

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Follow-up Program and Compliance Reporting
December 12, 2014

30.0 FOLLOW-UP PROGRAM AND COMPLIANCE REPORTING

Follow-up programs designed to support the Project were provided in Section 30 of the EIS. This section of the EIS Addendum provides:

- An update to the Follow-up Programs and Compliance Reporting VC of the EIS as a result of the project changes
- Responses to requests for additional information from the federal government (August 14 and September 11, 2014) applicable to the Follow-up Programs and Compliance Reporting VC.

Table 30-1 lists the documents applicable to Follow-up Programs and Compliance Reporting submitted by PNW LNG as part of the environmental assessment process to date and identifies if information is either *updated by EIS Addendum*, *superseded*, *not relevant*, or *not affected* by information in the EIS Addendum. The following sections of the EIS Addendum contain information that updates the documents classified as *updated by EIS Addendum* in Table 30-1.

Table 30-1 Status of Previously Submitted Documents

Document Name	Status
Section 30 of the EIS (February 2014)	Updated by EIS Addendum

30.1 FOLLOW-UP PROGRAM UPDATE

Follow-up programs specific to each valued component (VC) considered in the EIS are summarized in Table 30-2. The table links the follow-up programs with compliance monitoring and reporting. Follow-up programs verify the accuracy of effects predictions presented in the EIS and determine the effectiveness of unproven mitigation measures. Compliance monitoring and reporting verifies implementation of required mitigation measures. The follow up program framework for the Project has been revised based on feedback received during the environmental assessment review process and in consideration of the project changes. Details are provided in Section 30.4.

The marine terminal design mitigation will result in the relocation of the marine terminal berth by about 510 m from the location described in the EIS which will remove project infrastructure on Flora Bank and eliminate the need for dredging on Agnew Bank. The updated effects assessments for the VCs described in this EIS Addendum determined that the project changes either do not change predicted adverse effects or reduce them on assessed VCs. The project changes will therefore not lead to potential adverse effects which require new follow-up programs.

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The marine terminal design mitigation removes the need for dredging of approximately 7 million m³ of material over an area of 84.6 ha to support terminal construction and operations. The marine terminal design mitigation will also reduce project interactions with Flora Bank. In this context, the revised sediment transport follow-up program in Section 30.4.6 reflects the latest project dredging and disposal at sea requirements. For further details please reference Section 13 and Appendix A of the EIS Addendum.

30.2 COMPLIANCE MONITORING AND REPORTING UPDATE

The marine terminal design mitigations do not result in amendments to the compliance monitoring and reporting commitments presented in the EIS. Compliance with the conditions listed in the federal and provincial environmental assessment approvals will be undertaken for all relevant VCs. Compliance monitoring and reporting will also include the conditions of various permits, authorizations, and licenses described in the EIS and updated in this EIS Addendum. As those permits, authorizations and licenses are developed and finalized; the associated compliance monitoring and reporting requirements will be revised and adjusted accordingly.

Table 30-2 outlines the follow-up programs and related preliminary compliance monitoring requirements identified for each VC. The project environmental management team will apply the environmental management plans, including specific requirements for compliance monitoring and reporting, throughout the life of the Project. Further details regarding compliance monitoring and reporting associated with the Environmental Management Plan and its component plans can be found in Section 24 of this EIS Addendum.

Table 30-2 Follow-up Programs, Compliance Monitoring and Reporting for Assessed Valued Components

Valued Component	Related Follow-up Programs	Related Compliance Monitoring and Reporting Requirements
Air Quality	Aquatic Acidification and Eutrophication (Section 30.4.4) Terrestrial Acidification and Eutrophication (Section 30.4.5)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., air waste discharge permit; Oil and Gas Commission (OGC) facilities permit) Section 5.1.1 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Air Quality Compliance Monitoring (see Environmental Management Plan (EMP) – Appendix J.16).
Greenhouse Gas Management	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals. Monitoring compliance with conditions of relevant permits and authorizations (e.g., air waste discharge permit; OGC facilities permit) Section 5.1.2 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Greenhouse Gas Compliance Monitoring (see EMP – Appendix J.16).

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Valued Component	Related Follow-up Programs	Related Compliance Monitoring and Reporting Requirements
Acoustic Environment	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., OGC facilities permit) Section 5.2.1 of Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Noise and Vibration Compliance Monitoring (see EMP – Appendix J.16)
Ambient Light	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., OGC facilities permit) Section 5.2.2 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Ambient Light Compliance Monitoring (see EMP – Appendix J.16).
Vegetation and Wetland Resources	Terrestrial Acidification and Eutrophication (Section 30.4.5) Vegetation and Wetland Resources (Section 30.4.9)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., OGC facilities permit) Section 5.5 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Vegetation and Soils Compliance Monitoring (see EMP – Appendix J.16).
Terrestrial Wildlife and Marine Birds	Terrestrial Acidification and Eutrophication (Section 30.4.5)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., OGC facilities permit) Sections 5.2, 5.4, 5.5, 5.7, and 5.8 of the Preliminary Draft Environmental Monitoring Management Plan identify specific components of compliance monitoring for noise, vibration and ambient light; marine and freshwater resource; vegetation and soils; terrestrial and underwater blasting activities; and marine pile installation (see EMP – Appendix J.16).
Freshwater Aquatic Resources	Aquatic Acidification and Eutrophication (Section 30.4.5)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Section 5.4 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Marine and Freshwater Resource Compliance Monitoring (see EMP – Appendix J.16).

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Valued Component	Related Follow-up Programs	Related Compliance Monitoring and Reporting Requirements
Marine Resources	Sediment transport (Section 30.4.6) Marine fish and fish habitat (Section 30.4.7) Marine country foods (Section 30.4.8) Habitat Offsetting Plan (Appendix G.10)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., <i>Fisheries Act</i> authorization, marine waste discharge permit, disposal at sea) Sections 5.4, 5.7, 5.8 and 5.9 of Preliminary Draft Environmental Monitoring Management Plan identify specific components of compliance monitoring for marine and freshwater resources; terrestrial and underwater blasting activities; marine pile installation; and dredging, respectively (see EMP – Appendix J.16).
Economic Environment	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Socio-economic Effects Management Plan identifies general and activity-specific monitoring requirements for the various phases of project construction and operations.
Navigation and Marine Resource Use	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., approval under the <i>Navigation Protection Act</i>) Monitoring and reporting on compliance with mitigation measures included within the Transportation Management Plan (see Socio-economic Effects Management Plan).
Infrastructure and Services	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Socio-economic Effects Management Plan identifies general and activity-specific monitoring requirements for the various phases of project construction and operations.
Visual Quality	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Section 5.2.2 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Ambient Light Compliance Monitoring (see EMP – Appendix J.16) Socio-economic Effects Management Plan identifies general and activity-specific monitoring requirements for the various phases of project construction and operations.
Community Health and Well Being	Marine country foods (Section 30.4.8)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Socio-economic Effects Management Plan identifies general and activity-specific monitoring requirements for the various phases of project construction and operations.

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Valued Component	Related Follow-up Programs	Related Compliance Monitoring and Reporting Requirements
Human and Ecological Health	Marine country foods (Section 30.4.8)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Section 5.9 of the Preliminary Draft Environmental Monitoring Management Plan identifies specific components of Dredging Compliance Monitoring (see EMP – Appendix J.16).
Archaeological and Heritage Resources	Not required	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Monitoring compliance with conditions of relevant permits and authorizations (e.g., <i>Heritage Conservation Act</i>) Environmental Management Plan - Appendix J.16 – Preliminary Draft Environmental Monitoring Management Plan identifies general and activity-specific monitoring requirements for the various phases of project construction and operations.
Current Use of Land and Resources for Traditional Purposes	Marine country foods (Section 30.4.8)	<ul style="list-style-type: none"> Monitoring compliance with relevant conditions of federal and/or provincial environmental assessment approvals Environmental Management Plan - Appendix J.16 – Preliminary Draft Environmental Monitoring Management Plan identifies general and activity-specific monitoring requirements for the various phases of project construction and operations.

30.3 OUTSTANDING INFORMATION REQUESTS

PNW LNG received requests for outstanding information pertaining to follow-up programs from the CEA Agency on August 14, 2014 and September 11, 2014. Those information requests and the associated responses are provided below.

30.3.1 Follow-up Information Request #1 (August 14, 2014)

30.3.1.1 Government of Canada – Outstanding Information

Agency: Information requested regarding follow-up program(s) is outstanding, including clear program objectives, implementation plans, and reporting mechanisms for each program. The Agency’s Operational Policy Statement on Follow-up Programs under the Canadian Environmental Assessment Act states that, if project implementation is likely to begin shortly after approval, the follow-up program should be fully designed and a reliable baseline established during the environmental assessment phase of the project. Given that project implementation is planned to begin shortly after regulatory approvals (EIS indicates January 2015), it is important that robust follow-up program information be provided as part of the environmental assessment. This information is required to inform the Agency's determination regarding the likelihood that the follow-up program will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), and to confirm both the assumptions and the effectiveness of mitigation. The adequacy of the baseline information is addressed in

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other, topic specific comments. For the three follow-up programs described in the EIS, as well as for any additional follow-up programs determined to be necessary in satisfying other information requests, provide:

- *Report elements (e.g., summarized content of the report including what will be measured and the data collection methods)*
- *Reporting frequency (e.g., annually, monthly, etc.).*

30.3.1.2 Response

The follow-up programs presented in the EIS have been updated to reflect the project changes and to more obviously demonstrate compliance with the Agency's 2011 *Operational Policy Statement on Follow-up Programs under the Canadian Environmental Assessment Act* (CEAA Follow-up OPS). These updates are provided in Section 30.4 below.

