

10.0 VEGETATION

The assessment of potential effects of the Project on vegetation and wetlands was provided in Section 10 of the EIS. This section of the EIS Addendum provides:

- An update to the potential project and cumulative effects on the Vegetation and Wetlands VC as a result of the project changes
- Responses to requests for additional information received from the federal government (August 14, 2014 and September 11, 2014)
- An updated list of mitigation measures for the Vegetation and Wetland Resources VC
- Updated conclusions on the assessment of effects on the Vegetation and Wetland Resources VC, taking into account project changes and the requested additional information.

Table 10-1 lists the documents applicable to Vegetation and Wetland Resources 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of the environmental assessment process to date and identifies if information is either *updated by EIS Addendum*, *superseded*, *not relevant*, or *not affected* by information in the EIS Addendum.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 15-1. Figure 10-1 to Figure 10-10 have been updated from those provided in the EIS to reflect the project changes and any other applicable updates.

Table 10-1 Status of Previously Submitted Documents

Document Name	Status
Section 10 of the EIS (February 2014)	Updated by EIS Addendum
Appendix E of the EIS (February 2014)	Not affected
Technical Memorandum: Wetland Compensation (June 23, 2014)	Not affected
Technical Memorandum: Traditional Use Plants (June 23, 2014)	Updated by EIS Addendum
Technical Memorandum: Vegetation and Wetland Resources Regional Assessment Area (June 22, 2014)	Not affected
Technical Memorandum: 30 metre Vegetation Buffer around Lelu Island (June 23, 2014)	Not affected
Responses to the Working Group (June 2014)	Updated by the EIS Addendum

10.1 PROJECT EFFECTS ASSESSMENT UPDATE

10.1.1 Baseline Conditions

The baseline conditions described in the EIS and the Vegetation and Wetland Resources Technical Data Report (TDR) (submitted February 2014) apply to the marine terminal design mitigation. The design mitigation results in the relocation of the marine terminal berth by about 510 m from the location described in the EIS; however, the area affected by the design mitigation is primarily in marine waters with negligible changes to the location on land.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Therefore, the terrestrial vegetation and wetland resources are effectively the same as those originally presented in the EIS (see Section 10.1.2 of this EIS Addendum).

Since the submission of the EIS, Traditional Use Studies have been provided by First Nations and reviewed for additional information that would apply to the assessment of the Vegetation and Wetlands VC (DM Cultural Services Ltd and Metlakatla First Nation 2014, Calliou Group 2014, Pulla 2014, Crossroads Cultural Resource Management Ltd 2014, and Inglis Consulting Services 2014; see Section 21 and Appendix B of the EIS Addendum). Information from the Traditional Use Studies has been incorporated into this effects assessment and in the responses to information requests wherever applicable.

The EIS included a list of traditional use plants that was determined from existing literature sources only (Compton, 1993; MacDonald 2005; Metlakatla 2013). The list in the EIS included seven tree, 24 shrub, 10 herb and one fern species. As a result of reviewing the Traditional Use Studies provided to PNW LNG by First Nations after the submission of the EIS, 15 tree, 44 shrub, 43 herb, four fern and two lichen species were added to the list (see Table 10-2).

Table 10-2 Traditional Use Plants

Species	Scientific Name	First Nation Use
Trees		
Balsam	<i>Abies spp.</i>	^a
Balsam poplar	<i>Populus balsamifera</i>	Medicine, material
Birch	<i>Betula spp.</i>	Material
Black cottonwood	<i>Populus trichocarpa</i>	Food
Engelmann spruce	<i>Picea engelmannii</i>	Material, food
Hemlock	<i>Tsuga species</i>	Food (cambium)
Lodgepole pine	<i>Pinus contorta</i>	Food, medicine, material
Maple	<i>Acer spp.</i>	^a
Mountain hemlock	<i>Tsuga mertensiana</i>	Medicine, food
Pacific crabapple	<i>Malus fusca</i>	Food, material
Pacific silver fir/coastal balsam	<i>Abies amabilis</i>	Food, medicine, material
Pacific yew/Western yew	<i>Taxus brevifolia</i>	Food, material, medicine
Paper birch	<i>Betula papyrifera</i>	Material
Ponderosa pine	<i>Pinus ponderosa</i>	Food
Red alder	<i>Alnus rubra</i>	Medicine, food
Shore pine/jack pine ^b	<i>Pinus contorta var contorta</i>	Material
Sitka spruce	<i>Picea sitchensis</i>	Food (cambium), material
Subalpine fir/alpine fir	<i>Abies lasiocarpa var lasiocarpa</i>	Material
Trembling aspen	<i>Populus tremuloides</i>	Food, medicine

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Species	Scientific Name	First Nation Use
Western redcedar	<i>Thuja plicata</i>	Material, cultural purposes
Western hemlock	<i>Tsuga heterophylla</i>	Food, medicine, material
Yellow-cedar	<i>Chamaecyparis nootkatensis</i>	Material
Shrubs		
Alaska blueberry	<i>Vaccinium alaskaense</i>	Food
American highbush-cranberry	<i>Viburnum edule</i>	Food, medicine
Arctic willow	<i>Salix arctica</i>	^a
Beaked hazelnut	<i>Corylus cornuta</i>	^a
Bearberry	<i>Arctous</i> spp.	Food, medicine
Black crowberry	<i>Empetrum nigrum</i>	Food
Black currant	<i>Ribes nigrum</i> <i>Ribes hudsonianum</i>	Food
Black hawthorn	<i>Crataegus douglasii</i>	Food, material
Black huckleberry	<i>Vaccinium membranaceum</i>	Food, medicine
Black mountain berry ^c	-	Food
Black raspberry Black cap	<i>Rubus leucodermis</i>	Food, medicine
Black swamp gooseberry	<i>Ribes</i> spp.	Medicine
Black twinberry	<i>Lonicera involucrata</i>	Medicine
Blackberry	<i>Rubus</i> spp.	Food
Blueberry	<i>Vaccinium</i> spp.	Food
Bog cranberry	<i>Oxycoccus oxycoccos</i>	Food
Choke cherry	<i>Prunus virginiana</i>	Food
Cloudberry	<i>Rubus chamaemorus</i>	Food
Copper-bush	<i>Elliottia pyroliflora</i>	Medicine
Creeping raspberry	<i>Rubus pedatus</i>	Food
Devil's club	<i>Oplopanax horridus</i>	Food, medicine
Elderberry	<i>Sambucus racemosa</i>	food, medicine
False azalea	<i>Menziesia ferruginea</i>	Medicine
False box	<i>Paxistima myrsinites</i>	Medicine
Gooseberry	<i>Ribes</i> sp	Food
Grouse berry	<i>Vaccinium scoparium</i>	^a
Hazelnut	<i>Corylus cornuta</i>	Food
Highbush cranberry	<i>Viburnum edule</i>	Food
Hudson bay tea	<i>Rhododendron</i> spp.	Food, medicine

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Species	Scientific Name	First Nation Use
Juniper	<i>Juniperus</i> spp.	Food, material
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	Food
Labrador tea	<i>Rhododendron groenlandicum</i>	Medicine, food
Laughing berries ^b	-	Medicine
Low-bush cranberry	<i>Vaccinium vitis-idaea</i>	Food
Mountain alder	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	Medicine
Mountain ash	<i>Sorbus</i> spp.	Medicine
Mountain huckleberry	<i>Vaccinium</i> sp.	Food, medicine
Nootka rose	<i>Rosa nutkana</i>	Food, medicine
Northern black currant	<i>Ribes hudsonianum</i>	Food
Pacific willow	<i>Salix lasiandra</i> var <i>lasiandra</i>	Material
Pigeon berry ^c	-	a
Raspberry	<i>Rubus</i> sp	Food
Red currant	<i>Ribes</i> sp	Food
Red elderberry	<i>Sambucus racemosa</i>	Food
Red huckleberry	<i>Vaccinium parvifolium</i>	Food, medicine
Red osier dogwood	<i>Cornus stolonifera</i>	Food, material
Rocky mountain juniper	<i>Juniperus scopulorum</i>	Material
Rocky mountain maple	<i>Acer</i> spp.	Material
Rose	<i>Rosa</i> spp.	Food, medicine
Salal	<i>Gaultheria shallon</i>	Food
Salmonberry	<i>Rubus spectabilis</i>	Food
Saskatoon berry	<i>Amelanchier alnifolia</i>	Food
Scouler's willow	<i>Salix scouleriana</i>	Material
Sitka alder	<i>Alnus viridis</i> ssp. <i>sinuata</i>	Medicine, material
Sitka mountain ash	<i>Sorbus sitchensis</i>	Medicine
Sitka willow	<i>Salix sitchensis</i>	Material
Snowberry	<i>Symphoricarpos albus</i>	Food
Soapberry	<i>Shepherdia canadensis</i>	Food
Sourberries ^c	-	a
Stink currant	<i>Ribes bracteosum</i>	Food
Swamp gooseberry	<i>Ribes</i> spp.	a
Thimbleberry	<i>Rubus parviflorum</i>	Food
Thunderberry ^c	-	a
Western mountain ash	<i>Sorbus scopulina</i>	Medicine

