

Appendix K
Aboriginal Issues

Appendix K.1
Aboriginal Issues
Information Request #1

December 12, 2014

Catherine Ponsford
Project Manager
Canadian Environmental Assessment Agency
Pacific and Yukon Regional Office
410-701 Georgia Street West
Vancouver, BC V7Y 1C6

Dear Ms. Ponsford:

Reference: Aboriginal Issues Information Request #1

This technical memorandum responds to the request for Outstanding Information received from the Canadian Environmental Assessment (CEA) Agency on August 14, 2014, copied below.

Information Request #1

Aboriginal Issues – Outstanding Information:

In its EIS, the proponent includes a general, aggregated assessment of direct economic impacts with reference to Aboriginal peoples, including anticipated labor changes to populations, enhanced employment opportunities, income increases and training/education agreements. However, the EIS includes limited consideration of changes to economic conditions as a result of changes to the environment caused by the Project, which is a requirement of 5(1)(c) of CEEA 2012. The technical memo submitted in response to Aboriginal Issues – IR#1 partially addresses effects of changes to the environment on socio-economic conditions through impacts on Aboriginal health and on traditional harvesting. Qualitative information on the indirect economic impacts of changes to the environment (e.g., Aboriginal fisheries, including commercial fisheries, and water based tourism) is still required for each Aboriginal group. Concerns regarding the Project's environmental impacts on water tourism have been noted in the original IRs from Lax Kw'alaams. Transport Canada noted that the proponent's assessment of marine navigation usage would have captured the vessels used in the area for water-based tourism. The information needs to include a separate assessment for each Aboriginal group as requested.

See also Human and Ecological Health IR#1 and IR#2 regarding deficiencies identified with respect to the Human Health Risk Assessment in relation to the assessment of health and socio-economic conditions for Aboriginal peoples resulting from changes to the environment caused by the Project.

The Agency requires information collected through existing and ongoing socioeconomic studies with potentially-affected Aboriginal groups to be considered during the EIS review phase, and prior to regulatory permitting, in order to effectively support a decision regarding environmental effects of the Project related to 5(1)(c) of CEEA 2012.

Pacific NorthWest LNG Limited Partnership (PNW LNG) – Response:

This technical memorandum provides additional assessment of effects to Aboriginal groups' economic activities and interests due to project related environmental changes. This assessment is based on socio-economic studies with potentially-affected Aboriginal groups. Potentially-affected Aboriginal groups considered in the technical memorandum include: Metlakatla First Nation, Lax Kw'alaams First Nation, Gitxaala Nation, Kitselas First Nation, Kitsumkalum First Nation and Gitga'at First Nation.

The scope of the assessment outlines temporal and spatial boundaries and potential indirect economic effects. Information sources and methods provides TU/TK studies used for the assessment of effects and include a description of the steps taken to assess residual effects. The assessment section describes baseline conditions for each Aboriginal group and assesses indirect economic effects, provides mitigation measures and characterizes the residual effects.

Scope of the Assessment

Assessment Boundaries

Based on the current Pacific NorthWest LNG Project (the Project) schedule, the temporal boundaries for each project phase are:

- **Construction** Approximately 5 years from the *Canadian Environmental Assessment Act* approval
- **Operations** Over 30 years from construction completion
- **Decommissioning** After cessation of operations.

The spatial boundaries for the assessment are as follows:

Project Development Area

The project development area (PDA) is approximately 261 ha, including approximately 160 ha on Lelu Island and 100 ha of marine infrastructure. The project components on the mainland are limited to road infrastructure connecting the bridge and road from Lelu Island to the mainland, with a disturbance area of less than 1 ha.

Local Assessment Area

The local assessment area (LAA) includes Lelu Island, Stapledon Island, Ridley Island, Kitson Island, the Kinahan Islands, adjacent marine areas including Porpoise Channel, Flora Bank, Porpoise Harbour, Inverness Passage and Chatham Sound, and the potential use of the existing shipping route between the marine terminal and the pilot boarding station at Triple Island. The majority of the project related effects on this valued component (VC) will occur within the boundaries of the PDA and surrounding marine areas.

To capture potential effects from a broader range of related VCs the LAA also includes the wider area of all of Prince Rupert Harbour, the two communities of Prince Rupert and Port Edward, Kaien Island, most of Digby Island, and Smith Island. These boundaries include the respective LAAs for marine resources, air quality, and human and ecological health and reflect concerns brought forward during Aboriginal engagement.

Regional Assessment Area

The regional assessment area (RAA) includes the RAAs for marine resources, air quality, and human and ecological health. The RAA includes the Project's contribution to potential cumulative effects, in combination with other projects and activities.

Identification of Potential Effects

Indirect economic effects on Aboriginal peoples are expected to occur where project components and activities result in residual environmental effects that interfere with some Aboriginal economic activities. Traditional Aboriginal economic activities that have the potential to experience indirect economic effects from the Project include commercial fishing, marine-based tourism, and marine services such as ferry services, barging and towing. Environmental effects that have the potential to interact with these Aboriginal economic activities include effects on marine resources, navigation and marine use, visual quality, and heritage and archaeological resources.

Table 1 identifies relevant environmental VCs that are predicted to interact with project components and activities to result in residual effects.

Table 1 Valued Components Predicted to Experience Residual Effects due to Interaction with the Project

Project Components and Activities	Valued Components with Predicted Residual Effects				
	Marine resources	Navigation and Marine Use	Visual Quality	Human Ecological Health	Heritage and Archaeological Resources
Construction					
Site Preparation (land-based)			✓		✓
Onshore Construction			✓		✓
Vehicle Traffic					
Dredging	✓	✓	✓	✓	✓
Marine Construction	✓	✓	✓		✓
Waste Management and Disposal					
Disposal at Sea	✓				
Operational Testing and Commissioning					
Site Clean-Up and Reclamation					
Operations					
LNG Facility			✓	✓	
Marine Terminal Use	✓	✓	✓	✓	
Shipping	✓	✓	✓	✓	
Waste Management and Disposal					
Fish Habitat Offsetting					
Wetland Habitat Compensation					
Decommissioning					
Dismantling Facility and Infrastructure	✓	✓			

In addition to the potential interactions identified in Table 1, the Project holds the potential to result in indirect economic effects due to project related changes in population. Population changes are assessed in the Community Health and Well Being Section 18 of the EIS.

Project related residual environmental effects hold the potential to create the following indirect adverse economic effects to Aboriginal peoples and businesses:

- **Reduced (or increased) business revenue:** Reduced quantity and quality of fisheries resources could result in reduced catch and buyer demand, resulting in reduced sales. Reductions in marine

resources and degradation of the sensory environment and could reduce demand for marine-based tourism, resulting in reduced sales.

On the contrary, the Project use of aboriginal buildings (renting buildings from aboriginal groups), hiring aboriginal tree harvesting services to support investigative works, hiring aboriginals as environmental monitors, utilizing aboriginal ferry services, barging and water taxi services could (and have already) added considerable new sources of business revenue to the aboriginal groups (e.g., MDC building leases, Metlakatla Water Taxi, Metlakatla boat and crew rental).

- **Increased (or lower) cost of business:** Reduced fisheries resources and marine-based tourism resources, temporal interference with access to fishing locations and marine-based tourism locations, and temporal interference with marine vessel routes (ferries, barging, towing) could increase business expenses due to changes in time and costs (e.g., fuel, wages)
- **Reduced (or increased) income:** Reduced revenue for Aboriginal-owned businesses has the potential to result in reduced income for owners and employees. In addition, Aboriginal employees of non-Aboriginal businesses may experience similar effects
- **Reduced (or increased) employment:** Reduced revenue for Aboriginal-owned businesses has the potential to result in reduced employment for owners and employees. In addition, Aboriginal employees of non-Aboriginal businesses may experience similar effects.

Information Sources and Methods

Information Sources

The Proponent has utilized the following information sources prepared by Aboriginal groups for the Project:

- DM Cultural Services Limited and Metlakatla First Nations (DMC). 2014. Metlakatla First Nation Traditional Land Use and Ecological Knowledge of the Project. Final Report. Prepared for: PNW LNG. May 13, 2014
- Compass Resource Management Ltd. 2014. Impact Assessment of LNG and Other Development on the Metlakatla First Nation. Prepared for Metlakatla Stewardship Office. May 31, 2014.
- Inglis Consulting Services. 2014. Gitga'ata First Nation Traditional Use and Occupancy Study, Prince Rupert Region- Preliminary Results Report. Submitted to Gitga'at First Nation. July 7, 2014.
- Crossroads Cultural Resource Management (CRM). 2014a. Kitsumkalum First Nation Socio-Economic Impact Study- Petronas/Pacific Northwest LNG. Submitted to Kitsumkalum First Nation. July 2014.
- Crossroads Cultural Resource Management (CRM). 2014b. Kitsumkalum Traditional Use Study for the Pacific Liquefied Natural Gas Project. Submitted to Kitsumkalum First Nation. October 27, 2014.
- Pulla, Siomonn. 2014. Kitselas First Nation Traditional Use Study Analysis: Lelu Island and the North Coast of British Columbia. Prepared for: PNW LNG. August 15, 2014.
- Calliou Group. 2014a. Gitxaala Nation Socioeconomic Report. Prepared for Port Edward Area LNG Projects, including PNW LNG, on behalf of Gitxaala Nation. August, 2014.
- Calliou Group. 2014b. Gitxaala Use Study. Prepared for Port Edward Area LNG Projects, including PNW LNG, on behalf of Gitxaala Nation. July, 2014.