30.3.2 Follow-up Information Request #1 (September 11, 2014)

30.3.2.1 Government of Canada – Outstanding Information

When updating the follow-up programs as per this information request, please include the information described below.

- a) TSS and turbidity monitoring and adaptive management measures are proposed in Section 13 of the EIS and in the technical memo "Effects of Dredging and Disposal at Sea", but are not included in the follow-up programs in Section 30 of the EIS. Include TSS and turbidity monitoring as part of the follow-up program for Marine Resources.*
- b) Include the effects on amphibians, freshwater fish and fish habitat in the acidification and eutrophication follow-up program.*
- c) The EIS proposed follow-up programs to address key concerns raised by Aboriginal groups prior to submission of the EIS/Application. The EIS also commits to designing further follow-up programs during the review of the EIS/Application should any be identified through Aboriginal consultation. Please identify all factors considered by the proponent in determining areas where follow-up programs would be proposed. Please describe, using the guidance in Follow-Up IR#1, any new follow-up programs that are being developed as a result of Aboriginal consultation.*
- d) For federally listed species (SARA and COSEWIC), provide a follow-up program or a rationale as to why a follow-up program is not required.*
- e) The Environmental Management Plans in Chapter 24 of the EIS describe monitoring not captured by a follow-up program. Identify how this monitoring will be included in a follow-up program, or provide a rationale as to why follow-up is not required, in the following areas:*
 - Effects on vegetation, with a focus on ecologically sensitive areas (see monitoring proposed in Vegetation Management Plan, Chapter 24.4.6 of EIS)*
 - Marine bird mortality (see Environmental Management Plan, Chapter 24.4.12 of EIS)*
 - Archaeological and Heritage Resources (see Archaeological and Heritage Resources Management Plan, Chapter 24.2.11 of EIS).*

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30.3.2.2 Response

The information requested by the Government of Canada in its September 11, 2014 elaboration on Follow-up IR #1 is presented in the following sections of this EIS Addendum:

- a) Total suspended solids (TSS) and turbidity monitoring were added to the Sediment Transport Follow-up Program. Please refer to Section 30.4.6 for further details
- b) Effects on amphibians, fish and fish habitat were added to the Aquatic Acidification and Eutrophication Follow-up Program presented in Section 30.4.4. The Terrestrial Acidification and Eutrophication Follow-up Program is presented separately in Section 30.4.5
- c) Based on ongoing consultation and dialogue with Aboriginal groups and in consideration of the criteria outlined in the CEAA Follow-up OPS, a Marine Country Foods Follow-up Program has been developed. This follow-up program is presented in Section 30.4.7.3
- d) A rationale for not including a follow-up program for federally listed species is provided in Section 30.4.2
- e) Additional information describing the linkages between follow-up programs and compliance monitoring associated with Environmental Management Plans (Section 24 of the EIS and EIS Addendum) has been included as follows:
 - Table 30-2 demonstrates the compliance monitoring and/or follow-up program associated with each VC
 - A new follow-up program supporting vegetation and wetland resources is provided in Section 30.4.9
 - A rationale for not including a follow-up program for marine bird mortality is provided in Section 30.4.2
 - A rationale for not including a follow-up program for archaeological and heritage resources is provided in Section 30.4.2.

30.3.3 Follow-up Information Request #5 (August 14, 2014)

30.3.3.1 Government of Canada –Outstanding Information

Provide a conceptual outline for a follow-up program to monitor contaminants in marine country foods. Provide a conceptual outline that includes the program objectives, implementation plans and reporting mechanisms. Guidance on the development of Follow-up Programs is available in the 2011 Operational Policy Statement: <http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=499F0D58-1>.

30.3.3.2 Response

Follow-up monitoring program specific to marine country foods is presented in Section 30.4.7.3.

30.4 UPDATED FOLLOW-UP PROGRAM FRAMEWORK

Follow-up programs presented for the Project have been updated to more demonstrably reflect the recommendations of the CEAA Follow-up OPS. The OPS recommends developing clear objectives, implementation plans and reporting mechanism which deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), and can be used to confirm both the assumptions and the

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effectiveness of adopted mitigation. The following follow-up programs comprise the overall follow-up framework for the Project:

- Aquatic acidification and eutrophication
- Terrestrial acidification and eutrophication
- Sediment transport
- Marine fish and fish habitat
- Marine country foods
- Vegetation and wetland resources.

Based on the factors outlined in the CEAA Follow-up OPS for determining the need for follow-up programs and the marine terminal design mitigation, several potential follow-up programs presented in the EIS and/or suggested by CEA Agency during its review were determined to be unnecessary. These included potential follow-up programs specific to sediment quality, fish and fish habitat over Flora Bank, species at risk, land and marine bird mortality, underwater noise, and archaeological and heritage resources. Further details describing this follow-up program selection process, including a rationale for excluding the above-noted potential follow-up programs are presented in Section 30.4.2.

Since the purpose of follow-up programs are to verify the accuracy of the conclusions presented in the EIS and the effectiveness of the mitigation measures, they rely on baseline collection programs to establish existing conditions prior to commencement of project activities. Follow-up programs may also rely on compliance monitoring to verify whether required mitigation measures are implemented and effective. For this reason, the follow-up programs include baseline and compliance monitoring components.

30.4.1 Roles and Responsibilities

An environmental management team will be assembled for each phase of the Project and may consist of project engineers, environmental compliance monitors, and other environmental professionals. The environmental management team will ensure that the Project is constructed, operated, and decommissioned in compliance with the conditions of environmental assessment approval, environmental management plans and required regulatory permits and licenses. The environmental management team will liaise with relevant government agencies, Aboriginal groups, stakeholders and local/regional organizations during the implementation of the follow-up program.

30.4.2 Follow-up Program Selection Process

The CEAA Follow-up OPS identifies several criteria to consider when developing a project follow-up program. These include:

- Existence of environmentally sensitive area
- Existence of protected areas or areas under consideration for protection
- Project related issues of public concern
- Accuracy of environmental assessment predictions
- Effectiveness of presented mitigation measures

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- New or unproven environmental assessment or mitigation techniques and technology
- Cumulative environmental effects
- Nature or scale of the Project warrants careful monitoring of environmental effects
- Limited scientific knowledge.

The follow-up programs presented in Section 30 of the EIS focused on acidification and eutrophication, sediment quality, and fish and fish habitat. Based on the criteria outlined in the CEAA Follow-up OPS and in consideration of project changes, additional candidate follow-up programs were evaluated (see Table 30-3). The OPS criteria are used as a screening tool to determine if the candidate follow-up programs are necessary. A check mark (“✓”) is applied if criteria apply to the candidate follow-up program. If any of the criteria apply, a follow-up program is presented for the Project and detailed in this section. Likewise, if none of the criteria apply, the candidate follow-up programs are not brought forward. Follow-up programs identified in the EIS and/or suggested by CEA Agency during its review are not considered necessary for sediment quality, fish and fish habitat over Flora Bank, species at risk, land and marine bird mortality, or underwater noise based on the criteria listed in the OPS (CEA Agency 2011).

As is described in Section 13 and Appendix A of the EIS Addendum (Marine Resources), the marine terminal design mitigation avoids or reduces project related effects to the marine environment. It removes the need for dredging of approximately 7 million cubic metres (m³) of material over an area of 84.6 ha to support terminal construction. The marine terminal design mitigation will also eliminate any project infrastructure from being located on Flora Bank. In this context, follow-up programs for sediment quality and fish and fish habitat over Flora Bank are no longer required. The assessment of the physical and chemical attributes of sediment in the materials off-loading facility (MOF) dredge area was included in the EIS and remains valid. The Sediment Transport (Section 30.4.6) and Marine Country Foods (Section 30.4.8) Follow-up Programs will verify EIS predictions and assess the effectiveness of implemented mitigation measures.

A follow-up program for listed species under the *Species at Risk Act* (SARA) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was considered and determined to be not required. The potential effects of the Project on terrestrial and marine species at risk are further discussed in Section 12 – Terrestrial Wildlife and Marine Birds, specifically in the response to the August 14, 2014 federal Information Request #6, #7, and #9. Mitigation measures presented in the EIS are expected to be effective in avoiding, minimizing, or offsetting for potential effects of the Project on federally listed species with a moderate or high degree of confidence. A number of mitigation activities have also been identified to address effects on SARA listed species and will be implemented as part of compliance monitoring for the Project. These include:

- Monitoring of fish habitat offsetting measures meant to replace eelgrass foraging habitat for marbled murrelet that will be removed by construction of the materials off-loading facility
- Wetland habitat compensation to restore and compensate for wetland habitats
- Installation of roosting structures for bats to compensate for removal of roosting habitat within the project development area (PDA).

A follow-up program for monitoring marine bird mortality was considered but determined to be adequately addressed by compliance monitoring. Petrels, storm-petrels, shearwaters, auks, murrelets, and puffins are most susceptible to light-induced mortality (BirdLife International 2012; Rich and Longcore 2006; Black 2005). However, baseline data indicate those species are uncommon in nearshore waters surrounding Lelu Island. Lighting

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mitigations are expected to reduce light dispersal from project infrastructure and effectively reduce the potential for mortality events to occur. Accordingly, mortality monitoring is recognized as a compliance monitoring component of the environmental management plans for the Project. As part of compliance monitoring, PNW LNG employees and contractors will participate in an employee education program to increase awareness of lighting effects on mortality of birds. Employees and contractors will report any collisions of birds with structures in the PDA. PNW LNG will compile data on collision events and submit reports to the appropriate regulatory agencies on an annual basis. This component of compliance monitoring will assist in verifying the effectiveness of lighting mitigations and mortality predictions.