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Species	Scientific Name	First Nation Use
White-stemmed gooseberry	<i>Ribes inerme</i> var. <i>inerme</i>	Food
Willow	<i>Salix</i> spp.	^a
Herbs		
Arctic lupine	<i>Lupinus arcticus</i>	Food
Arrowhead	<i>Sagittaria latifolia</i>	Food
Baneberry	<i>Actaea rubra</i>	Medicine
Black lily	<i>Fritillaria camschatcensis</i>	Food
Branchless horsetail	<i>Equisetum</i> spp.	Material
Bunchberry (western cordillera)	<i>Cornus unalaschkensis</i>	Food
Cattail	<i>Typha latifolia</i>	Material
Chocolate lily	<i>Fritillaria affinis</i> var. <i>affinis</i>	^a
Clover	<i>Trifolium</i> spp.	Food
Common red paintbrush	<i>Castilleja miniata</i>	Medicine
Cow parsnip/Indian celery	<i>Heracleum maximum</i>	Food, medicine
Cut-leaved anemone	<i>Anemone multifida</i>	Medicine
Desert parsley	<i>Lomatium</i> spp.	Medicine
False solomon's seal	<i>Maianthemum racemosum</i> ssp. <i>amplexicaule</i>	Food, medicine
Field mint	<i>Mentha arvensis</i>	Medicine
Fireweed	<i>Epilobium angustifolium</i>	Food
Common horsetail	<i>Equisetum arvense</i>	Food
Hedge mustard	<i>Sisymbrium officinale</i>	Medicine
Hemlock parsley	<i>Conioselinum gmelinii</i>	Food
Hemp-nettle	<i>Galeopsis tetrahit</i>	Material
Indian celery ^c	-	^a
Indian hellebore	<i>Veratrum viride</i>	Food, medicine
Kneeling angelica	<i>Angelica genuflexa</i>	Medicine
Lance-leaved stonecrop	<i>Sedum lanceolatum</i>	Medicine
Lily bulbs	Liliaceae	Food
Lupines	<i>Lupinus</i> spp.	Food
Nodding onion	<i>Alium cernuum</i> var. <i>cernuum</i>	food
Nootka lupine	<i>Lupinus nootkatensis</i>	Food
Northern starflower	<i>Trientalis europaea</i> ssp. <i>arctica</i>	Food
Pacific Clover root	<i>Trifolium</i> spp.	Food
Parsley ^b	-	Food

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Species	Scientific Name	First Nation Use
Red clover	<i>Trifolium pratense</i>	food, medicine
Red columbine	<i>Aquilegia formosa</i> ssp. <i>formosa</i>	Food, medicine
Reed canary grass	<i>Phalaris arundinacea</i>	Material
Rhubarb	<i>Rheum rhabarbarum</i>	Food
Sheep sorrel	<i>Rumex acetosella</i>	^a
Silverweed	<i>Potentilla anserina</i>	Food
Single-delight wax flower	<i>Moneses uniflora</i>	Medicine
Skunk cabbage	<i>Lysichiton americanus</i>	Food
Solomon's seal	<i>Maianthemum racemosum</i>	Medicine
Springbank clover	<i>Trifolium wormskioldii</i>	Food
Stinging nettle	<i>Urtica dioica</i> ssp. <i>gracilis</i>	Medicine, material
Stink cabbage	<i>Lysichiton americanus</i>	^a
Strawberry	<i>Fragaria</i> sp	Food
Sylvan goat's beard	<i>Aruncus dioicus</i>	Medicine
Water parsley	<i>Oenanthe sarmentosa</i>	Medicine
Wild calla	<i>Calla palustris</i>	Medicine
Wild celery (sea watch)	<i>Angelica lucida</i>	Food
Wild onion	<i>Allium</i> spp.	Food
Wild tobacco	<i>Nicotiana attenuata</i>	Medicine
Woodland strawberry	<i>Fragaria</i> spp.	Food
Yarrow	<i>Achillea millefolium</i>	Medicine
Yellow water/pond lily	<i>Nuphar polysepala</i>	Medicine
Ferns		
Bracken fern	<i>Pteridium aquilinum</i>	Medicine, food
Deer fern	<i>Blechnum spicant</i>	Medicine
Lady fern	<i>Athyrium filix-femina</i>	Food, medicine
Licorice fern	<i>Polypodium glycyrrhiza</i>	Food, medicine
Spiny wood fern	<i>Dryopteris expansa</i>	Food
Lichens		
black lichen ^c	-	Food, material
lichen ^c	-	^a

NOTES:

^a The specific use (food, medicine, material or ceremony) was not indicated in traditional use studies, but the species was identified.

^b The common name Jack pine is typically associated with *Pinus banksiana*, a species which occurs east of the Rocky Mountains; therefore, it is assumed that the species being referred to is shore pine (*Pinus contorta* var *contorta*).

^c Where the common name provided was inconclusive, no scientific name was entered.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

The EIS provided a list of six tree, 11 shrub, five herb and one fern traditional use species that were observed within the local assessment area (LAA) during field studies. Using the updated information provided in the traditional use studies, an additional three tree, five shrub, eight herb and four fern species were added to this list of traditional use species found within the LAA during field surveys conducted for the EIS (see Table 10-3).

Some of the species identified as those used by First Nations were unable to be identified from the name, including black mountain berry, lily root, and Pacific clover root (see Table 10-3).

Table 10-3 Traditional Use Plants Observed in the LAA

Species	Latin Name	First Nation Use	Occurs in the LAA
Trees			
Hemlock	<i>Tsuga species</i>	Food (cambium)	Yes
Mountain hemlock	<i>Tsuga mertensiana</i>	Food, medicine	Yes
Pacific crabapple	<i>Malus fusca</i>	Food	Yes
Pacific silver fir/Amabilis fir	<i>Abies amabilis</i>	Food (cambium)	Yes
Red alder	<i>Alnus rubra</i>	Food, medicine	Yes
Shore pine	<i>Pinus contorta var. contorta</i>	Material	Yes
Sitka spruce	<i>Picea sitchensis</i>	Food (cambium)	Yes
Western redcedar	<i>Thuja plicata</i>	Material	Yes
Yellow-cedar	<i>Chamaecyparis nootkatensis</i>	Material	Yes
Shrubs			
Alaska blueberry	<i>Vaccinium alaskaense</i>	Food	Yes
Black crowberry	<i>Empetrum nigrum</i>	Food	Yes
Black mountain berry	-	Food	unconfirmed
Blueberry	<i>Vaccinium spp.</i>	Food	Yes
Bog blueberry	<i>Vaccinium uliginosum</i>	Food	Yes
Bog cranberry	<i>Oxycoccus oxycoccos</i>	Food	Yes
Cloudberry	<i>Rubus chamaemorus</i>	Food	Yes
Devil's club	<i>Oplopanax horridus</i>	Medicine (bark)	Yes
Dwarf blueberry	<i>Vaccinium caespitosum</i>	Food	Yes
False azalea	<i>Menziesia ferruginea</i>	Medicine	Yes
Juniper	<i>Juniperus spp.</i>	Medicine	Yes
Labrador tea	<i>Rhododendron groenlandicum</i>	Medicine, food	Yes
Oval-leaved blueberry	<i>Vaccinium ovalifolium</i>	Food	Yes
Red huckleberry	<i>Vaccinium parvifolium</i>	Food	Yes
Salal	<i>Gaultheria shallon</i>	Food	Yes

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Species	Latin Name	First Nation Use	Occurs in the LAA
Salmonberry	<i>Rubus spectabilis</i>	Food	Yes
Herbs			
Bunchberry (western cordillera)	<i>Cornus unalaschensis</i>	Food	Yes
Common silverweed	<i>Potentilla anserina</i>	Food	Yes
Fireweed	<i>Epilobium angustifolium</i>	Food	Yes
Indian hellebore	<i>Veratrum viride</i>	Food, medicine	Yes
Lily root	-	Food	unconfirmed
Northern starflower	<i>Trientalis europaea</i>	Food	Yes
Pacific Clover root	-	Food	unconfirmed
Pond lily	<i>Nuphar polysepala</i>	Medicine	Yes
Scarlet paintbrush	<i>Castilleja miniata</i>	Medicine	Yes
Indian celery	<i>Angelica lucida</i>	Food	Yes
Single delight	<i>Moneses uniflora</i>	Medicine	Yes
Skunk cabbage	<i>Lysichiton americanus</i>	Food	Yes
Yarrow	<i>Achillea millefolium</i>	Medicine	Yes
Ferns			
Bracken fern	<i>Pteridium aquilinum</i>	Food, medicine	Yes
Deer fern	<i>Blechnum spicant</i>	Medicine	Yes
Lady fern	<i>Athyrium filix-femina</i>	Food, medicine	Yes
Licorice fern	<i>Polypodium glycyrrhiza</i>	Food, medicine	Yes
Spiny wood fern	<i>Dryopteris expansa</i>	Food	Yes

10.1.2 Effects Assessment

Construction of the Project will result in adverse effects on vegetation and wetlands. The key potential effects addressed in the vegetation and wetland assessment are the change in abundance of plant species of interest (i.e., loss of traditional use plants), the change in abundance of ecological communities of interest (i.e., loss of communities at risk and old forest), and change in wetland functions due to clearing and grading within the project development area (PDA).