The Project has also accessed the following publically available sources (Table 2):

Table 2 Publically Available Secondary Sources

Metlakatla First Nation - website	http://www.metlakatla.ca/
Lax Kw'alaams Band- website	http://laxkwalaams.ca/
Kitsumkalum First Nation- website	http://www.kitsumkalum.bc.ca/index.html
Kitselas First Nation- website	http://www.kitselas.com/
Gitxaala Nation- website	http://gitxaalanation.com/
Gitga'at First Nation- website	http://www.gitgaat.net/index.html
Fisheries and Oceans Canada- Pacific Region- website	http://www.pac.dfo-mpo.gc.ca/index-eng.html

Efforts were made to locate copies of the most recent Comprehensive Fisheries Agreements (CFAs) negotiated between each Aboriginal group and the Ministry of Fisheries and Oceans Canada (DFO). However, the Proponent has been notified by DFO Pacific Region that these Agreements are no longer publically available online due to privacy concerns (J. Chin, Pers. Comm., 2014). This lack of publically available commercial fishing information has constrained the assessment of effects to these groups' economic conditions.

Steps in the Assessment

The assessment proceeds according to the following steps, for each Aboriginal group:

1. Baseline conditions are presented for Aboriginal marine economic activities that have the potential to interact with the Project's residual environmental effects, based on available information
2. Predicted indirect economic effects are provided based on a qualitative consideration of the Project's likelihood to adversely affect key conditions for marine economic enterprises, including: access to sites utilized for business operations; quantity of resources available for economic purposes; quality of resources used for economic purposes; and sensory environment for business activities (marine-based tourism)
3. Mitigation measures are presented
4. Residual effects are assessed following application of potential mitigation measures
5. Residual effects are characterized and a determination of significance is provided.

Assessment of Indirect Economic Impacts to Aboriginal Groups Resulting from Changes to the Environment

Metlakatla First Nation

Baseline Marine Economic Setting

The Metlakatla Development Corporation (an independent business arm of the Metlakatla Governing Council), operates a number of economic enterprises that hold the potential to interact with the Project's marine infrastructure and the increase in vessels coming to port in Prince Rupert harbour (MFN 2012):

- Metlakatla Ferry Services provides transportation between Prince Rupert and Metlakatla and is available for charters. PNW LNG contracts ferry and water taxi services from Metlakatla.
- North Co-Corp ferry service is owned by Hartley Bay (Gitga'at), Kitkatla (Gitxaala) and Metlakatla. The ferry provides transportation between Prince Rupert and Metlakatla, Hartley Bay, Kitkatla Village and Oona River.

- Gat Leedm Marine Services LLP, a joint venture LLP between Metlakatla Development Corporation and Island Tug & Barge Ltd, provides barging, towing, marine construction, and fuel supply services.

Metlakatla fishermen are active throughout the year in Fishery Management Area 4, within which the Project is located (Compass Resource Management Ltd. 2014).

The most consistently fish for economically valuable commercial fish species in Metlakatla territory. These include Sockeye salmon, herring, geoduck, pink salmon, and crab, in that order (Compass Resource Management Ltd. 2014).

Key Metlakatla First Nation salmon gillnetting and seining areas include Chatham Sound and marine waters immediately south of Lelu Island away from the Project's marine infrastructure. Gillnetting takes place at various depths and locations, but largely in the outer estuary of the Skeena River. Seining takes place near to shorelines.

Both fishing methods are used in mid- to late-summer. Herring is harvested by gillnet in open waters in the spring. Big Bay (outside of the project area) is a noted location. Crabs are trapped in low intertidal areas to depths of 230m year round. Crab fisheries are undertaken in waters to the southwest of Kitson Island (Compass Resource Management Ltd. 2014).

Currently, 15 Metlakatla fishers participate in the commercial fishery. MFN holds the following communal commercial licenses (Compass Resource Management Ltd. 2014):

- 1 salmon gillnet
- 1 salmon seine
- 1 prawn
- 1 area B crab
- 2 Halibut
- 1 roe on kelp
- 1 herring gillnet.

Information regarding these communal commercial licenses is not publically available.

Assessment of Indirect Economic Effects

Change in Business Revenue

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites and ferry services and barging/towing routes may be affected to the extent that access routes associated with these Metlakatla businesses overlap with project marine components and activities. A change in access to regular commercial fishing areas, ferry services and barging/towing routes may increase the time and effort spent in conducting these activities, and decrease the supply of resources or the demand by customers to utilize the business.

Project related vessel traffic during construction may occasionally alter preferred traditional access, particularly in and out of Porpoise Channel and through Lelu Slough. Activities related to dredging and disposal at sea may occasionally interfere with traditional marine navigation routes. Marine navigation is regulated by the Port of Prince Rupert and therefore project construction related disruptions will be managed so they do not unduly inconvenience traditional aboriginal navigation use in and around Porpoise Channel.

Access through Lelu Slough is limited to high tide events and may be limited periodically during construction of the bridge between Lelu Island and the mainland. North-south navigation between Lelu Island and Flora Bank is limited to high tide events and may be periodically limited during construction of the suspended bridge-trestle. Associated construction activities with respect to the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound may also temporarily impede normal access to the north-south channel just west of Lelu Island.

During operations, local traditional navigation will not be affected through Lelu Slough since the bridge will be designed to allow continuation of current use for boats up to gillnetter size. The suspended bridge-trestle extending over Flora Bank will have a clearance of approximately 11 metres under a portion of the suspended bridge-trestle near Lelu Island to allow high tide access to the current north-south channel and local traditional navigation travel route just west of Lelu Island.

Large ship navigation from the Pacific and into Chatham Sound may be temporarily affect local aboriginal business navigation (e.g., ferry to Hartley Bay) when LNG Carriers are being piloted into Port although only one LNG carrier per day/350 per year are estimated to berth at the terminal. Local navigation may also be affected by temporary anchorages of LNG Carriers at the Port. The anchorage locations will be identified by the PRPA and be within the Prince Rupert Inner Harbour and Chatham Sound.

Metlakatla First Nation commercial fishers utilize waters to the southwest of Lelu Island for crab fishing and waters to the north of Smith Island and in Chatham Sound for salmon fishing (Compass Resource Management Ltd. 2014). The extent to which Metlakatla fishers access these fishing areas via using the marine waters surrounding Lelu Island (Lelu Slough, Porpoise Channel and Flora Bank) to access these fishing sites has not been provided to the Proponent. The extent to which Metlakatla ferry services and Gat Leedm Marine Services utilize waters around Lelu Island has also not been provided to the Proponent.

The Port of Prince Rupert has been monitoring vessel traffic to and from Port Edward with cameras. This information is organized into two major categories, commercial fishing vessels and "other". A number of vessels transit in and out of Porpoise Channel increasing substantively in the summer months (1,000's of movements) due to the seasonal increase in commercial and recreational fishing traffic. The information collected by the Port does not differentiate aboriginal vessels from non-aboriginal.

Construction and, perhaps, if the Port approves decommissioning of the marine terminal will create temporary interferences to the movement of Metlakatla First Nation marine commercial enterprises using those locations and, conversely, likely provide opportunities for Metlakatla marine business and joint ventures.

Vessel movement will not be restricted during operations in those locations as vessel access has been maintained under the Project's marine infrastructure at high tide. Effects on Metlakatla marine vessel movements due to increased large vessel shipping and anchorages are expected to be minimal, as LNG Carriers coming to and leaving Port will be limited to one ship per day. Therefore, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project marine components and activities during construction, operations, and any Port-required decommissioning have the potential to affect the quantity of marine waters and resources used for commercial fishing. Quantity of resources is not anticipated to affect marine ferry services or

barging/towing. Changes to the quantity of fish resources may result in decreases in revenue earned by commercial fishermen.

Construction of project components such as the road access bridge between Lelu Island and the mainland, the MOF and turning basin in Porpoise Channel, as well as the suspended bridge-trestle over Flora Bank, the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound will temporarily render these locations unavailable for fishing, marine gathering, and marine hunting and trapping.

Upon completion of construction, passage under the road access bridge and the suspended bridge-trestle across Flora Bank will be possible at high tide throughout operations, however, it is envisioned that regulatory authorities may require marine safety exclusion zones to be put in place along and underneath the suspended bridge-trestle and along the pipe pile supported jetty on Agnew Bank. Marine traffic will likely only be possible right near Lelu Island where the suspended bridge-trestle allows for safe vessel passage for ships up to a gill netter in size at high tide.