The underwater noise component of the marine fish and fish habitat follow-up program is recognized as a compliance component of the environmental management plans for the Project. Details specific to the pile driving monitoring program are outlined in the Marine Mammal Monitoring and Protection Plan (refer to Section 13).

A follow-up program for archaeological and heritage resources was considered and determined to be not required. Mitigation measures presented in the EIS are expected to be effective in avoiding or minimizing potential effects of the Project on traditional sites such as geographical features, culturally modified trees, and other resources important to Aboriginal groups. PNW LNG has committed to implementing an Archaeological Resources and Heritage Management Plan (see Section 20). The procedures and practices for managing and protecting these resources, including compliance monitoring, are described in the plan. As part of its commitment to compliance monitoring, PNW LNG will record and mitigate interactions with archaeological and heritage resources to the satisfaction of the local Aboriginal groups. Any encountered and previously unrecorded archaeological or heritage resources will be identified prior to substantive disturbance. PNW LNG will take direction from the Prince Rupert Port Authority (PRPA) with respect to the management of archaeological and heritage resources on federal land. This includes reporting the results of compliance monitoring. The requirements of the *Heritage Conservation Act* will apply for any archaeological and heritage resources identified on the mainland.

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Table 30-3 Follow-up Program Criteria

Candidate Follow-up Program	Considerations in determining the need for a follow-up program								
	Environmentally sensitive areas	Protected areas	Public concern	Accuracy of predictions	Mitigation effectiveness	New and unproven techniques	Cumulative environmental effects	Nature or scale of project	Limited scientific knowledge
Aquatic acidification/eutrophication									
Freshwater aquatic environment	✓	-	✓	-	-	-	✓	✓	✓
Freshwater fish and fish habitat	✓	-	✓	✓	-	-	✓	✓	-
Amphibians	✓	-	✓	✓	-	-	✓	✓	-
Terrestrial acidification/eutrophication									
Vegetation and wetland resources	✓	-	-	✓	-	-	✓	-	✓
Sediment transport									
Sediment quality	-	-	-	-	-	-	-	-	-
Sediment transport and turbidity levels	-	-	✓	✓	-	-	✓	-	-
Marine fish and fish habitat									
Conceptual Fish Offsetting Strategy	-	-	✓	-	✓	-	-	-	-
Flora Bank	-	-	-	-	-	-	-	-	-
Underwater noise	-	-	-	-	-	-	-	-	-
Marine fish and fish habitat	-	-	✓	-	✓	-	-	-	-
Marine country foods									
Federally listed species	-	-	-	-	-	-	-	-	-
Vegetation	✓	-	-	-	✓	-	-	-	-
Marine bird mortality	-	-	-	-	-	-	-	-	-
Archaeological and heritage resources	-	-	-	-	-	-	-	-	-

Notes:

“✓” indicates criteria applies to the candidate follow-up program.

“-” indicates criteria does not apply to the candidate follow-up program.

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30.4.3 Program Components

During the EIS review process only conceptual level follow-up programs can reasonably be developed. Program details will be finalized as the Project moves through final design and permitting. Detailed refinement of each follow-up program will be driven by the guidelines established in the CEAA Follow-up OPS and based on feedback received from government and working group members during the EIS review process. Each follow-up program defines:

- Program objectives
- Implementation plans
- Reporting
- Adaptive management and potential mitigation measures.

PNW LNG will report the results of the follow-up programs to the CEA Agency and other applicable regulatory agencies. Report format and delivery schedule will be determined following discussions with applicable regulatory agencies and pending the receipt of relevant conditions of approval. Each report will outline how mitigation measures were implemented and assess the effectiveness of selected mitigation measures in reducing the predicted effects of the Project. Program-specific reporting requirements are outlined below.

30.4.4 Aquatic Acidification and Eutrophication

30.4.4.1 Introduction

The Aquatic Acidification and Eutrophication Follow-up Program (AAEFP) will verify acidification and eutrophication effects predicted in the EIS on the freshwater aquatic environment. The AAEFP will also evaluate the effectiveness of the mitigation measures presented in the EIS in order to assess whether to modify them or implement additional mitigation measures.

The AAEFP includes the following elements:

- Program objectives
- Detailed study design (i.e., measurable parameters, sampling sites, data collection methods and statistical analyses methods)
- Sampling/monitoring schedule
- Reporting requirements.

The final AAEFP will be developed in consultation with applicable regulatory jurisdictions and Aboriginal groups.

30.4.4.2 Objectives

The AAEFP has the following objectives:

- Verify acidification and eutrophication effects assessment predicted in the EIS on the freshwater aquatic environment

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- Determine whether project activities will result in measureable effects in the aquatic environment (i.e., water quality, freshwater fish and fish habitat and amphibians)
- Assess the effectiveness of mitigation measures and identify whether changes and/or additional mitigation measures are required.

30.4.4.3 Implementation Plan

30.4.4.3.1 Schedule

Commencement of the AAEP will be a function of the project construction and operations schedule. Construction activities are expected to occur between Q2 2015 and Q3 2019. Completion dates for liquefied natural gas (LNG) Train 1 and Train 2 (Phase 1) will be staged in sequence with commissioning expected to occur in Q3 2019 and Q1 2020, respectively. Timing of construction of LNG Train 3 (Phase 2) will depend on market conditions.

The AAEP schedule is presented in Table 30-4. The table summarizes all baseline collection programs supporting the follow-up program. In some instances baseline collection may continue into project construction if associated activities commence later in the five-year construction schedule presented by PNW LNG. This will ensure reliable baselines are established prior to implementing the follow-up program. The follow-up program will be implemented in the context of the final construction schedule and baseline programs that are underway. Since commissioning of Phase 2 has no specific timeframe, the AAEP will verify EIS predictions based on Phase 1 follow-up sampling results. The timeframe assumes follow-up data collection will commence once Train 1 is commissioned and conclude one year following commissioning of Train 2. Results collected during this period will be compared against baseline data collected prior to commencement of project operations to verify the project effects. The AAEP timeframe may be adapted depending on the results.

Table 30-4 AAEP Schedule for the Freshwater Aquatic Environment

Sampling Period	Approximate Sampling Time
Pre-construction and Construction Phase	
Wet deposition station (weekly)	Ongoing
Reconnaissance survey and fish habitat assessment	1 years prior to commissioning
Amphibian desktop study and reconnaissance survey	1 years prior to commissioning
Water quality sampling and laboratory analysis (monthly)	1-2 years prior to commissioning
Assessment of acidification potential in the study area surface waters	6 months prior to commissioning
Reporting	4 months prior to commissioning
Phase 1 (LNG Train 1 and 2)	
Wet deposition station (weekly)	up to 1 year following commissioning of Trains 1 and 2
Water quality sampling and laboratory analysis (monthly)	up to 1 year following commissioning of Trains 1 and 2
Analysis of results	up to 1 year following commissioning of Trains 1 and 2
Reporting	up to 1 year following commissioning of Trains 1 and 2

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30.4.4.3.2 Sampling

Sampling effort is summarized in Table 30-5. AAEPF will cover the Wolf Creek system, Hays Creek system, Alwyn Lake and two headwater lakes on Kaien Island. Sampling locations for various components of the AAEPF will be provided with the detailed plan.

Metlakatla First Nation (Metlakatla) has expressed interest in participating in this follow-up sampling program. As such, PNW LNG will continue to work in collaboration with Metlakatla to identify potential additional sampling locations.

Table 30-5 AAEPF Sampling Effort for Various Components

AAEPF Component	Wet Deposition	Water Quality	Fish and Fish Habitat	Amphibians
Wolf Creek Watershed	-	✓	✓	✓
Hays Creek Watershed	-	✓	✓	✓
Alwyn Lake	✓	✓	-	✓
Headwater Lakes on Kaien Island	-	✓	-	✓

30.4.4.3.2.1 Wet Deposition

A wet deposition monitoring station (BC24) was installed at the Port Edward drinking water treatment plant in January 2014 through a partnership between PNW LNG, British Gas Group (BG Group) and PRPA. Station BC24 is part of the National Atmospheric Deposition Program (NADP) network which consists of over 300 sites in United States and Canada. Collected data will be used to establish baseline wet deposition characteristics in Port Edward and Prince Rupert. It is expected that Station BC24 will continue to operate while the follow-up program is underway (up to 1 year following commissioning of Trains 1 and 2) in tandem with other sampling programs within the AAEPF. Data collected at the station will verify whether cumulative emissions contribute to an increase in acidifying or eutrophying compound depositions. The results will reflect cumulative effects for the region which will include the effects of reasonably foreseeable projects such as Prince Rupert LNG.

Weekly rainwater analysis will focus on precipitation (mm), pH, specific conductivity, acidic ions, basic ions, and nutrients. Measurements will be collected in accordance with methods described in the National Trends Network Site Operation Manual (NADP 1999). Data collected through this program will be subject to the NADP quality assurance program and will be publically available on the NADP site.