Two ecosystems are present within the area of the original trestle and revised trestle locations based on the marine terminal design mitigation. The marine terminal design mitigation results in a very small (<0.1 ha) increase in the loss of old forest and swamp wetland. No ecological communities at risk are affected by the marine terminal design mitigation.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Potential effects of the marine terminal design mitigation are therefore comparable to those reported in the EIS since the new design results in a negligible change in the PDA and the measureable parameters (i.e., loss of old forest, wetlands and traditional use plants).

The project changes are not expected to result in a material change to the assessment of residual effects for the construction, operations, and decommissioning phases of the Project. The potential change in effects to Vegetation and Wetland Resources are very minor in area and nature and do not change the characterization of residual effects presented in the EIS and summarized below.

The project residual effects to vegetation and wetland resources are comparable to the residual effects in the EIS. The project residual effects to vegetation and wetland resources are summarized in the following sections and in Table 10-5.

10.1.2.1 Change in Abundance of Plant Species of Interest

The residual effects on traditional use plants as a direct result of the Project are expected to be adverse in direction, low in magnitude, local in extent, long-term, will only occur once, and will be reversible. Traditional use plants are moderately resilient to disturbance and are currently in an undisturbed state. The likelihood of a residual effect is high because clearing of the land will lead to loss of traditional use plants within the PDA.

The residual effects on traditional use plants are expected to be not significant since the traditional use plants found on Lelu Island are generally common across the region and because they will be incorporated into the Wetland Habitat Compensation Plan (Appendix F of the EIS) wherever possible and practical. The confidence in this prediction is moderate (see Table 10-5).

Additional information is provided in Section 10.3.2.2 of this EIS Addendum to reflect how Aboriginal traditional knowledge acquired since the submission of the EIS has been incorporated into the revised consideration of environmental effects on traditional use plant species.

10.1.2.2 Change in Abundance of Ecological Communities

The residual project effect on ecological communities at risk is expected to be adverse in direction, low in magnitude, local in extent, permanent, will only occur once, and will be irreversible. These ecosystems have low resilience to disturbance and are presently undisturbed.

The residual effect on old forest is expected to be adverse in direction, low in magnitude, local in extent, permanent, will only occur once and will be irreversible. These ecosystems have low resilience to disturbance and are presently undisturbed.

The likelihood of a residual effect is high since clearing for the PDA will result in the removal of 2.7 ha of blue-listed ecosystems and about 86 ha of old forest.

None of the red-listed ecological community on Lelu Island will be directly affected by the Project. Small areas of two of the four blue-listed communities present on the island will be lost, relative to their abundance in the regional assessment area (RAA). The loss of 0.12% will be much less than the acceptable 30% disturbance

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

threshold within the RAA established in the Central and North Coast Order (CNCO) for each blue-listed community. The effect on ecological communities at risk is therefore not significant.

There will be a loss (86 ha) of the old forest as a result of the Project. This loss represents less than 1% of the old forest within the RAA and is considerably less than the retention limit of 30% within the RAA set forth in the CNCO and the 40% threshold set for this assessment. The effect on old forest is therefore not significant.

The confidence in the predictions of effects to ecological communities is high given the quality, extent, and recent production dates of spatial data for both the LAA and RAA (see Table 10-5).

10.1.2.3 Change in Wetland Functions

The Federal Policy on Wetland Conservation (Government of Canada 1991) includes the goal of no net loss of wetland functions on all federal lands and waters. This goal applies to this Project because it occurs within the jurisdiction of the Prince Rupert Port Authority, which is a federal agent. Although wetland functions will be lost within the PDA, no net loss of wetland functions is expected as a result of the Project due to implementation of the Wetland Habitat Compensation Plan. Therefore, the residual effects of the Project on wetland functions are expected to be neutral.

Within the PDA, clearing of approximately 119 ha of wetlands is a disturbance of moderate magnitude, since it requires active management (i.e., compensation) to ensure the continuance of wetland functions in the region. The duration of time required to replace the wetland functions through implementation of wetland compensation would likely be medium-term. While wetland functions will not return at the site where they are lost due to project development, the loss of functions will be reversible through implementation of compensation measures (i.e., no net loss will be achieved). The loss of wetland function in the PDA will only occur once. The existing wetland ecosystems within the PDA are currently undisturbed and exhibit low-resilience to disturbance.

While the likelihood of a loss of wetland functions within the PDA is high there will be no net loss of wetland functions associated with the Project overall due to the implementation of the Wetland Habitat Compensation Plan. Therefore the likelihood of a net residual effect to wetland functions is low.

Given that a Wetland Habitat Compensation Plan will be developed and implemented to ensure no net loss of wetland functions, no residual effects on wetland functions are anticipated. Therefore, changes in wetland function are not significant. The confidence in this prediction is high, given the commitment to implementing wetland habitat compensation and Ducks Unlimited Canada's proven track record providing habitat compensation to offset the loss of wetland functions as a Wetland Restoration Agency in other provinces (see Table 10-5).

10.1.2.4 Summary of Residual Project Effects

The project changes have negligible effects on the Vegetation and Wetland Resources VC and therefore do not result in a material change in the characterization of residual effects for the Project (i.e., context, magnitude, extent, duration, frequency, reversibility) from those that were assessed in the EIS. The overall determination of significance described in Section 10.5 of the EIS does not change as a result of the marine terminal design mitigation (i.e., remains not significant). Table 10-5 contains a summary of the residual effects characterization for Vegetation and Wetland Resources, including mitigation and follow-up programs.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Changes to the information presented in Table 10-5 (compared to Table 10-17 of the EIS) are identified with underlined text and reflect commitments in response to requests for information received in August or September 2014.

10.2 CUMULATIVE EFFECTS ASSESSMENT UPDATE

The cumulative effects assessment provided in the EIS (Section 10.6) was reviewed with respect to the marine terminal design mitigation, the potential cumulative effects from the change in location of the accommodation camp, and additional information requests related specifically to the cumulative effects assessment.

The Project was determined to have the following adverse effects on vegetation and wetland resources (Section 10.6.2 of the EIS):

- Loss of traditional use plants within the PDA
- Loss of 2.7 ha of blue-listed ecological communities
- Loss of 85.6 ha of old forest
- Potential change in 3.5 ha of ecological communities affected by nitrogen deposition.

Some of these areas associated with adverse effects are concurrent (e.g., 2.7 ha of old forest are also blue-listed ecological communities at risk), therefore the total area of these combined effects does not equal the sum of each category. With compensation, no net loss of wetland functions will occur due to project activities. As a result there will be no residual effect on wetland functions and no overlap with past, present, or reasonably foreseeable future projects.

Given the low magnitude of the direct residual effects of the Project to species and communities of management concern, it is not likely that the cumulative effects will affect the sustainability of species and communities regionally. For example, the Project is affecting less than 1% of the total area of ecological communities at risk and/or old forest within the RAA, while regional ecosystem based planning objectives have set management targets allowing for a loss of these community types at 30% and 40%, respectively, within the RAA. Even in combination with other past, present or reasonably foreseeable future projects in the RAA, these residual effects would not approach the significance threshold limits set for this assessment. These findings are consistent with the conclusions on cumulative effects for vegetation and wetland resources presented in the EIS (Section 10.6.2).

10.2.1 Summary of Cumulative Effects

A summary of the cumulative effects is presented in Table 10-6. While the Project will result in the loss of traditional use plants within the PDA and the loss of ecological communities of interest (ecological communities at risk and old forest), these losses represent very small proportions of the total resource base for each measurable parameter within the RAA. Similarly, although the Project is predicted to result in areas of nitrogen deposition that exceed screening level critical loads, these areas represent very small proportions of the total resource base for ecological communities within the RAA. Neither the project specific residual effects, nor the residual effects of the Project acting cumulatively with other projects would threaten the regional sustainability of the vegetation and wetland resources identified in this assessment.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Changes in the construction schedule for the Project have not affected the outcomes of the cumulative effects assessment for vegetation and wetland resources. Conclusions on significance of cumulative effects are based primarily on spatial overlaps, rather than temporal overlaps; therefore, changes in the construction schedule do not affect these conclusions. Cumulative residual effects on vegetation would not approach the significance thresholds described in the EIS and therefore cumulative effects on vegetation and wetland resources are not significant.