Metlakatla First Nation commercial fishers utilize waters to the south of Lelu Island for crab fishing and waters to the north of Smith Island and Chatham Sound for salmon fishing (Compass Resource Management Ltd. 2014). The specific locations of Metlakatla First Nations halibut, prawn, herring, and roe on kelp fisheries have not been provided to the Proponent by Metlakatla.

The Project's suspended bridge and pipe pile trestles are not expected to result in the loss of marine waters for Metlakatla First Nations' commercial fishing, as limited (if any) commercial fishing occurs in the space planned for the suspended bridge-trestle and pipe pile trestle and the marine terminal (Compass Resource Management Ltd. 2014).

Construction and operations activities hold the potential to reduce the quantity of marine resources used by Aboriginal commercial fishers within preferred locations due to direct mortality and alteration of movement. Injury and mortality of fish due to blasting during construction is expected to be limited in extent (Section 13.5.4.3 in Appendix A of the EIS Addendum). Blasting activities during marine construction will be undertaken in accordance with DFO blasting guidelines in order to avoid harm to marine mammals. In addition, most species of commercial importance are expected to be rarely present or absent from the blast area. Resident Dungeness crabs will be relocated prior to blasting.

Injury or mortality due to 'Disposal At Sea' deposition at Brown Passage associated with dredging the MOF and Turning Basin is expected to affect only immobile species in close proximity to these activities. Increases in Total Suspended Solids (TSS) levels associated with dredging at the MOF and disposal at sea are not expected to result in injury or mortality to fish as marine organisms (including juvenile salmon) are; adapted to seasonal variations in TSS levels, levels are below those that cause lethal effects to salmon and other species, and the TSS will be limited in extent and duration. In any event, TSS will be monitored during dredging and deposition so that lethal levels do not result from these activities.

The relative number of marine resources available in preferred sites in the Project's marine infrastructure areas around Lelu Island may be reduced during construction due to altered distribution of fish (Section 13.5.5.3 in Appendix A of the EIS Addendum). There is potential for fish (e.g., eulachon, herring, rockfish) to react to construction noises; however, if such reactions occur, they are likely to be spatially and temporally limited. Salmon may show local avoidance of particularly noisy zones (Feist et al. 1996), but this reaction is expected to be limited in spatial extent and short-lived.

The relative number of marine resources available at Metlakatla preferred commercial fishing sites may be reduced due to altered distribution of fish populations (Section 13.5.5.3 in Appendix A of the EIS Addendum). The preferred fishing areas are not in close proximity to the Project's marine infrastructure, so impacts from project construction and operations to Metlakatla commercial fishing sites is anticipated to be low.

Metlakatla First Nation fishes commercially for salmon, prawn, crab, halibut, herring, and roe on kelp. Crab fishing is undertaken in waters to the south of Lelu Island. Salmon fishing is undertaken in waters to the north of Smith Island and in Chatham Sound (Compass Resource Management Ltd. 2014). The location of Metlakatla First Nations commercial halibut, prawn, herring, and roe on kelp fisheries have not been provided to the Proponent.

Project related reductions in the quantity of fish commercially harvested by MFN fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities at or near project marine infrastructure. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in reduced catch and buyer demand, resulting in reduced sales for Metlakatla commercial fishermen. Quality of resources is not anticipated to affect marine ferry services or barging/towing. Project components and activities during construction and operations hold the potential to affect the quality of marine waters and resources for used for commercial fishing.

The Project is not disposing of any LNG Plant liquid wastes into marine waters as they are being treated and sent to be treated and disposed of through the Port Edward waste water treatment system. Stormwater will be collected on Lelu Island, treated, stored and eventually deposited in the marine waters in Chatham Sound via a submerged outfall.

Porpoise harbour and channel sediments have concentrations of dioxins and furans. These existing sediment concentrations have been analyzed and are below Environment Canada disposal at sea thresholds. Existing sediment chemical compounds (e.g., dioxins and furans) exposed during MOF dredging or MOF vessel berthing and departure during construction and operations are not expected to pose to any toxicological risks to marine biota (Section 13.5.2.5 in Appendix A of the EIS Addendum) or to human health from the consumption of marine animals as these sediments have levels of contamination well below regulatory thresholds.

Underwater noise from impact pile driving during construction is anticipated. It can be mitigated using a bubble curtain. Therefore, the underwater noise is not expected to result in injury or mortality to fish.

The Project is not expected to affect the quality of resources commercially harvested by MFN members. Therefore, effects to business revenue due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Metlakatla First Nation is currently involved in marine based tourism, no negative effects to business revenue are anticipated due to changes in the sensory environment. Commercial fishing, ferry services or barging/towing are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

Change in Costs of Business

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites, ferry services and barging/towing routes may be affected to the extent that Metlakatla preferred commercial marine vessel access routes overlap with project components and activities. A change in access to regular commercial fishing areas, ferry services and barging/towing routes may increase the time and effort spent in conducting these activities, and increase the expenses incurred by the company in operating their businesses, for example through increases in fuel consumption for boats.

Changes in marine access that may affect marine waters and resources are assessed in detail above. To summarize, construction and decommissioning of the Project's marine infrastructure, (in the unlikely event decommissioning of marine infrastructure is approved by the PRPA), may create temporary interferences to the movement of Metlakatla First Nation commercial enterprises coming in and out of Porpoise Channel and harbor.

Vessel movements will not be unduly restricted during marine terminal operations in those locations. Effects on marine movement due to shipping and anchorages are expected to be minimal, as LNG carriers will move into Prince Rupert Harbour from Triple Island following existing shipping routes approximately once per day. Therefore, the increase in business costs due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and decommissioning hold the potential to affect the quantity of marine waters and resources used for commercial fishing. Quantity of resources is not anticipated to affect marine ferry services or barging/towing. Changes to the quantity of fish resources may increase the time and effort involved in finding and harvesting fish resources, resulting in an increase in expenses for the business, (e.g., increased wages and fuel).

Changes in the quantity of marine waters and resources are assessed in detail in above. To summarize, project related reductions in the quantity of fish commercially harvested by MFN fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business costs (such as the increased use of fuel) due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in a change in the location of commercial fishing and increase in time and effort to access fishing areas, resulting in increased costs for Metlakatla commercial fishermen. Quality of resources is not anticipated to affect marine ferry services or barging/towing.

Changes quality of marine waters and resources are assessed in detail in above. The Project is not expected to affect the quality of resources commercially harvested by MFN members. Therefore, effects to business costs due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that the Metlakatla First Nation is currently involved in marine based tourism, no effects to business costs are anticipated due to changes in the sensory environment. Commercial fishing, ferry services or barging/towing are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

Change in Income

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Metlakatla commercial fishing, ferry services and barging/towing operations as a result of changes to access to marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to temporary changes in Metlakatla preferred commercial vessel marine access, is anticipated to be small and manageable. Therefore, it is unlikely that a small change in business revenue will result in changes to incomes.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced income for owners and employees. Quantity of resources is not anticipated to affect marine ferry services or barging/towing.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employee income are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced income for owners and employees. Quality of resources is not anticipated to affect marine ferry services or barging/towing.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Metlakatla members. Therefore, no effects to employee income are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Metlakatla First Nation is currently involved in marine based tourism, no effects to employee income are anticipated due to changes in the sensory environment. Commercial fishing, ferry services or barging/towing are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

Change in Employment

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Metlakatla commercial fishing ferry services and barging/towing operations as a result of changes to access to marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in reduced employment.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced employment for owners and employees. Quantity of resources is not anticipated to affect ferry services or barging/towing.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employment are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced employment for owners and employees. Quality of resources is not anticipated to affect marine ferry services or barging/towing.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Metlakatla commercial fishers. Therefore, no effects to employment are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Metlakatla First Nation is currently involved in marine based tourism, no effects to employment are anticipated due to changes in the sensory environment. Commercial fishing, ferry services or barging/towing are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

Mitigation Measures

Mitigation measures for access to commercial use sites include:

- Measures to reduce changes to navigation (Section 15.5.2.2 of the EIS);

The PRPA will be coordinating marine construction through a required Construction Coordination Committee. A key objective for the committee is to minimize and mitigate temporary navigation interferences from marine construction in Port waters. The Project and the EPCC contractor are required to participate on this committee as this forms part of the Port's authorization for marine construction within the Port of Prince Rupert.

Mitigation measures for potential effects on quantity of marine waters and resources for commercial purposes include:

- Measures to reduce the potential for project related changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes to fish habitat (Section 13.5.3.2 in Appendix A of the EIS Addendum)
- Measures to reduce the potential for injury or mortality to fish (Section 13.5.4.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes in the behaviour of fish (Section 13.5.5.2 in Appendix A of the EIS Addendum).

Mitigation measures for potential effects on quality of marine waters and resources for commercial purposes include:

- Measures to reduce changes to marine resources due to changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum).

