, the Agency determined that it is necessary to change mitigation measures and follow-up requirements in order to address the adverse environmental effects that result from the proposed project changes. The following new mitigation measures would be required:

- Minimum flow should be maintained in both Mill Creek and Woodfibre Creek to support fish and fish habitat;
- Water intakes should be designed, installed, and operated in such a way to avoid or reduce the risk of injury and mortality to fish in both Mill Creek and Woodfibre Creek; and
- Wildlife monitoring should be conducted, in consultation with Aboriginal groups, to verify the accuracy of the EA as it pertains to the environmental effects of the air cooling system on migratory birds and little brown myotis.

The following previously proposed mitigation measure would need to be modified to remove reference to residual chlorine concentrations and water temperature:

- Design, install and operate any marine discharge diffuser to prevent the deposit of a deleterious substance in water frequented by fish and taking into consideration the Canadian Council of Ministers of the Environment's *Water Quality Guidelines for the Protection of Aquatic Life* for residual chlorine concentrations and water temperature.