10.3 RESPONSES TO THE OUTSTANDING INFORMATION REQUESTS

10.3.1 Vegetation and Wetland Resources Information Request #1

10.3.1.1 Comment Received

Figure 1 of the Technical Memorandum: *Wetland Compensation* submitted in June 2014 identifies blue-listed ecological communities at risk within the local assessment area (LAA) (solid-blue lines). However, this figure also includes the area of the liquefied natural gas (LNG) facility, which makes it difficult to distinguish the exact location of the blue-listed ecological community at risk in the PDA. Figure 10-4 in Chapter 10 of the EIS also identifies ecological communities at risk within the LAA; however, Figure 10-4 does not identify the same blue-listed ecological community as Figure 1 of the technical memorandum. Figure 1 of the wetland compensation memorandum shows a blue-listed ecological community (in solid blue lines) in close proximity to the LNG facility; this blue-listed ecological community is not identified in Figure 10-4. As these two figures do not match, clarifications are sought on where the ecological communities at risk explicitly are.

Provide a map that clearly identifies the exact location of the blue-listed ecological communities within the project LAA. In addition, identify which of these communities are wetlands. Similarly, explicitly identify which of the ecological communities at risk in the RAA are wetlands.

10.3.1.2 Response

The updated Figure 10-4 shows the red- and blue-listed ecological communities at risk found within the LAA according to the project specific terrestrial ecosystem mapping (TEM) that was produced at a scale of 1:1,000. The red-listed ecological community is shown in red and blue-listed communities are shown in three different shades of purple corresponding to the percentage of each TEM polygon occupied by blue listed communities (see the figure legend for the range of values associated with each shade of purple). The TEM polygons on Lelu Island are complex, having up to three communities within each one. The ecosystem label is used to indicate the specific proportions (decile) and contents (map code) of each polygon; see the figure legend for an example of an ecosystem label. The red- and blue-listed communities in the LAA are shown on updated Figure 10-4 and summarized in Table 10-4.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Table 10-4 Ecological Communities at Risk in the LAA

TEM Map Code	Ecosystem Code	Ecosystem Name	Provincial Status
Forested Units			
HM	CWHvh2/04	western hemlock – Sitka spruce/lanky moss	Blue
RF	CWHvh2/05	western redcedar – Sitka spruce/sword fern	Blue
SD	CWHvh2/07	western redcedar – Sitka spruce/devil’s club	Blue
Wetland Units			
Ed	CWHvh2/Ed01	tufted hairgrass – meadow barley estuarine meadow	Red
RC	CWHvh2/13 (Ws54)	western redcedar – Sitka spruce/skunk cabbage swamp	Blue

Figure 10-11 shows the blue-listed wetland communities at risk found within the RAA according to the North Coast TEM that was produced at a scale of 1:20,000. The blue-listed western redcedar – Sitka spruce/skunk cabbage swamp was the only blue-listed wetland mapped in the RAA according to the North Coast TEM. No red-listed ecological communities were identified in the RAA according to the North Coast TEM. The results differ because of the difference in scale and resolution of mapping used to produce these two figures. In cases where there are discrepancies between the data, the larger scale 1:1,000 (i.e., more-precise) TEM results prevail. The coarser scale 1:20,000 TEM remains useful for deriving the wetland extent within the larger extent of the RAA (nearly 50,000 ha).

10.3.2 Vegetation and Wetland Resources Requests for Additional Information

10.3.2.1 Comment Received

Requests for Additional Information issued from the federal government on August 14, 2014 and September 11, 2014, included the following requests pertaining to vegetation and wetlands:

- Summarize where and how Aboriginal traditional knowledge acquired since the submission of the EIS has been incorporated into any revised consideration of environmental effects, including effects on: traditional use species of plants
- When updating the follow-up programs as per this information request, please include the Environmental Management Plans in Chapter 24 of the EIS to 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 in Vegetation Management Plan, Appendix J.9).

10.3.2.2 Response

10.3.2.2.1 Incorporation of Aboriginal Traditional Knowledge Acquired Since the Submission of the EIS
Since the submission of the EIS, Traditional Use Studies have been provided by First Nations and reviewed for additional information that would apply to the assessment of the Vegetation and Wetlands VC (DM Cultural Services Ltd and Metlakatla First Nation 2014, Calliou Group 2014, Pulla 2014, Crossroads Cultural Resource

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Management Ltd 2014, and Inglis Consulting Services 2014; see Section 21 and Appendix B of the EIS Addendum). Information from the Traditional Use Studies has been incorporated into this effects assessment addendum within the updated baseline information (Section 10.1.1 of this EIS Addendum) and effects assessment (Section 10.1.2 of this EIS Addendum).

Vegetation clearing for project components will lead to loss of traditional use plants within the PDA. Traditional Use Studies indicate that portions of the LAA are used for harvesting traditional use plants by some communities (DM Cultural Services Ltd and Metlakatla First Nation 2014, Calliou Group 2014, Pulla 2014).

Traditional use species present within the LAA are common both regionally and provincially, although detailed abundance and distribution is not known. One exception is scarlet paintbrush (*Castilleja miniata*), which was observed on Lelu Island. The taxonomy of this species is uncertain (Douglas et al 1998; BC CDC 2014; ITIS 2014); however, to be conservative, occurrences of this species within the LAA 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). Stantec is currently investigating the sub-specific taxonomic identification of the species further. Current known locations are within the LAA, but outside the PDA and are expected to persist, although the availability of populations located on Lelu Island for traditional use may be limited by the project activities. The Species at Risk Discovery Contingency Plan, a part of the Vegetation Management Plan (Appendix J.9), will be implemented if the *Castilleja* species is confirmed to be provincially red- or blue-listed. Section 30.4.9 of this EIS Addendum includes a description of the Vegetation and Wetland Resources Follow-up Program (VWRFP), which includes survey methods to assess effects on this species.

Residual effects on traditional use plants are considered significant if they eliminate the ability of First Nations to access traditional use species within the RAA. Similarly, the threshold for significant effects on the use of land and resources for traditional purposes (Section 21.2.7 of the EIS) refers to a high degree of change in traditional land use practice or traditional resource use, and has serious implications for the continuance of traditional practices and traditional knowledge. Based on the information available, the localized loss of traditional plant species does not suggest that such a degree of change in traditional practices would occur because the traditional use plant species remain regionally common and abundant.

Residual effects on traditional use plants are considered low in magnitude because traditional use plant species identified by available information will persist outside of the PDA and are abundant within the RAA. Regional ecosystem mapping suggests that the RAA includes 49,998.5 ha, 1,519.4 ha of which are disturbed through existing development or resource management activities, and an additional 2,767.0 ha of which is non-vegetated (i.e., rock, ice, open water), leaving approximately 45,640.1 ha with the capability of supporting traditional use plants that are commonly encountered in the area. A total of 162 ha of the PDA will be cleared, so approximately 0.4% of the total area of the RAA will be affected. This change constitutes a low magnitude effect in the context of an EIS, even though it is acknowledged that the localized loss may affect those communities that have traditionally used Lelu Island to gather plants.

The cumulative effects assessment for traditional use plant species indicates that although the Project will result in the localized loss of approximately 162 ha of vegetation communities containing traditional use species within the

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

PDA, these species remain so common and abundant throughout the RAA that there is no expectation that the addition of the residual effect of the Project would cause a change in cumulative effects that could affect the quality or sustainability of identified traditional use plant species in the region. The traditional use species identified in this EIS Addendum can be accessed in different areas throughout the RAA.

In addition to the elements of the Wetland Habitat Compensation Plan described in Appendix F of the EIS, PNW LNG is committed to implementing wetland compensation in the form of local trail and/or parks improvements. These measures are intended to increase access to traditional use plants within the traditional territories of potentially-affected First Nations. Partners involved in compensation measures (e.g., Ducks Unlimited) will incorporate traditional use plants in the detailed wetland compensation designs to the greatest extent that is technically-feasible.

The residual effects on traditional use plants is adverse in direction, low in magnitude, local in extent, long-term, will only occur once and will be reversible. Traditional use plants are in an undisturbed state at baseline and show moderate resilience to disturbance. The likelihood of a residual effect is high since clearing for project components will lead to loss of traditional use plants.

Although traditional use species will be lost within the LAA, and specific collecting areas within the PDA will be lost, the effects on traditional use plants are not significant because these species will persist within the RAA.

10.3.2.2.2 Vegetation and Wetland Resources Follow-up Program

The VWRFP is provided in Section 30 of this EIS Addendum. The VWRFP is presented in order to verify predicted project effects on red- and blue-listed ecological communities, wetlands, and old forest outside of the PDA. The VWRFP will 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. The VWRFP contained in this EIS Addendum provides consistency between Section 24.4.6 of the EIS, the Vegetation Management Plan (Appendix J.9), and Section 30 of the EIS, follow up programs. Table 10-5 in this EIS Addendum now reflects the follow-up and monitoring programs pertaining to vegetation and wetlands resources.