30.4.4.3.2.2 Water Quality

Water samples will be collected in accordance with methods described in the BC Field Sampling Manual (BC MOE 2003). The initial frequency of water quality sampling will be monthly. The sampling frequency may be revised (i.e., reduced) at the end of the program, based on the initial assessments.

Water samples will be analyzed for general chemistry (e.g., conductivity, alkalinity), nutrients, anions, organic carbon, total and dissolved metals and chlorophyll *a*. Samples will be used to calculate changes from baseline conditions on water parameters such as pH. Critical loads will be seasonally evaluated by using modelled and measured nitrogen and sulphate deposition (winter and summer) for targeted aquatic systems.

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30.4.4.3.2.3 Fish and Fish Habitat

Fish habitat assessment will follow field protocols outlined in Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures (RISC 2001) established by the BC Ministry of Sustainable Resource Management, Resource Inventory Standards Committee (RISC). This protocol includes the collection of biophysical information, in addition to other aspects of fish habitat (e.g., fish presence/absence, habitat suitability for various life stage processes, etc.). Based on the biophysical data collected, fish habitat quality (for salmonids) will be characterized at each site for specific life history functions (rearing, overwintering, spawning, migration, and staging/holding potential). Ratings of nil, poor, moderate, good and excellent will be used to rank each function of habitat based on the assessed quality of fish habitat and its potential to support salmonids. Salmonids, if present, are used as an index species to evaluate freshwater fish habitat because of their specific habitat requirements and sensitivity to changes in habitat and anthropogenic effects as well as their ecological and cultural importance and wide distribution in BC. Other species of concern may be added based on further discussion with DFO and relevant stakeholders. The need for further assessments (i.e., invertebrate sampling) will be determined based on the results of the acidification and fish and fish habitat assessments.

30.4.4.3.2.4 Amphibians

A desktop study will be conducted to identify amphibian species that have the potential to be present in the study area, including occurrence of listed species recorded in the BC Species and Ecosystems Explorer database. A reconnaissance site survey will also be conducted in accordance with Inventory Methods for Pond-breeding Amphibians and Painted Turtle, Version 2.0 (RISC 1998). The survey will support baseline data collection (i.e., during the construction phase of the Project) to characterize amphibian detected/not detected presence in study area surface waters with potential for acidification.

30.4.4.4 Reporting

Baseline conditions specific to acidification potential in the study area surface waters will be reported prior to commencement of project operations. The report will specify measurement type, collection methods, sampling frequency and data representative of baseline conditions. Data used to validate EIS predictions will be collected once Train 1 is commissioned and up to one year following commissioning of Train 2. It is anticipated that collection of field data up to one year following commissioning of Train 2 will be sufficient to assess the accuracy of environmental assessment predictions. PNW LNG will prepare a report at the end of the program and present the results of the assessment in comparison to established baseline conditions.

The effectiveness of the mitigation measures and the potential for acidification and eutrophication will be re-assessed during sampling and monitoring. The AAEPF is designed to assess the potential acidification and eutrophication effects associated with the Project within the first three years of operations. Pending the results of this review (i.e., if field findings exceed environmental assessment predictions), the extension of the AAEPF beyond three years will be reevaluated in consultation with appropriate government regulators. Over the longer-term, a coordinated program involving multiple parties responsible for contributing sources of emissions may be the preferred approach to monitoring the effects of this pathway on the aquatic environment.

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30.4.4.5 Summary

The AAEP involves the monitoring of wet deposition and the freshwater aquatic environment to verify predicted acidification and eutrophication effects on water quality, freshwater fish and fish habitat and amphibians. Supporting baseline sampling programs will be completed prior to project operations. Data used to validate EIS predictions will be collected once Train 1 is commissioned and up to one year following commissioning of Train 2. The program will be reviewed with input from regulators to determine whether sampling needs to continue in a regional context. The AAEP will be used to determine the effectiveness of implemented mitigation measures in order to modify or implement new measures where required.

30.4.5 Terrestrial Acidification and Eutrophication

30.4.5.1 Introduction

The Terrestrial Acidification and Eutrophication Follow-up Program (TAEFP) will verify acidification and eutrophication effects predicted in the PNW LNG EIS on soils and vegetation communities, including wetlands. The TAEFP will also evaluate the effectiveness of the mitigation measures presented in the EIS in order to assess whether to modify them or implement new measures where required.

The TAEFP includes the following elements:

- Program objectives
- Detailed study design (i.e., measurable parameters, sampling sites, data collection methods and statistical analyses methods)
- Sampling/monitoring schedule
- Reporting requirements.

The final TAEFP will be developed in consultation with applicable regulatory jurisdictions and Aboriginal groups.

30.4.5.2 Objectives

The TAEFP has the following objectives:

- Verify acidification and eutrophication effects assessment predictions in the EIS on the terrestrial environment, including predicted effects on pH of Soil Map Unit B3c
- Determine whether project activities will result in a measurable effect in the terrestrial environment (i.e., soil chemistry parameters; vegetation community composition and structure)
- Assess the effectiveness of mitigation measures and identify whether changes and/or additional mitigation measures are required.

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30.4.5.3 Implementation Plan

30.4.5.3.1 Schedule

Commencement of the TAEFP will be a function of the project construction and operations schedule. The schedule for the TAEFP is presented in Table 30-6. The table summarizes baseline and operations phase data collection programs supporting the follow-up program. The follow-up program will be implemented in the context of the final construction schedule and baseline programs that are currently underway. Since commissioning of Phase 2 has no specific timeframe, the TAEFP will verify EIS predictions once Train 1 is commissioned and up to one year following commissioning of Train 2. It is anticipated that collection of field data up to one year following commissioning of Train 2 will be sufficient to assess the accuracy of environmental assessment predictions. Results collected during this period will be compared against baseline data collected prior to commencement of project operations. Should field results exceed environmental assessment predictions, the program will be reassessed in consultation with appropriate regulators. The TAEFP timeframe may also be adapted depending on the results.

Metlakatla has expressed interest in participating in this follow-up sampling program. As such, PNW LNG will continue to work in collaboration with Metlakatla to identify potential additional sampling locations.

Table 30-6 TAEFP Schedule for the Terrestrial Environment

Follow-up Program Activity	Approximate Sampling Period for Soil	Approximate Sampling Period for Vegetation
Pre-Construction and Construction Phase		
Wet deposition station (weekly)	Ongoing	Ongoing
Desktop study and reconnaissance survey	1 year prior to commissioning	1 year prior to commissioning
Soil sampling and vegetation monitoring	1 year prior to commissioning	1 year prior to commissioning
Assessment of acidification and eutrophication modelled effects within the study area soils and vegetation communities	6 months prior to commissioning	6 months prior to commissioning
Reporting (annually)	4 months prior to commissioning	4 months prior to commissioning
Phase 1 (LNG Train 1 and 2)		
Wet deposition station (weekly)	up to 1 year following commissioning of Trains 1 and 2	up to 1 year following commissioning of Trains 1 and 2
Soil sampling and laboratory analysis (annually)	up to 1 year following commissioning of Trains 1 and 2	-
Vegetation monitoring	-	up to 1 year following commissioning of Trains 1 and 2
Analysis of results	up to 1 year following commissioning of Trains 1 and 2	up to 1 year following commissioning of Trains 1 and 2
Reporting	up to 1 year following commissioning of Trains 1 and 2	up to 1 year following commissioning of Trains 1 and 2

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30.4.5.3.2 Sampling

Field effort for soil and vegetation sample collection is summarized in Table 30-7. Soil sampling will occur in selected target areas on the perimeter of Lelu Island, Stapledon Island, Smith Island, and the mainland near Port Edward and Prince Rupert. Supplemental sampling will also target areas of Soil Map Unit B3C, where a predicted change in pH in the first 10 years of the Project was identified in the assessment.

The TAEFP will cover representative areas found within soils and ecosystems identified in the effects assessment with potential for measureable change in response to project emissions. Sampling locations for various components of the TAEFP will be provided within the detailed plan. Soil sampling for acidification will occur across several sites while soil sampling for eutrophication will be limited to areas where vegetation may be subject to potential effects from eutrophication.

Table 30-7 TAEFP Sampling Effort for Various Components

TAEFP Component	Wet deposition	Acid Deposition		Nitrogen Deposition	
		Soil Parameters	Ecosystem composition and structure	Soil Parameters	Ecosystem composition and structure
Lelu Island (ecosystems outside the PDA)	-	✓	✓	✓	✓
Prince Rupert vicinity	-	✓	✓	-	-
Alwyn Lake	✓	✓	✓	✓	✓
Stapledon Island	-	✓	✓	-	-
Port Edward vicinity	-	✓	✓	-	-
Smith Island	-	✓	✓	-	-

30.4.5.3.2.1 Wet Deposition

Wet deposition monitoring station (BC24) was installed at the Port Edward drinking water treatment plant in January 2014 through a partnership between PNW LNG, BG Group and PRPA. Station BC24 is part of the NADP network. Collected data will be used to establish baseline wet deposition characteristics in Port Edward and Prince Rupert. It is expected that Station BC24 will continue to operate while the follow-up program is underway in tandem with other sampling programs within the TAEFP. Data collected at the station will verify whether cumulative emissions contribute to an increase in acidifying or eutrophying compound depositions. The results will reflect cumulative effects for the region which will include the effects of reasonably foreseeable projects such as Prince Rupert LNG.