Residual Effects

Commercial Fishing

Following the implementation of mitigation measures, no residual effects are anticipated to Metlakatla commercial fishing operations. Changes in access to commercial fishing areas are predicted to be minimal. Changes in the quantity of fish resources are expected to be negligible, and no effects are predicted to the quality of fish resources harvested. Therefore, commercial fishing revenues and business costs should not change from baseline conditions. As no changes to commercial fishing revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of commercial fishers.

Ferry Services and Water Taxi Businesses

Following the implementation of mitigation measures, no residual effects are anticipated to Metlakatla ferry services and water taxi businesses. Temporary interferences with aboriginal vessel access related to ferry services routes are predicted to be minimal. Therefore, ferry services revenues and business costs should not change from baseline conditions. As no changes to ferry services revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of ferry services operation owners or employees.

PNW LNG often acquires water taxi and leased boat and boat crews supplied by Metlakatla.

Barging/towing Businesses

Following the implementation of mitigation measures, no residual effects are anticipated to Metlakatla barging/towing businesses. Changes in access to barging/towing routes are predicted to be minimal. Therefore, barging/towing revenues and business costs should not change from baseline conditions. As no changes to barging/towing revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of barging/towing operation owners or employees.

Summary of Significant Residual Indirect Economic Effects

There are no significant residual indirect economic effects to Metlakatla First Nation as a result of changes to the marine environment of the LAA and RAA.

Lax Kw'alaams First Nation

Baseline Marine Economic Setting

Lax Kw'alaams First Nation owns the Coast Tsimshian Seafood and Fish Plant. The company produces canned fish, crab and seafood, fish roe, and fish-oil for the natural health industry, and exports products to the United States and China (Section 27.1.2.4 of the EIS). The fish plant employs approximately 225 workers in the village of Lax Kw'alaams. The fishery also provides employment and skills training for approximately 150 fishing boat crew members in the community (Northern View 2013).

The success of the fish plant has been stated to be, at least in part, directly related to DFO and the Pacific Integrated Commercial Fisheries Initiative (PICFI) program, which provides First Nations with access to commercial fishing licenses. Lax Kw'alaams "flows" the licenses to professional harvesters in the community. The number of commercial fishing licenses owned by Lax Kw'alaams is currently not publically available.

Lax Kw'alaams owns Lax Kw'alaams Ferry Corporation, which provides ferry services (Lax Kw'alaams 2014). Ferries run between Aero Point and Tuck Inlet and some distant from marine areas impacted by the Project.

Assessment of Indirect Economic Effects

Change in Business Revenue

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites and ferry services routes may be affected to the extent that access routes overlap with project components and activities. A change in access to regular commercial fishing areas may increase the time and effort spent conducting these activities and decrease the supply of resources or the demand by customers to utilize the business.

Lax Kw'alaams ferry routes are not near the Project. Project related marine vessel movements will not temporally interfere with Lax Kw'alaams ferry businesses.

The Proponent has not been provided with information about where Lax Kw'alaams commercial fishing fleets fish.

Construction of project components such as the road access bridge between Lelu Island and the mainland, the MOF and turning basin in Porpoise Channel, as well as the suspended bridge-trestle over Flora Bank, the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound will temporarily render these locations unavailable for fishing.

Upon completion of construction, passage under the road access bridge and the suspended bridge-trestle across Flora Bank will be possible at high tide throughout operations, however, it is envisioned that regulatory authorities may require marine safety exclusion zones to be put in place along and underneath the suspended bridge-trestle and along the pipe pile supported jetty on Agnew Bank. Marine traffic will likely only be possible right near Lelu Island where the suspended bridge-trestle allows for safe vessel passage for ships up to a gill netter in size at high tide.

During any Port-required decommissioning, additional marine traffic associated with the dismantling and removal of the LNG facility, pipelines, storage tanks and associated supporting infrastructure may temporarily affect marine navigation and perhaps, Lax Kw'alaams First Nation commercial fishing vessels moving through or past those locations.

Vessel movements will not be unduly restricted during operations in those locations. Effects on Lax Kw'alaams commercial fishing vessel movements due to LNG carriers coming into, and leaving, the Port of Prince Rupert will be a minor interference (not unlike what occurs currently with other large ocean going vessels calling on the Port of Prince Rupert) as project LNG shipping will be limited to one ship per day. Therefore, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and at any Port-required marine infrastructure decommissioning, hold the potential to affect the quantity of marine waters and resources used for commercial fishing. Quantity of resources is not anticipated to affect ferry services. Changes to the quantity of fish resources may result in decreases in revenue earned by commercial fishermen and thus to fish plant operations.

Construction of project components such as the road access bridge between Lelu Island and the mainland, the MOF and turning basin in Porpoise Channel, as well as the suspended bridge-trestle over Flora Bank, the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound will temporarily render these locations unavailable for fishing, marine gathering, and marine hunting and trapping. Upon completion of construction, passage under the road access bridge and the suspended bridge-trestle across Flora Bank will be possible at high tide throughout operations, however, it is envisioned that regulatory authorities may require marine safety exclusion zones to be put in place along and underneath the suspended bridge-trestle and along the pipe pile supported jetty on Agnew Bank. Marine traffic will likely only be possible right near Lelu Island where the suspended bridge-trestle allows for safe vessel passage for ships up to a gill netter in size at high tide.

The location of Lax Kw'alaams commercial fishing activities have not been provided to the Proponent by Lax Kw'alaams; however, taking a precautionary approach, it is assumed that Lax Kw'alaams may utilize marine areas around Lelu Island for commercial fishing. It is unlikely that any of the Project's marine infrastructure is directly in conflict with a fishing area preferred by Lax Kw'alaams commercial fishers with the exception of the deep waters at the marine terminal in Chatham Sound.

Construction and operations activities hold the potential to reduce the quantity of marine resources used by Aboriginal peoples within preferred locations due to direct mortality and alteration of movement. Marine navigation is regulated by the Port of Prince Rupert and therefore project construction related disruptions will be managed so they do not unduly inconvenience or interfere with traditional aboriginal navigation use in and around Porpoise Channel.

Injury and mortality of fish due to blasting during construction is expected to be limited in extent (Section 13.5.4.3 in Appendix A of the EIS Addendum). Blasting activities during marine construction will be undertaken in accordance with DFO blasting guidelines in order to avoid harm to marine mammals. In addition, most species of commercial importance are expected to be rarely present or absent from the blast area. Resident Dungeness crabs will be relocated prior to blasting.

Injury or mortality due to 'Disposal At Sea' deposition at Brown Passage associated with dredging the MOF and Turning Basin is expected to affect only immobile species in close proximity to these activities. Increases in Total Suspended Solids (TSS) levels associated with dredging at the MOF, and disposal at sea are not expected to result in injury or mortality to fish as marine organisms (including juvenile salmon) are adapted to seasonal variations in TSS levels, levels are below those that cause lethal effects to salmon and other species, and will be limited in extent and duration. In any event TSS will be monitored during dredging and deposition. Any underwater noise from impact pile driving will employ the use of a bubble curtain. Therefore that noise is not expected to result in injury or mortality to fish.

The relative number of marine resources available in preferred fishing sites may be reduced due to altered distribution of fish populations (Section 13.5.5.3 in Appendix A of the EIS Addendum). There is potential for fish (e.g., eulachon, herring, rockfish) to react to construction noises; however, if such reactions occur, they are likely to be spatially and temporally limited. Salmon may show local avoidance of particularly noisy zones (Feist et al. 1996), but this reaction is expected to be limited in spatial extent and short-lived.

The location of Lax Kw'alaams commercial fishing activities has not been provided to the Proponent by Lax Kw'alaams; however, taking a precautionary approach, it is assumed that Lax Kw'alaams may utilize areas throughout the LAA for commercial fishing, including salmon in the waters around Lelu Island and crab in the vicinity of the suspended bridge-trestle and pipe pile supported trestle on Agnew Bank. These areas could be potentially affected by underwater noise.

Project related reductions in the quantity of fish commercially harvested by Lax Kw'alaams commercial fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in reduced catch and buyer demand, resulting in reduced sales for Lax Kw'alaams commercial fishermen and fish plant operators. Quality of resources is not anticipated to affect ferry services.

Project components and activities during construction and operations hold the potential to affect the quality of marine waters and resources for used for commercial fishing.

Dredging of the MOF during construction could expose marine species to sediments containing historical deposits of low concentrations of historic pulp mill originated dioxins and furans. Any existing sediment chemical compounds (e.g., dioxins and furans) exposed during MOF dredging during construction are not expected to pose any toxicological risks to marine biota (Section 13.5.2.5 in Appendix A of the EIS Addendum) or to human health from the consumption of marine animals as these sediments have levels of contamination well below regulatory thresholds.