10.4 MITIGATION

10.4.1 Changes to Mitigation Measures Presented in the EIS

Based on project changes and the feedback received during the environmental assessment process, the set of mitigation measures originally presented in the EIS to address potential effects to Vegetation and Wetland Resources has been updated. The following mitigation measure has been added to the list of mitigation measures initially included in the EIS:

- In addition to the elements of the Wetland Habitat Compensation Plan described in Appendix F of the EIS, PNW LNG will also implement wetland compensation by contributing to local trail and/or parks improvements. The purpose of the improvements will be to increase access to traditional use plants within the traditional territories of potentially-affected First Nations and to improve the aesthetic, educational, and/or recreational values of wetlands in the vicinity of Prince Rupert, Port Edward and the North Coast.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

- PNW LNG will invite participation of Aboriginal Groups and Environment Canada in development and implementation of the Wetland Habitat Compensation Plan.

10.4.2 Complete List of Current Mitigation Measures

All of the technically and economically-feasible mitigation measures currently being presented by PNW LNG to address potential effects to vegetation and wetland resources are listed below. This includes those originally presented in the EIS that remain relevant, as well as those that have been revised or added as a result of feedback received during the environmental assessment process or as a result of the project changes (see Section 10.4.1). By implementing this full set of mitigation measures, PNW LNG is confident that the Project will not result in significant adverse effects to vegetation and wetland resources.

- In the development of the Wetland Habitat Compensation Plan (Appendix F of the EIS), traditional use species present in the PDA will be used for planting wherever possible and practical.
- Standard mitigation practices (e.g., weed control) will be used during construction to prevent any introduction and spread of noxious weeds and invasive plants (see Appendix J.9).
- A Species at Risk Discovery Contingency Plan will be developed and followed to address any chance-discoveries of plant species at risk during construction.
- Potential direct effects to ecological communities of interest will be reduced through drainage and erosion controls, with the objective of retaining the baseline hydrological regime. Ecological communities of interest located adjacent to construction limits will be clearly marked with signs to alert workers to these features and ensure they are protected, and the use of herbicides will be restricted near such communities.
- Throughout construction and operations, PNW LNG will plan to limit adverse effects due to contaminant emissions from project activities. Specific mitigations pertaining to emissions are discussed in the assessment for Air Quality (Section 6) and apply equally to the reduction of potential effects from acid or nitrogen deposition on ecological communities.
- Monitoring of soils and vegetation within the areas of predicted nitrogen deposition exceedance of empirical critical loads is recommended since the precise response of these communities to such deposition is uncertain.
- Wetlands on Lelu Island outside the PDA will be protected using standard mitigation measures. These wetlands will be delineated as environmentally sensitive areas during construction, marked with fencing and construction access will be restricted within these areas. Drainage and erosion control techniques intended to maintain the local surface and ground hydrology will be designed and implemented to maintain the pre-disturbance drainage pathways through the wetlands bordering the PDA.
- To effectively mitigate the effects of the Project on wetland functions, these functions will be replaced through implementation of a Wetland Habitat Compensation Plan (Appendix F of the EIS) developed in consultation with Environment Canada (Canadian Wildlife Service). To offset these effects to wetland functions, PNW LNG has proposed the following wetland habitat compensation measures:
 - Securement, plus restoration or creation, of 120 ha of wetlands through a legally binding agreement between PNW LNG and Ducks Unlimited Canada
 - A five-year effectiveness monitoring program for the restored or created wetlands by Ducks Unlimited Canada

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation

December 12, 2014

- Bog restoration benefiting a minimum of 116 ha of coastal bog ecosystems through funding the immediate research and restoration priorities of the Burns Bog Management Plan and Burns Bog Ecological Conservancy Area Management Plan.
- In addition to the elements of the Wetland Habitat Compensation Plan described in Appendix F of the EIS, PNW LNG will also implement wetland compensation by contributing to local trail and/or parks improvements. The purpose of the improvements will be to increase access to traditional use plants within the traditional territories of potentially-affected First Nations and to improve the aesthetic, educational, and/or recreational values of wetlands in the vicinity of Prince Rupert, Port Edward and the North Coast.
- PNW LNG will invite participation of Aboriginal Groups and Environment Canada in development and implementation of the Wetland Habitat Compensation Plan.
- The Wetland Habitat Compensation Plan will be developed and implemented in consultation with Aboriginal Groups and Environment Canada.

10.5 CONCLUSION

The conclusions of the assessment of effects on vegetation and wetlands do not change from those presented in the EIS.

The change in abundance of plant species of interest is predicted to be not significant because:

- First Nations will be able to continue to access traditional use plant species within the RAA because traditional use plant species are common across the region and measures to offset effects on traditional use plant species will be incorporated into the Wetland Habitat Compensation Plan.
- No federally- or provincially-listed plant species were identified within the PDA during field studies, thus no effects related to these species are anticipated.
- No invasive plant species were detected in the LAA. The risk of potential adverse effects associated with these species will be addressed through applying standard mitigation measures.

The change in abundance or condition of ecological communities of interest is predicted to be not significant because:

- None of the red-listed ecological community on Lelu Island will be directly affected by the Project
- The loss of 0.12% of the extent of blue-listed ecological communities from within the RAA is much less than the 30% disturbance threshold within the RAA established in the CNCO that is used as a significance threshold for this project.
- The loss of less than 1% of the extent of old forest within the RAA does not compromise the ability to maintain the 40% retention limit set forth in the CNCO that is used as the conservative significance threshold for this project.
- Considering that the soils in the area will buffer any effects of acid deposition, it is expected that ecological communities would not be adversely affected due to changes in soil reactivity.
- The majority of the ecological communities within areas of nitrogen deposition in excess of empirical critical loads will persist within the RAA. A follow-up program will be conducted to determine whether the remaining

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

0.2 ha of provincially- listed wetland communities located within the nitrogen deposition exceedance area would be adversely affected.

The change in wetland functions is predicted to be not significant because:

- A Wetland Habitat Compensation Plan will offset the loss of wetlands within the PDA to achieve no net loss of wetland functions within the RAA.

The overall effects on vegetation and wetland resources are predicted to be not significant because none of the significance thresholds listed here were exceeded. Similarly, the cumulative effects on vegetation and wetlands are predicted to be not significant.

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Table 10-5 Characterization of Residual Effects for Vegetation and Wetland Resources

Project Phase	Mitigation Measures	Residual Effects Characterization						Likelihood	Significance	Confidence	Follow-up and Monitoring
		Context	Magnitude	Extent	Duration	Reversibility	Frequency				
Change in Abundance of Plant Species of Interest											
Construction	<ul style="list-style-type: none"> ▪ Incorporate traditional use plants into wetland compensation plans wherever possible and practical ▪ Incorporate weed and invasive plant control measures during construction and operations ▪ Implement a Species-at-Risk Discovery Contingency Plan. 	MU	L	P	L	R	S	H	N	M	Follow-up Program: <u>Vegetation and Wetland Resources</u>
Operations		No effects predicted									
Decommissioning											
Residual effects for all phases		MU	L	P	L	R	S				
Change in Abundance or Condition of Ecological Communities											
Direct Effects											
Construction	<ul style="list-style-type: none"> • During construction, ecological communities of management concern located outside of the PDA will be marked and protected • Design and implement drainage and erosion control techniques to maintain local surface and groundwater hydrology. 	LU	L	P	P	I	S	H	N	H	Follow-up Program: <u>Vegetation and Wetland Resources</u>
Operations		No effects predicted									
Decommissioning											
Residual effects for all phases		LU	L	P	P	I	S				

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Project Phase	Mitigation Measures	Residual Effects Characterization						Likelihood	Significance	Confidence	Follow-up and Monitoring
		Context	Magnitude	Extent	Duration	Reversibility	Frequency				
Indirect Effects											
Construction	<ul style="list-style-type: none"> Implement monitoring program to monitor effects of air emissions on ecological communities. 	No effects predicted						L ^a	N	H ^a	Follow-up Program: <u>Terrestrial Acidification and Eutrophication</u>
Operations		MU	N ^a M ^b	R	L	R	C	M ^b			
Decommissioning		No effects predicted									
Residual effects for all phases		MU	N ^a M ^b	R	L	R	C				
Change in Wetland Functions											
Construction	<ul style="list-style-type: none"> Delineate wetlands outside the PDA as environmentally sensitive areas, mark with fencing, and restrict construction access 	LU	M	P	M	R	S	L	N	H	Monitoring: <u>Complete Monitoring Requirements Described in the Wetland Habitat Compensation Plan</u>
Operations		No effects predicted									
Decommissioning											
Residual effects for all phases	<ul style="list-style-type: none"> Develop and implement the Wetland Habitat Compensation Plan Drainage and erosion control techniques designed to maintain the local surface and groundwater hydrology will be designed and implemented. 	LU	M	P	M	R	S				