Weekly rainwater analysis will focus on precipitation (mm), pH, specific conductivity, acidic ions, basic ions, and nutrients. Measurements will be collected in accordance with methods described in the National Trends Network Site Operation Manual (NADP 1999). Data collected through this program will be subject to the NADP quality assurance program and will be publically available on the NADP site.

30.4.5.3.2.2 Soil

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Baseline soil data was collected at targeted locations within the project airshed via a field sampling program in late 2013. Continued baseline soil chemistry sampling at a subset of those target locations with supplemental sampling of Soil Map Unit B3C will be completed in order to more fully establish baseline conditions. Baseline soil sampling sites will also be established at the wet deposition monitoring station.

Laboratory analysis will focus on soil chemistry parameters including mineralogical data, pH, cation exchange capacity (CEC), and acidic and eutrophying ions that are indicators of changes in soil chemistry in response to inputs from air emissions.

Soil sampling will commence once Train 1 is commissioned and up to one year following commissioning of Train 2. A review of the soil sampling program and annual air deposition data in the context of regional industrial development will be conducted with input from regulators. Pending the results of this review, an extension to the TAEFP will be reevaluated. Sampling at Year 5 and Year 10 post-commissioning would provide additional verification of the soils modelling predictions; however, additional projects may come on line within that timeframe presenting a technical limitation regarding the causal linkage between prospective sources and results. Over the longer-term, a coordinated program involving multiple parties responsible for contributing sources of emissions may be the preferred approach to monitoring the effects of this pathway on ecosystems in the region.

30.4.5.3.2.3 Vegetation – Ecosystem Composition and Structure

Baseline vegetation sampling will be completed at a subset of locations within the areas where loads of acid and nitrogen deposition are predicted to exceed screening criteria provided in guidance from the Ministry of Environment (BC MOE 2013). Sampling will be located within a range of ecosystem types in order to capture the representative range of diversity within the predicated areas of exceedance and will be paired with soil sampling locations. Sampling will also occur within a vegetation community near the wet deposition sampling site. Permanent plots will be paired with similar ecosystems outside the predicted exceedance areas for comparison. Specific sampling locations will be selected during the desktop review and reconnaissance study.

Sampling will resume at the sites established for baseline at the beginning of the operations phase. Plots will be monitored annually once Train 1 is commissioned and up to one year following commissioning of Train 2.

30.4.5.4 Reporting

Baseline conditions specific to acidification and eutrophication in the study area for the terrestrial environment will be reported in prior to commencement of project operations. Baseline conditions will be reported for soils and vegetation in order to establish pre-operations conditions. The report will specify measurement type, collection methods, sampling frequency and data prior to commencement of project operations. Data used to validate EIS predictions will be collected annually once Train 1 is commissioned and up to one year following commissioning of Train 2. Annual reports will specify sampling and laboratory analysis type, sampling frequency, and any identified trends in the data.

The effectiveness of the mitigation measures and the potential for terrestrial acidification and eutrophication will be re-assessed during subsequent sampling. The TAEFP is designed to assess the potential acidification and eutrophication effects associated with the Project within the first three years of project operations. Pending the

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results of this review, the extension of the TAEFP beyond three years will be reevaluated. Sampling at Year 5 and Year 10 post-commissioning would provide additional verification of the soils modelling predictions; however, additional projects may come on line within that timeframe presenting a technical limitation regarding the causal linkage between prospective sources and results. Over the longer-term, a coordinated program involving multiple parties responsible for contributing sources of emissions may be the preferred approach to monitoring the effects of this pathway on ecosystems in the region.

30.4.5.5 Summary

The TAEFP involves the monitoring of soils and vegetation to verify the predicted acidification and eutrophication effects on soils and terrestrial ecosystems, including wetlands. Baseline soil and vegetation sampling will be completed one to two years prior to commissioning. Data used to validate EIS predictions will be collected once Train 1 is commissioned and up to one year following commissioning of Train 2. A review of the sampling program with input from regulators will be completed at the end of the program to determine the validity of continued sampling in a regional context. The TAEFP will be used to determine the effectiveness of implemented mitigation measures in order to modify or implement new measures where required.

30.4.6 Sediment Transport

30.4.6.1 Introduction

The Sediment Transport Follow-up Program (STFP) will verify release of sediment during dredging/blasting at the MOF and disposal at Brown Passage, as predicted in Appendix A of the EIS Addendum. The STFP will also evaluate the effectiveness of the mitigation measures in order to assess whether to modify them or implement additional mitigation measures.

The STFP includes the following elements:

- Program objectives
- Detailed study design (i.e., measurable parameters, sampling sites, and data collection methods)
- A sampling/monitoring schedule
- Reporting requirements.

The final STFP will be developed in consultation with applicable regulatory jurisdictions and Aboriginal groups, as part of the Disposal at Sea application.

Approximately 790,000 m³ of material is expected to be dredged from the MOF: 590,000 m³ will be rocky material, re-used during project construction, while approximately 200,000 m³ will be sediment, potentially for disposal at sea. Sediment dispersion resulting from dredging was modelled by ASL Environmental Services Inc. (Appendix O of the EIS). Since modelling was based on a dredge volume of 615,000 m³ of sediment, the predictions provide a conservative estimate of sediment dispersion associated with the refined project area.

The guidelines applicable to dredging activities are the Canadian Council of Ministers of the Environment (CCME) water quality guideline (WQG) for protection of aquatic life (CCME 2013) which, for TSS and turbidity, is the same

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as the BC approved WQG (BC MOE 2006). For continuous activities (24 hours to 30 days), the TSS WQG is no more than 5 mg/L above background levels in clear water and 10 mg/L above background levels in turbid waters (25 to 100 mg/L). The turbidity WQG is 2 NTU above background levels in clear water and a 10% change from background levels in turbid water (50 NTU or greater). Predicted TSS levels resulting from dredging activities were generally below the 5 mg/L WQG (often less than 1 mg/L) outside the active dredge area. Inside the dredge area, the maximum TSS level was predicted to be 41.9 mg/L during a flood slack tide. TSS levels resulting from disposal activities at Brown Passage were predicted to be generally less than 2.0 mg/L above background in near-surface waters. Six hours after disposal, the minimum depth with TSS values greater than 5 mg/L above background was modelled to be at 37 m. TSS concentrations 3 km from the site in any direction are predicted to be below the 5 mg/L above background WQG (maximum values of 1.7, 2.5, and 4.3 mg/L above background at 0, 6, and 12 hours after a disposal event, respectively, as the plume drifts toward the 3 km radius).

Turbidity will be monitored at the MOF during dredging/blasting, and at Brown Passage during disposal of dredged material, and converted to a TSS value. This will be used to confirm predictions, identify any WQG exceedances, and implement any new or revised mitigation measures.

30.4.6.2 Objectives

The STFP has the following objectives:

- Verify predictions of TSS levels and spatial extent of the plume during dredging and disposal at sea (through turbidity monitoring, using a site-specific turbidity-TSS calibration curve to infer TSS levels from turbidity measurements)
- Determine whether dredging and disposal at sea will result in measureable effects in the marine environment (i.e., to water quality, fish and fish habitat)
- Assess the effectiveness of mitigation measures and identify whether changes and/or additional mitigation measures are required.

30.4.6.3 Implementation Plan

30.4.6.3.1 Sediment and Water Quality Monitoring Schedule

Turbidity will be monitored during dredging/blasting at the MOF and disposal at Brown Passage, which is expected to occur over about six months, once dredging activities commence.

30.4.6.3.2 Development of a Site-Specific TSS-Turbidity Calibration Curve

Turbidity, rather than TSS, will be monitored in the field, given that this will allow monitoring in real time to indicate whether further mitigation measures are needed. Results will be compared to the turbidity WQG and converted to TSS for comparison with sediment dispersion model predictions (Appendix O of the EIS).

A site-specific relationship between TSS and turbidity will be developed prior to dredging to allow comparison of in situ turbidity measurements to TSS. Sediment samples with particle size composition similar to that of MOF sediments will be suspended in synthetic seawater in a range of dilutions and analyzed for TSS and turbidity. Dilutions will reflect the range of TSS levels predicted to occur during dredging of the MOF. Samples will be

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analyzed immediately after preparation and 6 and 12 hours later, to provide an indication of settling rates and to supplement model predictions on behaviour of suspended sediment.

30.4.6.3.3 In-Situ Monitoring and Water Sample Collection

Turbidity will be monitored by an environmental monitor or qualified environmental professional.

At the MOF, turbidity levels will be measured every two hours at select sites within 500 m of the active dredge area (focusing on areas down current from the dredging) and in a nearby reference area (to establish background concentrations). If turbidity levels are higher than predicted outside the active dredge area, the rate of activity will be slowed or other mitigation measures used (e.g., silt curtains). In the first week of turbidity monitoring, 25 water samples will be collected and analyzed for both turbidity and TSS to verify the relationship identified in the calibration curve.

At Brown Passage, turbidity monitoring will occur at the edge of the disposal site and some distance down current of the site following a disposal event, with samples collected within the reasonably accessible portion of the water column (e.g., surface 100 m). Water quality monitoring will occur during daylight hours on 20 percent of days during which ocean disposal occurs. A field team will cycle among monitoring stations throughout each day and will be adaptive to the conditions, focusing efforts on any specific site(s) that are approaching or exceeding model-predicted TSS levels. If turbidity levels are higher than inferred by the model-predicted TSS levels, the rate of disposal will be slowed and the frequency of monitoring will be increased, commensurate with the magnitude of the exceedance of predicted TSS levels. Baseline water quality data is currently being collected in conjunction with the deployment of the acoustic Doppler current profiler at the Brown Passage disposal site. Water samples were collected from the near-bottom [~195 m], mid-depth [~100 m], and surface on three occasions during the deployment of the acoustic Doppler current profiler in October 2014, and analyzed in the lab for TSS. Additional water samples will be collected at these depths during the retrieval trip in April 2015 and analyzed for TSS and turbidity. Baseline turbidity and TSS data at any additional sites to be monitored will be collected just prior to the first disposal event.