The Project is not expected to affect the quality of resources commercially harvested or processed by Lax Kw'alaams members. Therefore, effects to business revenue due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

Despite the concern expressed by Lax Kw'alaams that the Project could impact marine tourism businesses, the Proponent has not been provided with information that Lax Kw'alaams are involved in marine tourism. As there is no publically available evidence that Lax Kw'alaams First Nation is currently involved in marine based tourism, no effects to business revenue are anticipated due to changes in the sensory environment. Commercial fishing and ferry services are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

Change in Costs of Business

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites and ferry services routes may be affected to the extent that access routes overlap with project components and activities. A change in access to regular commercial fishing areas and ferry services routes may increase the time and effort spent in conducting these activities, and increase the expenses incurred by the company in operating their businesses, for example through increased in fuel consumption for boats. Increased costs for commercial fishing may result in increased costs for the fish plant that purchases the catch.

Changes in access as they affect marine waters and resources, are assessed in detail above. To summarize, construction and, potentially, Port-required decommissioning of the road bridge, suspended bridge trestle, pipe pile trestle and marine terminal may create temporary interferences to the movement of Lax Kw'alaams First Nation commercial vessels that may pass near those locations. Movement will not be restricted during operations in those locations.

Effects on Lax Kw'alaams marine vessel movement due to LNG shipping and anchorages are expected to be minimal, as project shipping will be limited to one ship per day and any anchorages only used for

short durations and in only a few locations. Therefore, the effect to business costs due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and decommissioning hold the potential to affect the quantity of marine waters and resources used for commercial fishing and fish processing. Quantity of resources is not anticipated to affect marine ferry services. Changes to the quantity of fish resources may increase the time and effort involved in finding and harvesting fish resources, resulting in an increase in expenses for the business, for example in increased wages and fuel. Increased costs for commercial fishing may result in increased costs for the fish plant that purchases the catch.

Changes quantity of marine waters and resources are assessed in detail above. To summarize, project related reductions in the quantity of fish commercially harvested by Lax Kw'alaams commercial fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in a change in the location of commercial fishing and increase in time and effort to access fishing areas, resulting in increased costs for Lax Kw'alaams commercial fishermen. Increased costs for commercial fishing could, although unlikely, result in increased costs for the fish plant that purchases a catch of "low" quality. Ferry services are not impacted.

Changes to the quality of marine waters and resources are assessed in detail in above. The Project is not expected to affect the quality of resources commercially harvested by Lax Kw'alaams members. Therefore, effects to business costs due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Lax Kw'alaams First Nation is currently involved in marine based tourism, no effects to business costs are anticipated due to changes in the sensory environment. Commercial fishing, fish processing and ferry services are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

3.2.2.3 Change in Income

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Lax Kw'alaams commercial fishing, fish processing, and ferry services operations as a result of changes to access to marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in changes to incomes.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing and fish processing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced income for owners and employees. Quantity of resources is not anticipated to affect marine ferry services.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employee income are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing and fish processing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced income for owners and employees. Quality of resources is not anticipated to affect marine ferry services.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Lax Kw'alaams members. Therefore, no effects to employee income are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Lax Kw'alaams First Nation is currently involved in marine based tourism, no effects to employee income are anticipated due to changes in the sensory environment. Commercial fishing, fish processing and ferry services are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

3.2.2.4 Change in Employment

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Lax Kw'alaams commercial fishing, fish processing and ferry services operations as a result of changes to access to marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in reduced employment.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing and fish processing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced employment for owners and employees. Quantity of resources is not anticipated to affect marine ferry services.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employment are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing and fish processing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced employment for owners and employees. Quality of resources is not anticipated to affect marine ferry services.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Lax Kw'alaams members. Therefore, no effects to employment are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Lax Kw'alaams First Nation is currently involved in marine based tourism, no effects to employment are anticipated due to changes in the sensory environment. Commercial fishing, fish processing and ferry services are not anticipated to be affected due to changes in the sensory environment, since they do not depend on pristine sensory environments to operate their businesses.

Mitigation Measures

Mitigation measures for access to commercial use sites include:

- Measures to reduce changes to navigation (Section 15.5.2.2 of the EIS).

The PRPA will be coordinating marine construction through a required Construction Coordination Committee. A key objective for the committee is to minimize and mitigate temporary navigation interferences from marine construction in Port waters. The Project and the EPCC contractor are required to participate on this committee as this forms part of the Port's authorization for marine construction within the Port of Prince Rupert.

Mitigation measures for potential effects on quantity of marine waters and resources for commercial purposes include:

- Measures to reduce the potential for project related changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes to fish habitat (Section 13.5.3.2 in Appendix A of the EIS Addendum)
- Measures to reduce the potential for injury or mortality to fish (Section 13.5.4.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes in fish behaviour (Section 13.5.5.2 in Appendix A of the EIS Addendum).

Mitigation measures for potential effects on quality of marine waters and resources for commercial purposes include:

- Measures to reduce changes to marine resources due to changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum).

Residual Effects

Commercial Fishing

Following the implementation of mitigation measures, no residual effects are anticipated to Lax Kw'alaams commercial fishing operations. Changes in access to commercial fishing areas are predicted to be both temporary and minimal. Changes in the quantity of fish resources are expected to be negligible, and no effects are predicted to the quality of fish resources harvested. Therefore, commercial fishing revenues and business costs should not change from baseline conditions. As no changes to commercial fishing revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of commercial fishers.

Fish Processing

Following the implementation of mitigation measures, no residual effects are anticipated to Lax Kw'alaams fish processing operations. Changes in access to commercial fishing areas are predicted to be temporary and minimal. Changes in the quantity of fish resources are expected to be negligible, and no effects are predicted to the quality of fish resources harvested. Therefore, fish processing revenues and business costs should not change from baseline conditions. As no changes to fish processing revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of fish processing plant owners or employees.

Ferry Services Businesses

No residual effects are anticipated to Lax Kw'alaams ferry services businesses. As no changes to ferry services revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of ferry services operation owners or employees.

Summary of Significant Residual Indirect Economic Effects

There are no significant residual indirect economic effects to Lax Kw'alaams First Nation as a result of changes to the marine environment of the LAA and RAA.

Gitxaala Nation

Baseline Marine Economic Setting

Gitxaala members are reported to supplement their income by food harvesting, sharing, and trading. Fishing and fish processing has remained an important cornerstone of Gitxaala employment, income, and economy. Commercial fisheries provide food and income for Gitxaala Nation and play central role in their economy and society (Calliou Group 2014a). Of the 14% of Gitxaala members currently employed in the fishing and fish processing industry, almost 60% are employed in one of the canneries or fish processing plants, 12.5% own and operate a commercial fishing boat and 31% act as crew on commercial fishing boats. Many Gitxaala members travel from their community in Lach Klan to Prince Rupert to engage in commercial fishing (Calliou Group 2014a). The travel routes along the east and west sides of Lelu Island to Porpoise Harbour are important for their commercial fishing opportunities.

As noted in the recent Socio-economic Report (Calliou Group 2014a), "Gitxaala fisherman ... access a wide variety of licensing programs that are run by their home Nation, various First Nation collectives (e.g., [Northern Native Fishing Corporation], Native Fishing Association, and North Coast Community Fishing Enterprise), government programs, and commercial enterprises".

The Gitxaala Fisheries Program was developed to facilitate and expand the Nation's involvement in commercial fishing through marine planning, training, and programming (Calliou Group 2014a). The Gitxaala Fisheries Program provides permits to members fishing for salmon, halibut, and other types of fish. Permits are also issued to members hunting seals, sea lions, or digging clams and cockles (Gitxaala Environmental Monitoring 2012). The Nation has also instituted a program to hire commercial fishermen to catch and distribute traditional foods in the village and in Prince Rupert. Commercial fishermen use their own equipment, nets and vessels, while the Nation funds the gasoline for the boats (The Calliou Group 2014a).

As of 2012, there were nine commercially licensed gillnetters, and four unlicensed commercial fishing vessels registered to Gitxaala Nation members. In addition to member-owned boats, the Nation also owns a seine boat that was previously used in the commercial fishery (Calliou Group 2014a). The Nation holds six licenses (including a halibut quota) through agreements negotiated under the AFS which they lease to Gitxaala fishermen as well as non-Aboriginal fishermen and companies. As part of the Pacific Integrated Commercial Fisheries Initiative (PICFI), Gitxaala also holds an

8000-9500 lb quota for halibut, and an Area B crab license which they currently lease out (Calliou Group 2014a).

The Port Edward area, including Flora Bank, Inverness Passage, Porpoise Channel, and Chatham Sound were identified by Gitxaala as key salmon habitat and fishing areas. Several current and former commercial fishermen described the importance of the area to the Gitxaala fishery (Calliou Group 2014a). Seining and gillnetting were the commercial fishing methods identified, for salmon, herring, crab and shrimp.

Assessment of Indirect Economic Effects

Change in Business Revenue

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites and ferry services and barging/towing routes may be affected to the extent that access routes overlap with project components and activities. A change in access to regular commercial fishing areas may increase the time and effort spent in conducting these activities and decrease the supply of resources or the demand by customers to utilize the business.