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Project Phase	Mitigation Measures	Residual Effects Characterization						Likelihood	Significance	Confidence	Follow-up and Monitoring
		Context	Magnitude	Extent	Duration	Reversibility	Frequency				
<p>KEY</p> <p>CONTEXT: L = low resilience, sensitive to disturbance M = moderate resilience H = High resilience, not sensitive to disturbance</p> <p>U = Undisturbed M = Moderately disturbed H = Highly disturbed</p> <p>MAGNITUDE: N = Negligible L = Low M = Moderate H = High</p>	<p>EXTENT: P = Project development area L = Local assessment area R = Regional assessment area</p> <p>DURATION: S = Short-term M = Medium-term L = Long-term P = Permanent</p>	<p>REVERSIBILITY: R = Reversible I = Irreversible</p> <p>FREQUENCY: S = Single Event M = Multiple Events C = Continuous</p>						<p>LIKELIHOOD : Based on professional judgment L = Low probability of occurrence M = Medium probability of occurrence H = High probability of occurrence</p> <p>SIGNIFICANCE: S = Significant N = Not Significant</p> <p>CONFIDENCE: Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation, and assumptions made. L = Low level of confidence M = Moderate level of confidence H = High level of confidence</p>			

NOTES:

^a Refers to acid deposition

^b Refers to nitrogen deposition

Vegetation
December 12, 2014

Table 10-6 Summary of Cumulative Residual Environmental Effects on Vegetation and Wetland Resources

Cumulative Environmental Effect and Project Contribution	Other Projects, Activities and Actions	Mitigation and Compensation Measures	Residual Cumulative Effects Characterization						Likelihood	Significance	Prediction Confidence	Follow-up and Monitoring Programs	
			Context	Magnitude	Extent	Duration	Reversibility	Frequency					
<p>Change in abundance or condition of ecological communities of interest</p> <ul style="list-style-type: none"> Ecological communities at risk Old forest Ecological communities identified as sensitive to soil acidification, eutrophication or fumigation from air emissions 	<p>Cumulative Effect with Project (indirectly due to emissions effects)</p> <ul style="list-style-type: none"> Total area potentially affected by acid deposition in excess of empirical critical loads in the cumulative case is 591.5 ha Total area potentially affected by nitrogen deposition in excess of empirical critical loads in the cumulative case is 144.6 ha (in RAA). 	<ul style="list-style-type: none"> Canpotex Potash Export Terminal CN Rail Line Fairview Container Terminal Phase I Fairview Container Terminal Phase II Mount McDonald Wind Power Project NaiKun Wind Energy Project Northland Cruise Terminal Pinnacle Pellet Inc. Prince Rupert LNG Facility Prince Rupert Gas Transmission Project Prince Rupert Ferry Terminal Prince Rupert Industrial Park Prince Rupert Grain Limited Ridley Island Log Sort Ridley Terminals Inc. WatCo Pulp Mill Westcoast Connector Gas Transmission Project. 	<p>Indirect Effects</p> <p>Implement monitoring program to monitor effects of air emissions on ecological communities.</p>	MU	L	R	L	R	C	H	N	M	<p>Follow-up Program:</p> <ul style="list-style-type: none"> Aquatic Acidification and Eutrophication Terrestrial Acidification and Eutrophication
	<p>Cumulative Effect with Project (direct effects)</p> <p>No expectation that the contribution (i.e., addition) of the Project's residual effects would cause a change in cumulative effects that could affect the quality or sustainability of the VC due to low magnitude relative to established regional thresholds based on ecosystem management objectives.</p>		<p>Direct Effects</p> <ul style="list-style-type: none"> During construction, ecological communities of management concern located outside of the PDA will be marked and protected Design and implement drainage and erosion control techniques to maintain the local surface and groundwater hydrology. 	LU	L	R	P	I	S	H	N	M	None

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

Cumulative Environmental Effect and Project Contribution	Other Projects, Activities and Actions	Mitigation and Compensation Measures	Residual Cumulative Effects Characterization						Likelihood	Significance	Prediction Confidence	Follow-up and Monitoring Programs
			Context	Magnitude	Extent	Duration	Reversibility	Frequency				
<p>(Continued) Change in abundance or condition of ecological communities of interest</p> <ul style="list-style-type: none"> Ecological communities at risk Old forest Ecological communities identified as sensitive to soil acidification, eutrophication or fumigation from air emissions. 	<p>Project Contribution to Cumulative Effect (Indirect Effects in RAA)</p> <ul style="list-style-type: none"> 3.5 ha of ecological communities potentially affected by nitrogen deposition 6.5 ha ecological communities potentially affected by acid deposition in excess of empirical critical loads. 	<p>Indirect Effects</p> <p>See Table 10-17 Summary of Residual Effects on Vegetation and Wetland Resources.</p>	MU	Na Mb	R	L	R	C	La Mb	N	Ha Mb	<p>Follow-up Program:</p> <ul style="list-style-type: none"> Aquatic Acidification and Eutrophication Terrestrial Acidification and Eutrophication
	<p>Project Contribution to Cumulative Effect (Direct Effects in RAA)</p> <ul style="list-style-type: none"> Loss of 2.7 ha of blue-listed ecological communities Loss of 85.6 ha of old forest. 	<p>Direct Effects</p> <p>See Table 10-17 Summary of Residual Effects on Vegetation and Wetland Resources.</p>	LU	L	P	P	I	S	H	N	H	None
<p>KEY</p> <p>CONTEXT: L = low resilience, sensitive to disturbance M = moderate resilience H = High resilience, not sensitive to disturbance</p> <p>U = Undisturbed M = Moderately disturbed H = Highly disturbed</p> <p>MAGNITUDE: N = Negligible L = Low M = Moderate H = High</p>	<p>EXTENT: P = Project development area L = Local assessment area R = Regional assessment area</p> <p>DURATION: S = Short-term M = Medium-term L = Long-term P = Permanent</p>	<p>REVERSIBILITY: R = Reversible I = Irreversible</p> <p>FREQUENCY: S = Single Event M = Multiple Events C = Continuous</p>	<p>LIKELIHOOD : Based on professional judgment L = Low probability of occurrence M = Medium probability of occurrence H = High probability of occurrence</p> <p>SIGNIFICANCE: S = Significant N = Not Significant</p> <p>PREDICTION CONFIDENCE: Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation, and assumptions made.</p> <p>L = Low level of confidence M = Moderate level of confidence H = High level of confidence</p>									

NOTES:
A Refers to Acid Deposition
B Refers to Nitrogen Deposition

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Vegetation
December 12, 2014

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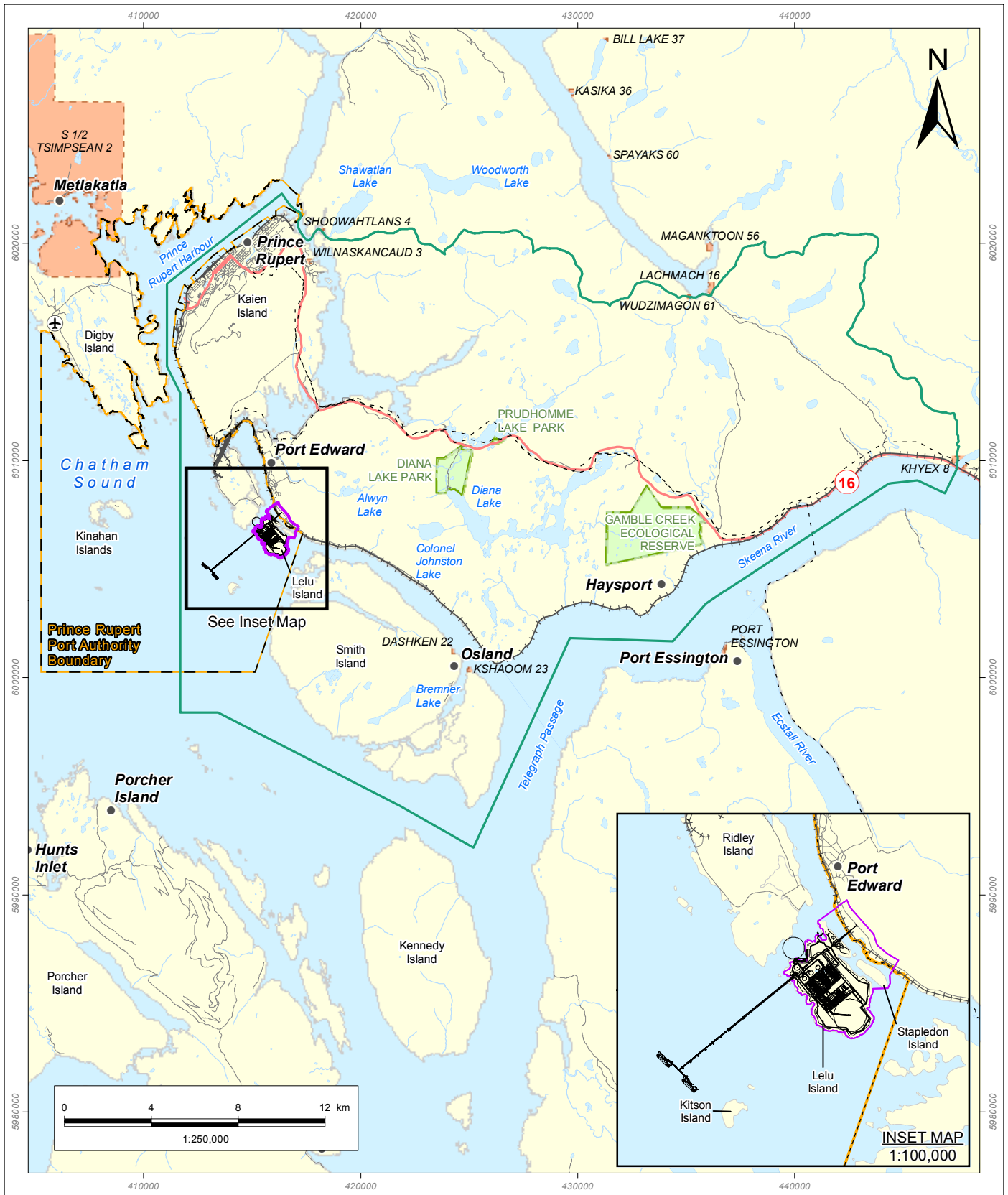
**PACIFIC NORTHWEST LNG - ADDENDUM TO THE
ENVIRONMENTAL IMPACT STATEMENT**