Cumulative effects on sediment and water quality are not anticipated because the effects of dredging and disposal activities of other reasonably foreseeable projects are not expected to overlap in both time and space, based on currently understood project construction schedules (see Section 13.6 and Figure 13-9 of Appendix A of the EIS Addendum). In the event of a delay in any construction schedule that results in temporal overlap of projects that are shown to have the potential to overlap spatially with construction of the MOF, water quality monitoring will be used to inform the application of additional mitigations (i.e., slowed production rate) as necessary to ensure there are no exceedances of model-predicted TSS levels outside the active work area or disposal site radius.

30.4.6.4 Reporting

Turbidity levels and mitigation measures implemented will be reported weekly to Fisheries and Oceans Canada (DFO) and Environment Canada, and summarized in a technical memorandum quarterly during construction. The technical memorandum will be submitted one month after the end of a quarter, and will include a discussion of turbidity levels, inferred TSS levels, and use of any additional mitigation measures.

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30.4.6.5 Adaptive Management and Mitigation Measures

If turbidity and inferred TSS levels are higher than model-predicted TSS levels outside the identified active work area (immediate area surrounding operating construction equipment) or disposal site, activities will be reduced or other additional mitigation measures (e.g., silt curtains) will be employed.

30.4.6.6 Summary

The STFP involves in-situ monitoring of turbidity levels during dredging and ocean disposal. A site-specific TSS-turbidity calibration curve will be generated, which will allow for conversion of field turbidity measurements to TSS for comparison to model predictions. This real-time monitoring of turbidity and inferred TSS levels will allow for modification of dredging or disposal activities and/or implementation of further mitigation measures if indicated.

30.4.7 Marine Fish and Fish Habitat

30.4.7.1 Introduction

The marine waters surrounding Prince Rupert provide a range of habitats supporting multiple fish and marine mammal species that contribute to the ecological, cultural, and economic conditions of the region. Fish and fish habitat and marine mammals are the key components of the Marine Resources VC.

Follow up monitoring of eelgrass beds associated with Flora Bank is no longer deemed a necessary requirement based on the marine terminal design mitigation. Although a small amount (approximately 900 m²) of eelgrass will be lost during construction of the MOF, this loss will be offset as part of the final Habitat Offsetting Plan. As such, follow up monitoring of eelgrass associated with the MOF will be addressed in the fish habitat offsetting follow up monitoring program.

The Marine Fish and Fish Habitat Follow-up Program (MFFHFP) will verify the predicted effects to marine fish and fish habitat described in Appendix A of the EIS Addendum (Marine Resources). The MFFHFP also assesses the effectiveness of mitigation and habitat offsetting measures. The details of the MFFHFP will be developed as part of the *Fisheries Act* authorization required for the Project. The MFFHFP will be developed in consultation with DFO, CEAA and other applicable regulatory jurisdictions and Aboriginal groups.

The MFFHFP includes the following elements:

- Program objectives
- Detailed study design (i.e., measurable parameters, sampling sites, and data collection methods)
- A sampling/monitoring schedule
- Reporting requirements.

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30.4.7.2 Objectives

The MFFHFP has the following objectives:

- Verify the predictions and extent of effects to fish and fish habitat, as identified in Appendix A of the EIS Addendum
- Monitor the effectiveness of mitigation measures during construction and operations
- Monitor the long-term effectiveness of habitat offsetting measures.

30.4.7.3 Implementation Plan

The approach adopted for the presented MFFHFP comprises three types of monitoring, as described below.

- **Compliance Monitoring:** evaluates compliance with conditions set forth in permits, licenses or Authorizations issued for the Project
- **Effectiveness Monitoring:** evaluates the success of prescribed mitigation and offsetting measures to minimize, mitigate, and offset for project impacts
- **Response Monitoring:** refers to the long-term monitoring of selected indicator parameters to determine if the Project is having an effect on the environment. This program typically collects data on environmental indicators such as fish habitat and fish productivity to establish whether the Project is having long term effects.

30.4.7.3.1 Schedule

The monitoring type, implementation timeframe, sampling frequency and program duration are presented in Table 30-8. The MFFHFP timeframe may be adapted depending on the results.

Table 30-8 Monitoring Parameters and their Associated Baseline Data Requirements, Frequency and Duration for the MFFHFP

Parameter	Monitoring Type	Baseline Requirements		Monitoring Requirements	
		Frequency	Duration	Frequency	Duration
Fish Habitat Offsetting	Compliance	n/a	n/a	Once	Immediately post-construction
	Effectiveness	Annually	Two Years	Annually	Operations Years 1, 2, 3, 5, and 10
Marine Fish and Fish Habitats	Compliance	TBD ¹	TBD	TBD	TBD
	Effectiveness	TBD	TBD	TBD	TBD
	Response	Annually	Two Years	Annually	Operations Years 1, 2, 3, 5, and 10

¹ Marine mammals are a component of the Marine Fish and Fish Habitats Parameter. PNW LNG will continue discussions with DFO regarding the applicability of the Marine Mammal Regulations of the *Fisheries Act* to project activities. As part of these discussions, appropriate compliance monitoring will be determined as applicable.

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30.4.7.3.2 Fish Habitat Offsetting

The Habitat Offsetting Plan for the Project is designed to address current regulatory and policy requirements pursuant to the federal *Fisheries Act* as well as specific guidance provided to PNW LNG by DFO. Based on the project changes and subsequent discussions with DFO and CEA Agency, the project related effects that need to be included in the Conceptual Fish Habitat Offsetting Strategy include:

- Permanent destruction of intertidal eelgrass habitat used by salmonids, herring, surf smelt and crab
- Permanent destruction of intertidal and subtidal hard bottom substrate with brown algae and kelp used as habitat by salmonids, herring, surf smelt and crab
- Permanent alteration of soft sediment habitat used by crab shrimp and benthic fish species
- Permanent alteration of deeper soft sediment habitat used by crab, shrimp and benthic fish species
- Permanent destruction of freshwater fish watercourses on Lelu Island.

Post-construction monitoring of the habitat offsetting measures may include both physical assessment as well as biological assessment of fish habitat use. Quality of the offsetting habitat will be monitored after 1, 2, 3, 5 and 10 years following project commissioning. Ongoing monitoring will be dependent on the performance of the offsetting habitat. Objectives of the habitat offsetting monitoring are to:

- Collect additional baseline data within the PDA
- Assess the geomorphic stability of the works over time
- Assess the functionality of fish habitat
- Assess the use of the habitat by commercial, recreational, and Aboriginal [fisheries] (CRA) fish species.

A detailed follow-up monitoring program will be developed as a component of the final detailed Habitat Offsetting Plan. The *Fisheries Act* Authorization will detail the conditions required for the habitat offsetting measures to be deemed functional. Upon receipt of the Authorization, these conditions will be incorporated into the final fish habitat offsetting follow up monitoring program.

30.4.7.3.3 Marine Fish and Fish Habitat

Pre and post-construction monitoring may include both physical habitat assessment as well as biological assessment of fish habitat use. Quality and functional state of habitats surrounding and adjacent to the marine terminal, MOF, pioneer dock and Lelu Island bridge will be monitored for one year prior to the start of construction (including surveys completed by PNW LNG starting in November 2014) and over a period of 10 years following construction with the following objectives:

- Assess marine fish, invertebrates and marine mammal relative abundance, and spatial and temporal habitat use on Horsey, Agnew and Flora banks and reference sites
- Provide pre- and post-construction baseline marine resource information around the constructed project infrastructure, with a focus to provide further information and verify temporal and spatial distribution and habitat use of key fisheries and marine mammals and their sensitive life history habitat dependence and potential least risk timing windows
- Confirm and/or refine construction and operations mitigation measure and provide information to measure the effectiveness.

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The fish and fish habitat monitoring program will use a range of methods to quantify the relative abundance, distribution and habitat use of CRA species and marine mammals that have been identified as important, including, Pacific salmon, crab, shrimp, herring, eulachon, and flatfish (flounder, sole), forage fish species (surf smelt, sandlance) and marine mammals. The presented monitoring program integrates the following survey methods:

- Hydroacoustic surveys paired with mid-trawl surveys to assess and characterize the abundance and distribution of pelagic fish species, including juvenile salmon, herring, eulachon, surf smelt and sandlance
- Beach seining to assess and characterize the abundance and distribution of intertidal and subtidal fishes
- Intertidal and subtidal trapping to assess and characterize the abundance and distribution of crab and prawn/shrimp
- Collection of oceanographic water property data and physical habitat information in parallel with biological surveys
- Habitat surveys at a reconnaissance level by site
- Vessel-based line-transect surveys to assess and characterize the relative abundance and distribution of marine mammals
- Monitoring of TSS and changes in bathymetry (i.e., sediment elevation) around the berth areas, along with characterization of propeller wash derived scour and associated TSS and sediment movement during LNG carrier maneuvering and berthing.

Final assessment methodologies will be developed in consultation with DFO and post-construction monitoring will be informed by the results of pre-construction monitoring.