Access through Lelu Slough is limited to high tide events and may be limited periodically during construction of the bridge between Lelu Island and the mainland. North-south navigation between Lelu Island and Flora Bank is limited to high tide events and may be periodically limited during construction of the suspended bridge-trestle. Associated construction activities with respect to the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound may also temporarily impede normal access to the north-south channel just west of Lelu Island.

Project related vessel traffic during construction may occasionally alter preferred traditional Gitxaala marine vessel access, particularly in and out of Porpoise Channel and through Lelu Slough. Activities related to dredging may occasionally interfere with traditional marine navigation. Marine navigation is regulated by the Port of Prince Rupert and therefore Project construction related disruptions will be managed so they do not unduly inconvenience or interfere with traditional aboriginal navigation use in and around Porpoise Channel.

During operations, local traditional navigation will not be affected through Lelu Slough since the bridge will be designed to allow continuation of current use for boats up to gillnetter size. The suspended bridge-trestle extending over Flora Bank will have a clearance of approximately 11 metres under a portion of the suspended bridge-trestle near Lelu Island to allow high tide access to the current north-south channel and local traditional navigation travel route just west of Lelu Island.

Large ship navigation from the Pacific and into Chatham Sound may temporarily interfere with Gitxaala preferred commercial fishing routes when LNG Carriers are being piloted into Prince Rupert harbour. The Gitxaala commercial fishing fleet already experiences this temporary interference currently as large ocean going vessels call on the Port of Prince Rupert.

Local navigation may also be affected by temporary weather-related LNG Carriers using Port of Prince Rupert temporary anchorages. The anchorage locations will be identified by the PRPA and be within the Prince Rupert Inner Harbour and Chatham Sound.

Vessel movement will not be restricted during operations at project marine infrastructure locations. Effects on marine movement due to shipping and anchorages are expected to be minimal, as LNG Carriers coming to and leaving Port will be limited to one ship per day. Therefore, the effect to

business revenue due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any.

Gitxaala commercial fishing, seining and gillnetting sites for salmon, herring, halibut, eulachon, crab and shrimp are located around the Kinahan Islands and in the area north of Digby Island, Prince Rupert and Brown Passage; south of Porcher Island, including east of the mouth of the Skeena River, and west including Stephens Island and Triple Island (Calliou Group 2014b). Commercial gillnetting and seining occurs in the study area for herring, eulachon, crab, and shrimp.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and decommissioning hold the potential to affect the quantity of marine waters and resources used for commercial fishing. Changes to the quantity of fish resources may result in decreases in revenue earned by commercial fishermen.

Construction of project components such as the road access bridge between Lelu Island and the mainland, the MOF and turning basin in Porpoise Channel, as well as the suspended bridge-trestle over Flora Bank, the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound will temporarily render these locations unavailable for fishing, marine gathering, and marine hunting and trapping. Upon completion of construction, passage under the road access bridge and the suspended bridge-trestle across Flora Bank will be possible at high tide throughout operations, however, it is envisioned that regulatory authorities may require marine safety exclusion zones to be put in place along and underneath the suspended bridge-trestle and along the pipe pile supported jetty on Agnew Bank. Marine traffic will likely only be possible right near Lelu Island where the suspended bridge-trestle allows for safe vessel passage for ships up to a gill netter in size at high tide.

Marine navigation is regulated by the Port of Prince Rupert and therefore project construction related disruptions will be managed so they do not unduly inconvenience or interfere with traditional aboriginal navigation use in and around Porpoise Channel.

Construction and operations activities hold the potential to reduce the quantity of marine resources available for commercial harvest due to direct mortality and alteration of movement.

Injury and mortality of fish due to blasting during construction is expected to be limited in extent (Section 13.5.4.3 in Appendix A of the EIS Addendum). In addition, most species of commercial importance are expected to be rare or absent from the blast area and Dungeness crabs will be relocated prior to blasting.

Injury or mortality due to deposition associated with dredging and disposal at sea is expected to affect only immobile species in close proximity to these activities. Increases in Total Suspended Solid (TSS) levels associated with dredging and disposal at sea are not expected to result in injury or mortality to fish as marine organisms (including juvenile salmon) are adapted to seasonal variations in TSS levels, levels are below those that cause lethal effects to salmon and other species, and will be limited in extent and duration.

Existing historic contaminants (e.g., low concentrations of post pulp mill emitted dioxins and furans) associated with dredging or vessel berthing and departure during construction are not expected to pose toxicological risks to marine biota (Section 13.5.2.5 in Appendix A of the EIS Addendum). Underwater noise from impact pile driving using a bubble curtain is not expected to result in injury or mortality to fish.

The relative number of marine resources available in preferred fishing sites may be reduced due to altered distribution of fish populations (Section 13.5.5.3 in Appendix A of the EIS Addendum). There is

potential for fish (e.g., eulachon, herring, rockfish) to react to construction noises; however, if such reactions occur, they are likely to be spatially and temporally limited. Salmon may show local avoidance of particularly noisy zones (Feist et al. 1996), but this reaction is expected to be limited in spatial extent and short-lived.

Commercial fishing, seining and gillnetting sites for salmon, herring, halibut, eulachon, crab and shrimp are located around the Kinahan Islands and in the area north of Digby island, Prince Rupert and Brown Passage; south of Porcher Island, including east of the mouth of the Skeena River, and west including Stephens Island and Triple Island (Calliou Group 2014b). Commercial gillnetting and seining occurs in the study area for herring, eulachon, crab, and shrimp.

Project related reductions in the quantity of fish commercially harvested by Gitxaala fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in reduced catch and buyer demand, resulting in reduced sales for Gitxaala commercial fishermen.

Project components and activities during construction and operations hold the potential to affect the quality of marine waters and resources for used for commercial fishing.

Dredging of the MOF during construction could expose marine species to sediments containing historical low concentrations of old pulp mill emitted dioxins and furans. These chemicals could accumulate in the tissues of commercially-important fish species; however the overall potential in commercially-important fish species to experience an unacceptable increase in concentrations is negligible to low.

The Project is not expected to affect the quality of resources commercially harvested by Gitxaala members. Therefore, effects to business revenue due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Gitxaala Nation is currently involved in marine based tourism, no effects to business revenue are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Change in Costs of Business

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites may be affected to the extent that access routes overlap with project components and activities. A change in access to regular commercial fishing areas may increase the time and effort spent in conducting these activities, and increase the expenses incurred by the company in operating their businesses, for example through increased in fuel consumption for boats.

Changes in access as they affect marine waters and resources are assessed in detail above. To summarize, construction and any Port-required decommissioning of the road bridge, suspended bridge and pipe pile trestles and the marine terminal may create temporary interferences to the

movement of Gitxaala Nation commercial enterprises passing through or by these locations. Movement will not be restricted during operations in those locations. Effects on marine movement due to LNG shipping and anchorages are expected to be minimal, as project shipping will be limited to one ship per day. Therefore, the effect to business costs due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and decommissioning hold the potential to affect the quantity of marine waters and resources used for commercial fishing. Changes to the quantity of fish resources may increase the time and effort involved in finding and harvesting fish resources, resulting in an increase in expenses for the business, for example in increased wages and fuel.

Changes to the quantity of marine waters and resources are assessed in detail above. To summarize, project related reductions in the quantity of fish commercially harvested by Gitxaala fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in a change in the location of commercial fishing and increase in time and effort to access fishing areas, resulting in increased costs for Gitxaala commercial fishermen.

Changes to the quality of marine waters and resources are assessed in detail above. The Project is not expected to affect the quality of resources commercially harvested by Gitxaala members. Therefore, effects to business costs due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Gitxaala Nation is currently involved in marine based tourism, no effects to business costs are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Change in Income

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Gitxaala commercial fishing operations as a result of changes to access to marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in changes to incomes.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced income for owners and employees.

As previously described, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employee income are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Gitxaala members. Therefore, no effects to employee income are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Gitxaala Nation is currently involved in marine based tourism, no effects to employee income are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Change in Employment

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Gitxaala commercial fishing operations as a result of changes to access to marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in reduced employment.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employment are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Gitxaala members. Therefore, no effects to employment are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Gitxaala Nation is currently involved in marine based tourism, no effects to employment are anticipated due to changes in the sensory environment.

Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Mitigation Measures

Mitigation measures for access to commercial use sites include:

- Measures to reduce changes to navigation (Section 15.5.2.2 of the EIS).

The PRPA will be coordinating marine construction through a required Construction Coordination Committee. A key objective for the committee is to minimize and mitigate temporary navigation interferences from marine construction in Port waters. The Project and the EPCC contractor are required to participate on this committee as this forms part of the Port's authorization for marine construction within the Port of Prince Rupert.

Mitigation measures for potential effects on quantity of marine waters and resources for commercial purposes include:

- Measures to reduce the potential for project related changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes to fish habitat (Section 13.5.3.2 in Appendix A of the EIS Addendum)
- Measures to reduce the potential for injury or mortality to fish (Section 13.5.4.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes in fish behaviour (Section 13.5.5.2 in Appendix A of the EIS Addendum).