Vegetation
December 12, 2014

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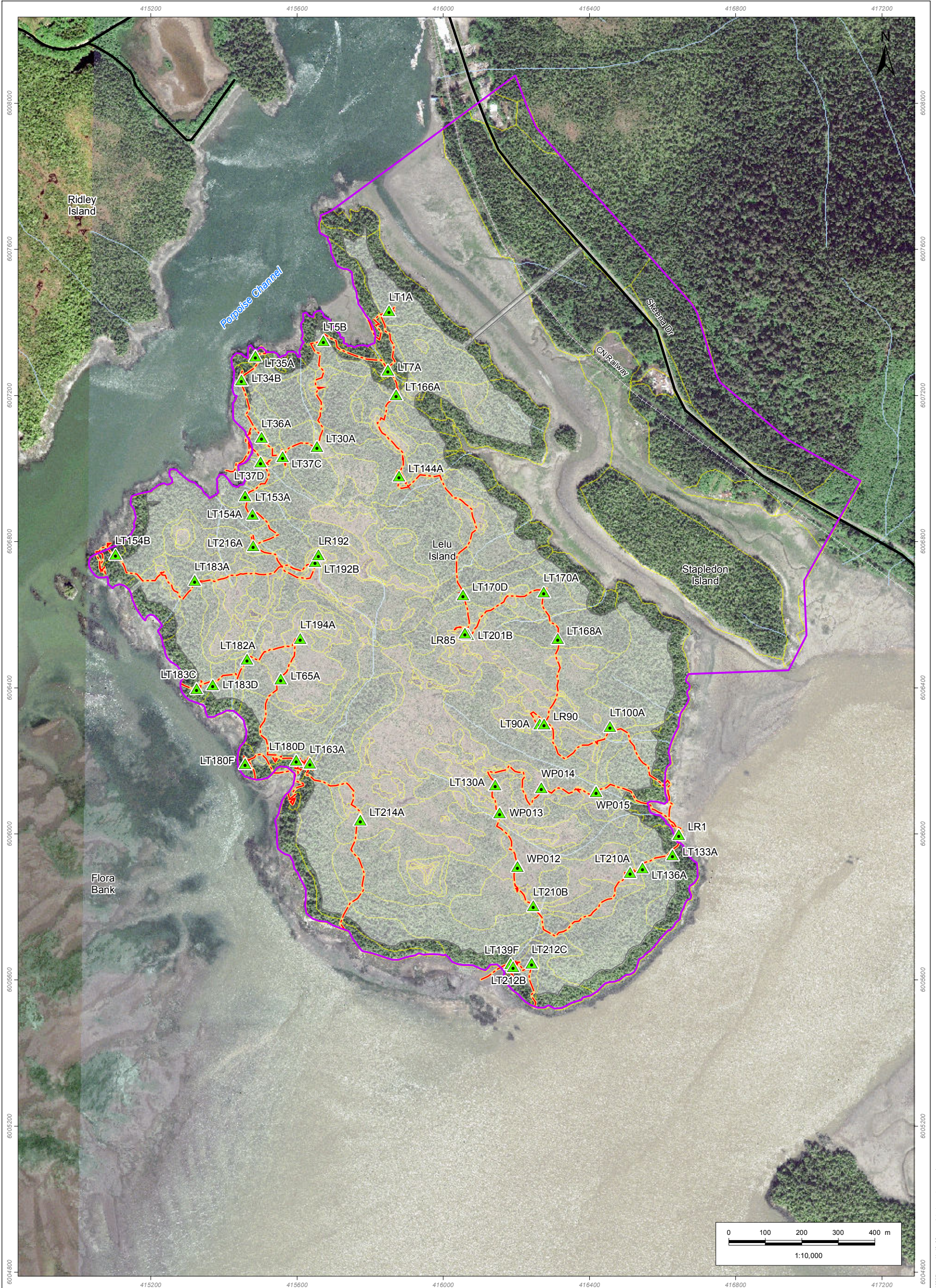
10.7 FIGURES

Please see following pages.



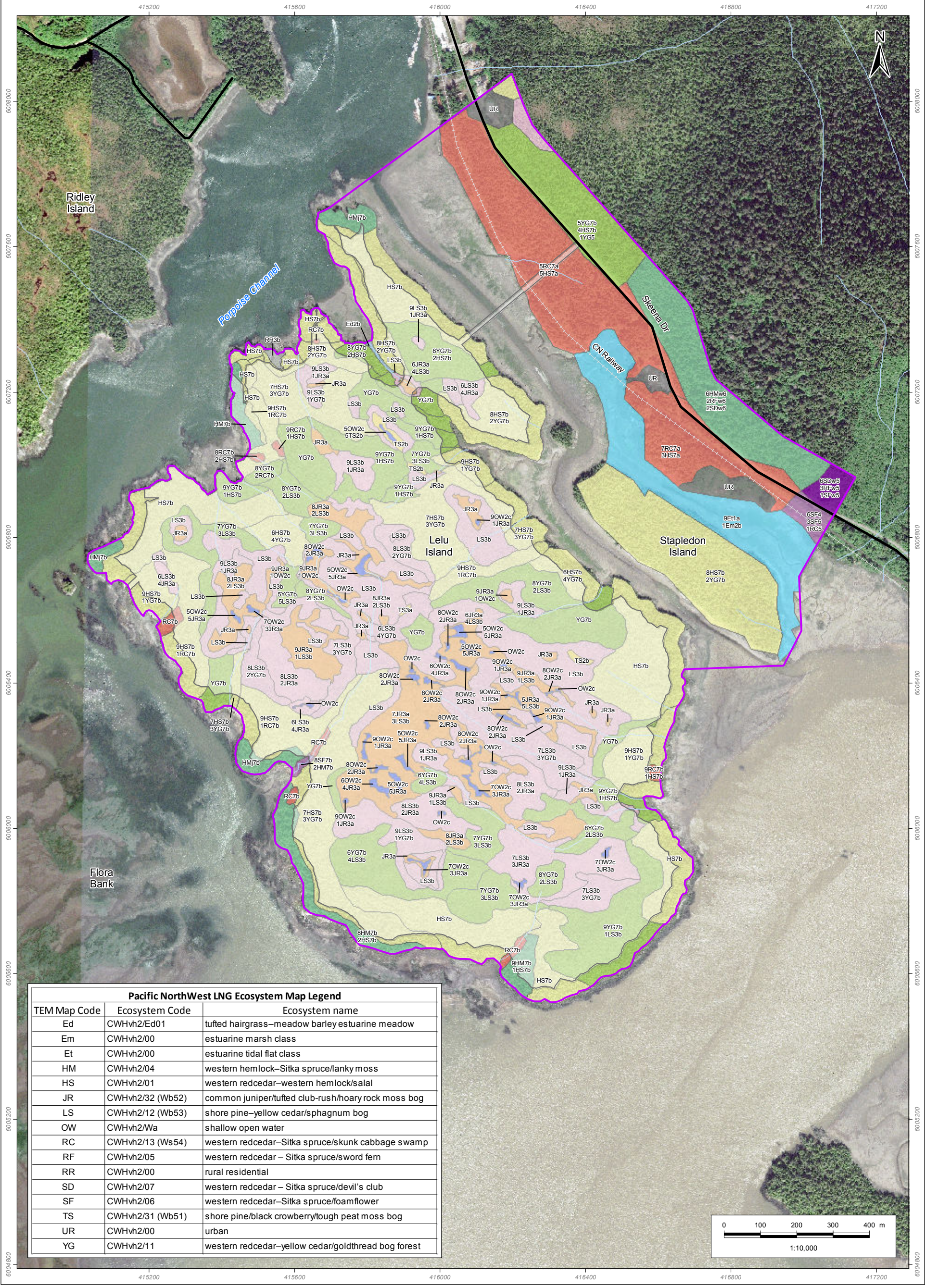
<ul style="list-style-type: none"> Project Component Local Assessment Area Regional Assessment Area Airport City or Town Electrical Power Transmission Line Highway Railway Secondary Road Watercourse Indian Reserve Prince Rupert Port Authority Boundary Protected Area Waterbody 	<p>Pacific NorthWest LNG</p> <p>Local and Regional Assessment Areas for Vegetation and Wetland Resources</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.</small></p> <p><small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p> <p>DATE: 20-NOV-14 FIGURE ID: 123110537-234 DRAWN BY: K. POLL</p> <p>PROJECTION: UTM - ZONE 9 DATUM: NAD 83 CHECKED BY: C. LION</p>	<p>PREPARED BY:</p> <p> Stantec</p> <p>PREPARED FOR:</p> <p> Pacific NorthWest LNG</p> <p>FIGURE NO:</p> <p style="font-size: 24pt; font-weight: bold; text-align: center;">10-1</p>
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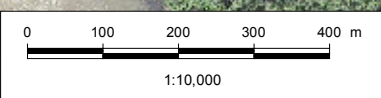
<ul style="list-style-type: none"> ▲ Rare Plant Sampling Location — Foot Traverse Terrestrial Ecosystem Polygon* Local Assessment Area Project Development Area Road — Watercourse <p><small>* Please refer to Terrestrial Ecosystem Study for detailed descriptions of vegetation communities.</small></p>	<p>Pacific NorthWest LNG</p> <p>Rare Plant Inventory Plots and Foot Traverse Survey Locations</p> <p>EIS ADDENDUM</p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; WorldView-2 Imagery, Imagery date: 2011.</small></p> <p><small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">DATE: 20-NOV-14</td> <td style="width: 33%;">PROJECTION: UTM - ZONE 9</td> <td style="width: 33%;">DRAWN BY: K. POLL</td> </tr> <tr> <td>FIGURE ID: 123110537-235</td> <td>DATUM: NAD 83</td> <td>CHECKED BY: D. HUEBERT</td> </tr> </table>	DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9	DRAWN BY: K. POLL	FIGURE ID: 123110537-235	DATUM: NAD 83	CHECKED BY: D. HUEBERT	<p>PREPARED BY:</p> <p> Stantec</p> <p>PREPARED FOR:</p> <p> Pacific NorthWest LNG</p> <p>FIGURE NO:</p> <p style="font-size: 24pt; font-weight: bold; text-align: center;">10-2</p>
DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9	DRAWN BY: K. POLL						
FIGURE ID: 123110537-235	DATUM: NAD 83	CHECKED BY: D. HUEBERT						