30.4.7.4 Reporting

All data collected for each fish and fish habitat follow-up monitoring program will be compiled into a single standalone report for review by relevant regulatory agencies and Aboriginal groups by March 31 of the year following completion of construction. In subsequent years, an annual monitoring report will document the findings of the previous year's monitoring program in comparison to established baseline conditions. Monitoring parameters that are not assessed annually will only be included where appropriate.

Annual monitoring reports will detail the methods, results, comparative analysis to baseline conditions and/or appropriate *Fisheries Act* Authorization and regulatory conditions and recommendations for future assessments (as per the adaptive management approach). Any changes to the follow-up program will be documented and submitted to the agencies for review and approval.

30.4.7.5 Summary

The MFFHFP involves the monitoring of the marine fish and fish habitat as identified in the Section 13 – Marine Resources of the EIS (see also Appendix A of the EIS Addendum) and fish habitat offsetting measures to be specified in the *Fisheries Act* authorization issued for the Project. The program will be reviewed with input from applicable regulatory jurisdictions to determine whether sampling should continue in a regional context. The MFFHFP will be used to determine the effectiveness of implemented mitigation measures to modify or implement new measures where required.

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30.4.8 Marine Country Foods

30.4.8.1 Introduction

The Marine Traditional Country Food Follow-up Program (MTCFFP) is a subcomponent of the Human and Ecological Health VC for the EIS. The public is concerned that marine dredging at the MOF and the subsequent increase in suspended solids in the water column could affect the concentration of polychlorinated dibenzo-p-dioxin and furan (PCDD/Fs) in locally harvested marine traditional country foods. It should be noted that Porpoise Channel (Management Area 4-11) is under a permanent, year-round crab harvesting ban due to its proximity to Porpoise Harbour which is an industrialized port (BC MOE 2007).

It is illegal and unsafe to commercially or recreationally harvest crab and shellfish from Management Area 4-11 at any time (DFO 2014). However, First Nations marine food harvesting for food, social and ceremonial purposes is open coast-wide throughout the year. The potential for First Nations to harvest marine country foods from the area is low due to perceived contamination and the availability of harvesting locations throughout Chatham Sound.

In response to this concern, a Human Health Risk Assessment (HHRA) was conducted to evaluate the potential change to human health risk. The HHRA concluded that the site-specific and project specific conditions at the MOF would not increase PCDD/F concentrations in marine traditional country foods. These site-specific and project specific conditions include:

- PCDD/Fs were introduced into the marine environment from historical pulp mills operating in Porpoise Harbour before 1995
- Existing concentrations of PCDD/Fs in the sediment have decreased more than 99% since 1985, and are below environmental benchmarks (i.e., the Probable Effects Level) that indicate a potential to affect vertebrate marine life
- The Project does not generate or release additional PCDD/Fs into the environment
- The highest environmental concentrations of PCDD/Fs are in the surface sediments that marine life is currently exposed to. There is no capping/burial effect of PCDD/Fs at the MOF
- Sediment transport modelling in the MOF predicted that increased suspended sediment would be restricted to Porpoise Channel. The potential for food quality to change with respect to PCDD/F concentrations would be within Porpoise Channel.

Dredging cannot increase the concentration of PCDD/Fs in the sediment because the highest concentrations in the environment are already present in surface sediments, and concentrations decreased with depth. Therefore, dredging beyond the surface will mix surface sediments containing PCDD/Fs with deeper sediments that do not contain PCDD/Fs.

The US Environmental Protection Agency (1993) provides methods for assessing the risk to aquatic life and associated wildlife from exposures to PCDD/F. Modelling formulas used to predict uptake are dependent on the PCDD/F concentrations in the environment. The hydrophobic nature of PCDD/Fs makes them virtually insoluble in the water and the concentrations are orders of magnitude lower compared to sediment and food. Almost all PCDD/F uptake in marine organisms is attributed to sediment contact and food ingestion (US EPA 1993).

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Conceptually, dermal absorption of PCDD/Fs from contact with suspended sediments in the water column will increase marginally during dredging – resulting in a small increase in risk from the dermal uptake pathway. In practice, the contribution of this uptake pathway is negligible given that almost all PCDD/F uptake in marine organisms is attributed to sediment contact and food ingestion. The United States Environmental Protection Agency (US EPA) notes that, “*For many extremely hydrophobic chemicals such as dioxins, reliable measurements of ambient water concentrations, especially dissolved concentrations, are not available. Therefore, the accumulation of chemicals by an organism cannot be referenced to a water concentration*” (US EPA 1993). Given that PCDD/F concentrations cannot increase from dredging at the MOF, no measurable increase in health risk was predicted in the HHRA.

However, there remains the perception by the public that dredging will affect the quality of marine country foods. The follow-up program is intended to verify the accuracy of the predictions stated in the HHRA and Section 19 - Human and Ecological Health - of the EIS. The assessment of naturally occurring arsenic and copper in marine foods is also included in the follow-up program as requested by CEAA on the advice of Health Canada.

30.4.8.2 Objectives

The MTCFFP will achieve the following objectives:

- Monitor changes in PCDD/F concentration in marine traditional country foods that are harvested near the MOF during and after dredging
- Assess the accuracy of the predictions stated in the HHRA – where no changes in human health risk relative to baseline are predicted from the consumption of marine traditional country foods harvested near the MOF
- Report the findings of the follow-up program to applicable regulatory jurisdictions, Aboriginal groups and the public.

30.4.8.3 Implementation Plan

30.4.8.3.1 Schedule

The MTCFFP monitoring schedule includes at least three sampling periods as shown in Table 30-9.

Table 30-9 Marine Country Foods Implementation Schedule

Sampling Period	Approximate Sampling Time
Pre-construction (baseline)	Pre-construction
Dredge completion	1 st year of construction
One year after dredge completion	2 nd year of construction

Pre-construction baseline sampling may be conducted any time before dredging begins. The second sampling period will be conducted upon completion of construction dredging activities, which is estimated to take approximately 6 months. The third sampling period will be one year later to determine whether there are latent changes to food quality. If PCDD/F concentrations are significantly greater than baseline conditions in the third sampling period, marine country food monitoring will continue annually until conditions have returned to baseline.

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The final sampling period is intended to capture any potential latent changes in PCDD/F concentrations in marine foods because chemicals typically accumulate in the tissues over time. Historical records of PCDD/Fs show an approximate latency period of 6 to 12 months from when changes to PCDD/F concentrations in the sediment result in comparable changes to PCDD/F concentrations in crab hepatopancreas (BC MOE 2007).

30.4.8.3.2 Sample Collection

30.4.8.3.2.1 Dungeness Crabs

Dungeness crabs (*Metacarcinus magister*) are the primary species of interest because they are the most relevant species of marine food present in the area near the MOF. Dungeness crabs are abundantly present within this shallow area, and may be harvested by Aboriginals and the public. Dungeness crabs are the most commonly monitored species of marine food by DFO and other international regulatory institutions and in academic literature.

Field crews will collect Dungeness crabs using standard crab traps. Crab traps will be deployed in several locations in Porpoise Channel. Crabs that meet the legally harvestable size for human consumption (>165 mm carapace) will be retained for laboratory analysis. Crabs that are below this size will be returned to the ocean immediately.

Up to 15 crabs will be collected per sampling period. Retained crabs will have their carapace size and weight recorded before being placed in a large ziplock bag (double bagged) and labelled for laboratory identification. Crabs will be immediately frozen in preparation for shipping to the analytical laboratory.

30.4.8.3.2.2 Groundfish

Species of small groundfish (e.g., English sole, *Parophrys vetulus*, and Yellowfin sole, *Limanda aspera*) are the secondary species of interest because they are actively harvested from the study area and live in close association with sediments. However, PCDD/Fs are not actively monitored in groundfish in the literature and they are known to metabolize PCDD/Fs comparatively faster than invertebrates such as crabs.

Field crews may collect groundfish with angling or box net methods, noting that they are only available in shallow coastal regions during the fall and winter months. A record will be made for each groundfish collection location, body weight and body length. Each groundfish will be placed in a ziplock bag (double bagged) and labelled for laboratory identification. Groundfish will be immediately frozen in preparation for shipping to the analytical laboratory.

Up to 15 groundfish will be collected per sampling period. The final sample size may vary due to the unpredictability of angling methods to collect fish and seasonal availability (i.e., groundfish migrate towards the coastline in the fall).

30.4.8.3.3 Laboratory Analysis

30.4.8.3.3.1 Sample Preparation

Each crab will yield one crab meat sample and one crab hepatopancreas sample. Crab hepatopancreas is independently analyzed because this organ is associated with PCDD/F accumulation. Each groundfish will yield one groundfish meat sample. The laboratory staff will be responsible for the thawing and dissection of each sample. A minimum of 20 grams of tissue is mandatory for all analysis for dioxins and furans. This tissue volume restriction does not apply to metal analysis because metal concentrations will typically exceed the lowest detectable limit in the laboratory.

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30.4.8.3.3.2 Tissue Analysis

Laboratory analysis of each tissue type will include the quantification of:

- Dioxins and furans; reported as wet weight and dry weight total concentration and toxic equivalencies (TEQs)
- Total metal; reported as wet weight and dry weight concentrations.