Mitigation measures for potential effects on quality of marine waters and resources for commercial purposes include:

- Measures to reduce changes to marine resources due to changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum).

Residual Effects

Commercial Fishing

Following the implementation of mitigation measures, no residual effects are anticipated to Gitxaala commercial fishing operations. Changes in access to commercial fishing areas are predicted to be temporary and minimal. Changes in the quantity of fish resources are expected to be negligible, and no effects are predicted to the quality of fish resources harvested. Therefore, commercial fishing revenues and business costs should not change from baseline conditions. As no changes to commercial fishing revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of commercial fishers.

Summary of Significant Residual Indirect Economic Effects

There are no significant residual indirect economic effects to Gitxaala Nation as a result of changes to the marine environment of the LAA and RAA.

Kitsumkalum First Nation

Baseline Marine Economic Setting

Kitsumkalum First Nation entered into a multi-year CFA with DFO (last ratified in 2012) to undertake an FSC Fishery under DFO's AFS. Funds are provided to Kitsumkalum for equipment, catch monitoring and reporting. The FSC fishery is located "[f]rom the Powerline Crossing at the Skeena River Bridge

located Highway 16 East of Terrace, downstream to the Coast, including Areas 3, 4, 5, 103, 104 and 105" (Kitsumkalum 2010). Commercial salmon fisheries are located on the Skeena River (for salmon) near Ecstall River and Grenville Channel, and in Chatham Sound and Hecate Strait for herring, halibut and cod (JRP 2012, Kitsumkalum 2012).

Assessment of Indirect Economic Effects

Change in Business Revenue

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites may be affected to the extent that Kitsumkalum commercial fishing vessel access routes overlap with project components and activities. A change in access to regular commercial fishing areas may increase the time and effort spent in conducting these activities and decrease the supply of resources, thereby decreasing the revenue associated with commercial fishing.

Project related vessel traffic during construction may occasionally alter preferred traditional access, particularly in and out of Porpoise Channel and through Lelu Slough. Activities related to dredging and disposal at sea may occasionally interfere with traditional marine navigation routes. Marine navigation is regulated by the Port of Prince Rupert and therefore project construction related disruptions will be managed so they do not unduly inconvenience traditional aboriginal navigation use in and around Porpoise Channel.

Access through Lelu Slough is limited to high tide events and may be limited periodically during construction of the bridge between Lelu Island and the mainland. North-south navigation between Lelu Island and Flora Bank is limited to high tide events and may be periodically limited during construction of the suspended bridge-trestle. Associated construction activities with respect to the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound may also temporarily impede normal access to the north-south channel just west of Lelu Island.

During operations, local traditional commercial fishing navigation routes will not be affected through Lelu Slough since the bridge will be designed to allow continuation of current use for boats up to gillnetter size. The suspended bridge-trestle extending over Flora Bank will have a clearance of approximately 11 metres under a portion of the suspended bridge-trestle near Lelu Island to allow high tide access to the current north-south channel and local traditional navigation travel route just west of Lelu Island.

Large ship navigation from the Pacific and into Chatham Sound may temporarily interfere with Kitsumkalum commercial fishers in Chatham Sound when LNG Carriers are being piloted into Port although only one LNG carrier per day/350 per year are estimated to berth at the terminal. Local navigation may also be affected by temporary anchorages of LNG Carriers at the Port. The anchorage locations will be identified by the PRPA and be within the Prince Rupert Inner Harbour and Chatham Sound.

The Port of Prince Rupert has been monitoring vessel traffic to and from Port Edward with cameras. This information is organized into two major categories, commercial fishing vessels and "other". A number of vessels transit in and out of Porpoise Channel increasing substantively in the summer months (1,000's of movements) due to the seasonal increase in commercial and recreational fishing traffic. The information collected by the Port does not differentiate aboriginal vessels from non-aboriginal. Kitsumkalum have not provided information to the Proponent with respect to their commercial fishing vessels using Porpoise harbour.

Vessel movement will not be restricted during operations originating in, or coming into, Porpoise Harbour as vessel access has been maintained under the Project's marine infrastructure at high tide. Therefore, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and decommissioning have the potential to affect the quantity of marine waters and resources used for commercial fishing. Changes to the quantity of fish resources may result in decreases in revenue earned by commercial fishermen.

Construction of project components such as the road access bridge between Lelu Island and the mainland, the MOF and turning basin in Porpoise Channel, as well as the suspended bridge-trestle over Flora Bank, the pipe pile supported jetty on Agnew Bank and the marine terminal in Chatham Sound will temporarily render these locations unavailable for fishing. Upon completion of construction, passage under the road access bridge and the suspended bridge-trestle across Flora Bank will be possible at high tide throughout operations, however, it is envisioned that regulatory authorities may require marine safety exclusion zones to be put in place along and underneath the suspended bridge-trestle and along the pipe pile supported jetty on Agnew Bank. Marine traffic will likely only be possible right near Lelu Island where the suspended bridge-trestle allows for safe vessel passage for ships up to a gill netter in size at high tide.

Kitsumkalum commercial fishers utilize Chatham Sound for salmon fishing. The specific locations of Kitsumkalum First Nations halibut, prawn, herring, and other commercial fisheries have not been provided to the Proponent by Kitsumkalum.

The Project's suspended bridge and pipe pile trestles are not expected to result in the loss of marine waters for Kitsumkalum commercial fishing, as limited (if any) commercial fishing occurs in the space planned for the suspended bridge-trestle and pipe pile trestle and the LNG carrier berth.

Construction and operations activities hold the potential to reduce the quantity of marine resources used by Aboriginal commercial fishers within preferred locations due to direct mortality and alteration of movement. Injury and mortality of fish due to blasting during construction is expected to be limited in extent (Section 13.5.4.3 in Appendix A of the EIS Addendum). Blasting activities during marine construction will be undertaken in accordance with DFO blasting guidelines in order to avoid harm to marine mammals. In addition, most species of commercial importance are expected to be rarely present or absent from the blast area. Resident Dungeness crabs will be relocated prior to blasting.

Injury or mortality due to 'Disposal At Sea' deposition at Brown Passage associated with dredging the MOF and Turning Basin is expected to affect only immobile species in close proximity to these activities. Increases in Total Suspended Solids (TSS) levels associated with dredging at the MOF and disposal at sea are not expected to result in injury or mortality to fish as marine organisms (including juvenile salmon) are; adapted to seasonal variations in TSS levels, levels are below those that cause lethal effects to salmon and other species, and the TSS will be limited in extent and duration. In any event, TSS will be monitored during dredging and deposition so that lethal levels do not result from these activities.

The relative number of marine resources available in preferred sites in the Project's marine infrastructure areas around Lelu Island may be reduced during construction due to altered distribution of fish (Section 13.5.5.3 in Appendix A of the EIS Addendum). There is potential for fish (e.g., eulachon, herring, rockfish) to react to construction noises; however, if such reactions occur, they are likely to be spatially and temporally limited. Salmon may show local avoidance of particularly

noisy zones (Feist et al. 1996), but this reaction is expected to be limited in spatial extent and short-lived.

Apart from Chatham Sound and Grenville Channel, the location of Kitsumkalum commercial fishing locations is currently unknown. However, using a precautionary approach, it is assumed that Kitsumkalum utilizes areas in the LAA (e.g., Chatham Sound) for commercial fishing. The relative number of marine resources available at Kitsumkalum preferred commercial fishing sites may be reduced due to altered distribution of fish populations (Section 13.5.5.3 in Appendix A of the EIS Addendum). The preferred fishing areas are not in close proximity to the Project's marine infrastructure, so impacts from project construction and operations to Kitsumkalum commercial fishing sites is anticipated to be low.

Project related reductions in the quantity of fish commercially harvested by Kitsumkalum fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in reduced catch and buyer demand, resulting in reduced sales for Kitsumkalum commercial fishermen.

Project components and activities during construction and operations hold the potential to affect the quality of marine waters and resources for used for commercial fishing.

Dredging of the MOF during construction could expose marine species to sediments containing historical low concentrations of old pulp mill emitted dioxins and furans. These chemicals could accumulate in the tissues of commercially-important fish species; however the overall potential in commercially-important fish species to experience an unacceptable increase in concentrations is negligible to low.

The Project is not expected to affect the quality of resources commercially harvested by Kitsumkalum members. Therefore, effects to business revenue due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Kitsumkalum First Nation is currently involved in marine based tourism, no effects to business revenue are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Change in Costs of Business

Access to Marine Waters and Resources Used for Economic Purposes

Access to commercial fishing sites may be affected to the extent that Kitsumkalum commercial fishing access routes overlap with project components and activities. A change in access to regular commercial fishing areas may increase the time and effort spent in conducting these activities, and increase the expenses incurred by the company in operating their businesses, for example through increased in fuel consumption for boats.