PCDD/F analysis will be conducted following the methods guidance provided by the US Environmental Protection Agency (US EPA, 1994). The methods guidance notes that 20 grams of tissue is necessary to achieve the lowest detection limit using the described analytical protocol. Due to the low traces of dioxins detected in tissues from previous tissue samples, a minimum of 20 grams of tissue will be mandatory when analyzing for dioxins and furans. This minimum tissue amount is not necessary when measuring total metals in tissues.

30.4.8.4 Reporting

Results of the food monitoring program will be reported in the subsequent quarter of the year for each sampling period, allowing time for laboratory analysis and interpretation of the data. Reporting will be in the form of an amendment to the HHRA. This amendment will provide updated health risk estimates based on analytical results of food tissues, using the same human biometrics information in the HHRA report.

The results of the amendment reports will inform the appropriate federal authorities as directed by the CEA Agency on whether there is a need for further action to reduce health risks associated with consuming locally harvested marine country foods from Porpoise Channel. Interpretations and results of the amendment reports will be communicated to local Aboriginal groups, and the general public of Prince Rupert and Port Edward through several communication lines which may include town meetings, website postings or newsprint. Submission of all reports and data may be provided electronically or by hardcopy.

The results of the reports will inform the appropriate authorities on whether there is a need for further action to reduce health risks associated with consuming locally harvested marine country foods from Porpoise Channel. If there is need to reduce the health risk associated with consuming locally harvested marine country foods, further actions will likely be in the form of advisory postings to either reduce or restrict consumption of Dungeness crabs harvested from Porpoise Channel. Porpoise Channel (Management Area 4-11) is already under a permanent crab harvesting ban due to its proximity to Porpoise Harbour (Fisheries and Oceans Canada 2014). It is currently illegal to harvest crabs from the MOF dredge area.

30.4.8.5 Summary

The Marine Traditional Country Food Follow-up Program will include the collection of crabs and groundfish from Porpoise Channel within the MOF study area. Sampling is anticipated to begin prior to construction to establish baseline chemical concentrations in marine country food tissues, with subsequent sampling periods at the end of dredging activities and one year post-completion of dredging activities.

Crab muscle, crab hepatopancreas and groundfish muscle will be analyzed for PCDD/Fs, while total metals will be analyzed in muscle meat only. Results of the food monitoring program will be reported as an amendment to the HHRA in the subsequent quarter of the year for each sampling period. This amendment will be provided to the

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appropriate regulatory agencies involved with the protection of human health, but will be available by request from all parties.

30.4.9 Vegetation and Wetlands Resources

30.4.9.1 Introduction

The Vegetation and Wetland Resources Follow-up Program (VWRFP) is presented to verify predicted project effects on red- and blue-listed ecological communities, wetlands and old forest outside of the PDA. It will also verify that a potentially blue-listed plant species is not adversely affected by the Project and will evaluate the effectiveness of mitigation measures for maintaining ecological communities of interest.

30.4.9.2 Objectives

The VWRFP has the following objectives:

- Verify that red- and blue-listed ecological communities, wetlands, and old forest located outside the PDA will not be adversely affected as a result of project construction or operations
- Verify that potentially-blue-listed plant species at risk are not adversely affected as a result of project construction or operations
- Monitor mitigation measures to ensure that they are effective in maintaining ecological communities of interest.

30.4.9.3 Implementation Plan

30.4.9.3.1 Schedule

The VWRFP implementation plan includes details of the follow-up program, sampling type, location, frequency and duration. The implementation schedule is presented in Table 30-10. The VWRFP timeframe may be adapted depending on the results.

Table 30-10 VWRFP Implementation Schedule

Sampling Period	Approximate Sampling Time
Pre-Construction and Construction Phase	
Vegetation monitoring	Pre-construction through commissioning of Train 1
Phase 1 (LNG Train 1 and 2)	
Vegetation monitoring	Up to 1 year following commissioning of Trains 1 and 2

If effects to vegetation exceed predictions made in the EIS, the need for additional monitoring and management of the vegetation buffer will be reevaluated in consultation with relevant government regulators.

30.4.9.3.2 Monitoring Methods

The monitoring component of the VWRFP includes both qualitative and quantitative methods designed to meet the program objectives. Qualitative monitoring methods include comprehensive reconnaissance surveys aimed at

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early detection of unintended adverse effects and to confirm the efficacy of mitigation measures. Qualitative methods also include the use of photo points to document the condition of vegetation and wetlands resources. Quantitative methods include plot-based sampling of communities and occurrences of particular plant species populations. Attributes of communities and species occurrences that are observed and recorded within a plot-based sampling approach will provide indicators of the condition of vegetation and wetlands resources. Analysis of the results of annual monitoring will provide evidence of trends spanning the construction and up to one year following commissioning of Trains 1 and 2.

30.4.9.3.2.1 Reconnaissance Surveys

Reconnaissance-level field surveys will be completed with the objective of qualitatively assessing vegetation and wetlands resources within the perimeter of the island. Methods entail walking through the area and recording any impairments to the health and condition of the vegetation or soils that are observed (e.g., windthrow, obvious increase in surface water, obvious reduction of surface water, erosion, pest or pathogen infestation, or invasive species occurrences, etc.). Reconnaissance surveys will incorporate methods and approaches for non-native invasive plant species surveys (Ministry of Forests and Range 2010; BC OGC 2013). If occurrences are observed, population attributes (density, cover and/or spatial extent) will be recorded.

This rapid assessment method provides thorough coverage of vegetation and wetland resources outside the PDA. Global positioning system (GPS) points, field notes, and photo documentation will be collected in locations where issues are observed.

30.4.9.3.2.2 Plot-based Surveys

Red- and blue-listed ecological communities, wetlands and old forest

To assess whether adverse effects have occurred in red- and blue-listed ecological communities, wetlands, and old forest stands, permanent ground inspection plots will be repeated annually according to provincial standard methods described in *Field Manual for Describing Terrestrial Ecosystems* (MOFR and MOE 2010). Ground inspections entail the collection of basic site, soils, and vegetation attributes listed below:

- Permanent plot number
- Universal Transverse Mercator coordinates for the center of the plot (where photo points will be established)
- Photos (one per cardinal direction)
- Site series/Wetland Association
- Vegetation composition and cover
- Moisture regime
- Nutrient regime
- Successional status
- Structural stage
- Stand age.

Permanent photo points will be established in the middle of the plot with a marker and photos will be taken in each cardinal direction. These photos will be repeated annually as another measure to detect change in the community composition over time.

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30.4.9.3.2.3 Species at Risk Surveys

Potentially Blue-listed plant species

While updating information on traditional use plants for the EIS, it was discovered that a potentially blue-listed plant species was observed on Lelu Island. The taxonomy of this species is uncertain (Douglas et al. 1998; BC CDC 2014; ITIS 2014; M. Eggers pers comm 2014; D. Meidinger pers comm 2014); however, to be conservative, occurrences of this species within the local assessment area should be managed as uncommon and associated with specialized habitats (coastal cliffs and/or coastal wetlands), but not significantly threatened, until their sub-specific taxonomic identification can be confirmed (M. Eggers pers comm 2014; D. Meidinger pers comm 2014).

Pre-construction surveys for the *Castilleja miniata* paintbrush species will occur in the growing season prior to scheduled land clearing to record presence, density, spatial extent and population throughout the vegetated perimeter outside the PDA. If populations are sufficiently large enough, specimens will be collected and sent to experts for confirmation of their precise taxonomy/classification. Prospective rare plant collections will follow methods set forth in the *Alberta Native Plant Council Guidelines for Rare Vascular Plant Surveys in Alberta*, and sources cited therein (ANPC 2012).

Once the occurrences and population-attributes of *Castilleja miniata* on Lelu Island are recorded, annual surveys will be conducted during construction and up to one year following commissioning of Trains 1 and 2 to monitor the condition of each occurrence. Attribute data such as density and/or cover will be collected and recorded annually at each known occurrence and reconnaissance surveys (described above) will be used to detect any new occurrences within areas of suitable habitat.

No federally listed (SARA and COSEWIC) plant species were detected in the local study area, therefore, no follow-up program specifically targeting these species is presented; however, both reconnaissance and plot-based surveys provide an opportunity for incidental discovery of species at risk.

30.4.9.3.3 Data Analysis

Results from the reconnaissance survey and plot data will be summarized annually. The inter-annual trend of indicators associated with each vegetation category (ecological communities of interest, species of interest) will be analyzed and compared with pre-construction conditions to determine whether adverse effects are occurring within the vegetated buffer.

30.4.9.4 Reporting

One annual report will be prepared following completion of pre-construction surveys, and at the end of each construction year and up to one year following commissioning of Trains 1 and 2. The results of the pre-construction surveys will be compared with the results from successive years' surveys. The annual report will summarize vegetation and wetland resource conditions documented in the field, as well as adaptive management recommendations to address potential remedial actions. The report will be submitted to relevant government agencies and shared with interested First Nations.

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30.4.9.5 Summary

The VWRFP will verify that vegetation and wetland resources of interest are not adversely affected as a result of project construction or operations. The VWRFP will also ensure that mitigation measures are effective to avoid or reduce potential adverse effects on vegetation and wetland resources of interest.

The VWRFP will rely on reconnaissance and plot-based surveys within the vegetated area of Lelu Island to detect impairments to vegetation and wetlands resources (e.g., erosion, non-native invasive species, or windthrow) and to monitor the condition of vegetation and wetlands resources directly (e.g., vegetation community composition, cover, soil moisture regime, etc.). Results of the vegetation follow-up program will be reported on an annual basis, and will be provided to applicable regulatory jurisdictions and Aboriginal groups.

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