Changes in access as they affect marine waters and resources are assessed in detail above. To summarize, construction and any Port-required decommissioning of the bridge, suspended and pipe

pile supported trestles and the LNG carrier berth may create temporary interferences to the movement of Kitsumkalum commercial fishing vessels using in those locations. Movement will not be restricted during operations in those locations. Effects on marine movement due to shipping and anchorages are expected to be minimal, as project shipping will be limited to one ship per day. Therefore, the effect to business costs due to changes in access, even in the absence of mitigation measures, is not anticipated to be small, if any.

Quantity of Marine Waters and Resources Used for Economic Purposes

Project components and activities during construction, operations, and decommissioning hold the potential to affect the quantity of marine waters and resources used for commercial fishing. Changes to the quantity of fish resources may increase the time and effort involved in finding and harvesting fish resources, resulting in an increase in expenses for the business, for example in wages and fuel.

Changes quantity of marine waters and resources are assessed in detail above. To summarize, project related reductions in the quantity of fish commercially harvested by Kitsumkalum fishers are expected to be negligible. Absolute reductions in the population sizes of harvestable fish species are not expected. Some limited fish movement out of preferred fishing locations may take place during construction activities. Therefore, effects to business revenue due to changes in quantity of fish resources are not anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced quality of fisheries resources could result in a change in the location of commercial fishing and increase in time and effort to access fishing areas, resulting in increased costs for Kitsumkalum commercial fishermen.

Changes to the quality of marine waters and resources are assessed in detail above. The Project is not expected to affect the quality of resources commercially harvested by Kitsumkalum members. Therefore, effects to business costs due to changes in quality of fish resources are not anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Kitsumkalum First Nation is currently involved in marine based tourism, no effects to business costs are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Change in Income

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Kitsumkalum commercial fishing operations as a result of changes to access to marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in changes to incomes.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employee income are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced income for owners and employees.

As previously stated, effects to business revenue due to changes in quality of fish resources are not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Kitsumkalum members. Therefore, no effects to employee income are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Kitsumkalum First Nation is currently involved in marine based tourism, no effects to employee income are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Change in Employment

Access to Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Kitsumkalum commercial fishing operations as a result of changes to access to marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, since changes in access will be periodic in nature and of short duration, the effect to business revenue due to changes in access, even in the absence of mitigation measures, is anticipated to be small, if any. Therefore, it is unlikely that a small change in business revenue will result in reduced employment.

Quantity of Marine Waters and Resources Used for Economic Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quantity of marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, effects to business revenue due to changes in quantity of fish resources are not anticipated, since changes to the quantity of fish resources are expected to be negligible. Therefore, no effects to employment are anticipated.

Quality of Marine Waters and Resources Used for Commercial Purposes

Reduced revenue for Aboriginal-owned commercial fishing businesses as a result of changes to quality of marine waters or resources has the potential to result in reduced employment for owners and employees.

As previously stated, effects to business revenue due to changes in quality of fish resources is not anticipated, since the Project is not expected to affect the quality of resources commercially harvested by Kitsumkalum members. Therefore, no effects to employment are anticipated.

Sensory Environment for Marine Economic Use

As there is no publically available evidence that Kitsumkalum First Nation is currently involved in marine based tourism, no effects to employment are anticipated due to changes in the sensory environment. Commercial fishing is not anticipated to be affected due to changes in the sensory environment, since it does not depend on pristine sensory environments to operate its business.

Mitigation Measures

Mitigation measures for access to commercial use sites include:

- Measures to reduce changes to navigation (Section 15.5.2.2 of the EIS).

The PRPA will be coordinating marine construction through a required Construction Coordination Committee. A key objective for the committee is to minimize and mitigate temporary navigation interferences from marine construction in Port waters. The Project and the EPCC contractor are required to participate on this committee as this forms part of the Port's authorization for marine construction within the Port of Prince Rupert.

Mitigation measures for potential effects on quantity of marine waters and resources for commercial purposes include:

- Measures to reduce the potential for project related changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes to fish habitat (Section 13.5.3.2 in Appendix A of the EIS Addendum)
- Measures to reduce the potential for injury or mortality to fish (Section 13.5.4.2 in Appendix A of the EIS Addendum)
- Measures to reduce changes in fish behaviour (Section 13.5.5.2 in Appendix A of the EIS Addendum).

Mitigation measures for potential effects on quality of marine waters and resources for commercial purposes include:

- Measures to reduce changes to marine resources due to changes in sediment or water quality (Section 13.5.2.2 in Appendix A of the EIS Addendum).

Residual Effects

Commercial Fishing

Following the implementation of mitigation measures, no residual effects are anticipated to Kitsumkalum commercial fishing operations. Changes in access to commercial fishing areas are predicted to be minimal. Changes in the quantity of fish resources are expected to be negligible, and no effects are predicted to the quality of fish resources harvested. Therefore, commercial fishing revenues and business costs should not change from baseline conditions. As no changes to commercial fishing revenue or expenses are anticipated, there are no predicted residual effects to the income or employment of commercial fishers

Summary of Significant Residual Indirect Economic Effects

There are no significant residual indirect economic effects to Kitsumkalum First Nation as a result of changes to the marine environment in the LAA and RAA.

Kitselas First Nation

Baseline Marine Economic Setting

The Kitselas First Nation fishes with salmon nets for FSC purposes under the authority of a communal licence issued to the band by DFO. FSC fishing by Kitselas members is permitted in all traditional fishing areas within the Skeena Watershed. The traditional fish harvest areas of the Kitselas First Nation includes the Skeena Watershed downstream of Lorne Creek to the mouth of the Skeena River (Kitselas FN 2014).

There is no publically available evidence that Kitselas First Nation currently takes part in a commercial fishery.

Assessment of Indirect Economic Effects

The purpose of this assessment is to assess effects to Kitselas economic activities and interests due to environmental changes in the coastal marine environment of the LAA and RAA. There is no publically available evidence that any Kitselas economic activities occur along the coast. There is also no publically available evidence that Kitselas First Nation currently takes part in a commercial fishery. Therefore, no effects to Kitselas economic activities or interests due to changes in the marine environment are anticipated.

Should new information be brought to light regarding any Kitselas marine economic activities, PNW LNG will re-consider their assessment.

Gitga'at First Nation

Baseline Marine Economic Setting

In 2004, the Gitga'at developed a tourism business plan that outlines a suite of services and products for visitors to Hartley Bay (some of which are currently being offered by Gitga'at Spirit Tours). These experiences are offered in an ecologically sensitive and culturally appropriate fashion. Products and experiences relate to three general themes, including cultural and nature-based tourism (Gitga'at 2004): Seaweed and halibut harvesting are included among the features of cultural tourism. Canoeing, kayaking and diving are included among the features of nature-based tourism.

Several tourism operations in Gitga'at territory are owned and run by the Gitga'at themselves, such as Spirit Bear Tours, and cultural tourism tours (Gregory, Failing and Joseph 2011).

There is no publically available evidence that suggests Gitga'at tourism activities, including marine-based tourism, operate outside of the Hartley Bay and Douglas Channel areas, which are outside of the LAA and nowhere near the Project's marine infrastructure.

The Gitga'at participate in the commercial fish harvest from their territory with their licenses, quota, and own vessels. Some licenses are held by Gitga'at individuals, others are held by the Hartley Bay Band Council, and some Gitga'at work as crew members on vessels holding licenses held by non-Gitga'at parties (Gregory, Failing and Joseph 2011).

Some of the Gitga'at-held licenses are owned, others are leased from the Northern Native Fishing Corporation, and yet others have been attained through AFS agreements with the DFO. Licenses and the quota attached to them change year to year. In a typical year, the Gitga'at are involved in 10 to 20 salmon licenses (gillnet and seine) as owners, as lessees, and as crew on licensed boats.

The Gitga'at also holds about 45,000 lbs of halibut quota through five to seven licenses, depending upon the year. One to two rockfish licenses are typically held in a given year, as well as one herring roe-on-kelp (16,000 to 18,000 lbs quota) and one Area B crab license.

The crab license is typically leased out for about \$25,000 a year. Twelve fishing vessels are owned by Gitga'at individuals including salmon gillnets and seiners; all have salmon gear, three have halibut gear, and one is outfitted for crab. In addition, one vessel is owned by the community and typically has halibut, crab, herring roe-on-kelp, and salmon seine licenses (Gregory, Failing and Joseph 2011).

There is no publically available evidence to suggest that Gitga'at commercial fisheries operate outside of Gitga'at traditional territory, which is outside of the LAA.

Assessment of Indirect Economic Effects

The purpose of this assessment is to assess effects to Gitga'at economic activities and interests due to environmental changes in the coastal marine environment of the LAA and RAA. There is no evidence that Gitga'at tourism activities, including marine-based tourism, occur outside of their traditional territory, which is outside the LAA.

There is also no publically available evidence to suggest that Gitga'at commercial fisheries operate outside of Gitga'at traditional territory, which is outside of the LAA. Therefore, no effects to Gitga'at economic activities or interests due to changes in the marine environment are anticipated.

Should new information be brought to light regarding any Gitga'at marine economic activities in the LAA, PNW LNG will re-consider their assessment.

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