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Pacific NorthWest LNG Ecosystem Map Legend

TEM Map Code	Ecosystem Code	Ecosystem name
Ed	CWHh2/Ed01	tufted hairgrass-meadow barley estuarine meadow
Em	CWHh2/00	estuarine marsh class
Et	CWHh2/00	estuarine tidal flat class
HM	CWHh2/04	western hemlock-Sitka spruce/lanky moss
HS	CWHh2/01	western redcedar-western hemlock/salal
JR	CWHh2/32 (Wb52)	common juniper/tufted club-rush/hoary rock moss bog
LS	CWHh2/12 (Wb53)	shore pine-yellow cedar/sphagnum bog
OW	CWHh2/Wa	shallow open water
RC	CWHh2/13 (Ws54)	western redcedar-Sitka spruce/skunk cabbage swamp
RF	CWHh2/05	western redcedar - Sitka spruce/sword fern
RR	CWHh2/00	rural residential
SD	CWHh2/07	western redcedar - Sitka spruce/devil's club
SF	CWHh2/06	western redcedar-Sitka spruce/foamflower
TS	CWHh2/31 (Wb51)	shore pine/black crowberry/tough peat moss bog
UR	CWHh2/00	urban
YG	CWHh2/11	western redcedar-yellow cedar/goldthread bog forest



Dominant Map Code		Ecosystem Label
Ed	RC	e.g. 5SHx7
Et	RR	5 = decile
HM	SD	SH = map code
HS	SF	x = map code modifier
JR	TS	7 = structural stage
LS	UR	
OW	YG	
		Local Assessment Area (purple outline)
		Project Development Area (grey outline)
		Railway (dashed line)
		Road (black line)
		Watercourse (blue line)

Pacific NorthWest LNG

Terrestrial Ecosystem Mapping in the Local Assessment Area

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; WorldView-2 Imagery; Imagery date: 2011.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

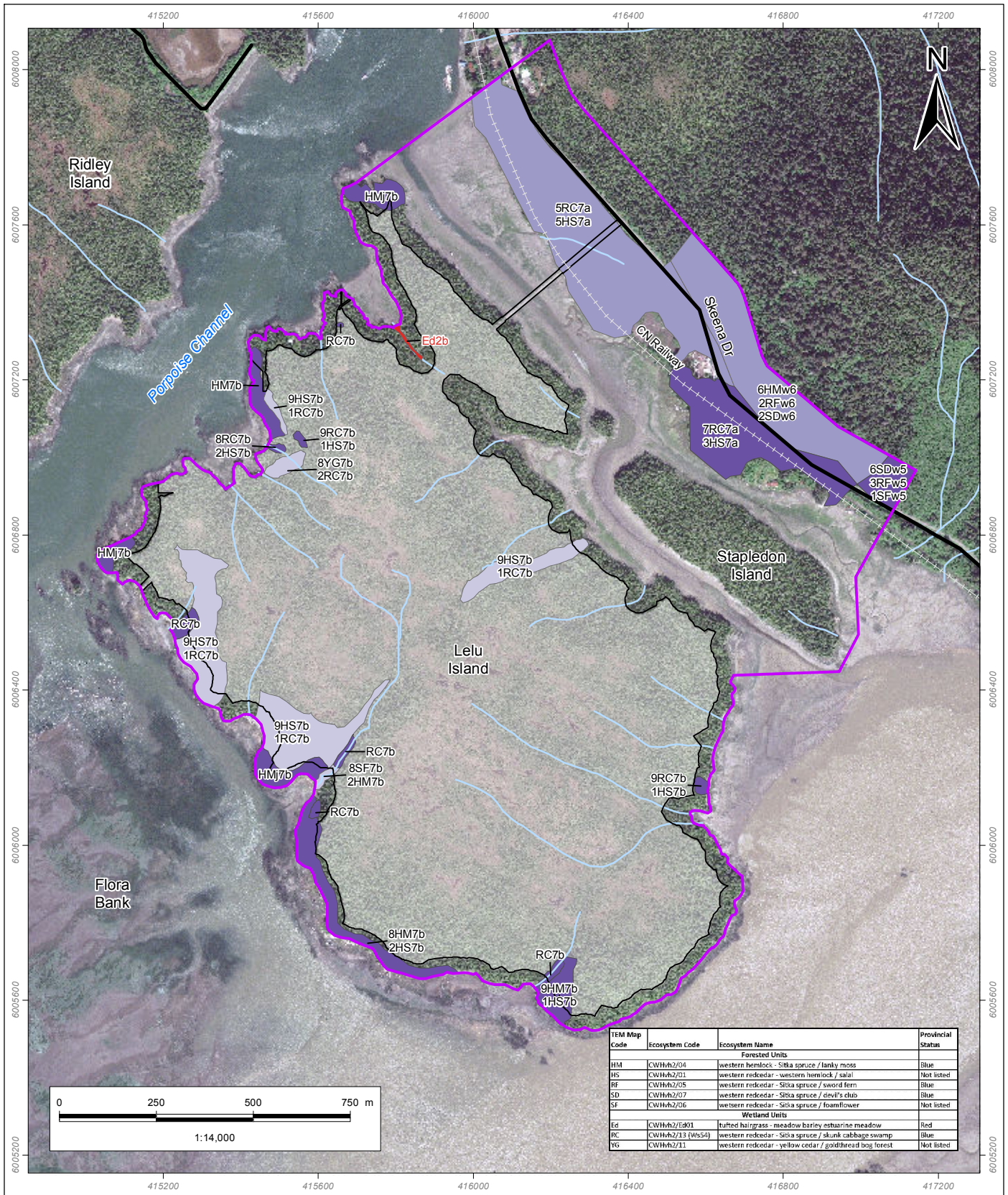
DATE: 20-NOV-14 PROJECTION: UTM - ZONE 9 DRAWN BY: K. POLL
 FIGURE ID: 123110537-230 DATUM: NAD 83 CHECKED BY: C. LION

PREPARED BY: **Stantec**

PREPARED FOR: **Pacific NorthWest LNG**

FIGURE NO: **10-3**

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TEM Map Code	Ecosystem Code	Ecosystem Name	Provincial Status
Forested Units			
HM	CWHk2/04	western hemlock - Sitka spruce / lanky moss	Blue
HS	CWHk2/01	western redcedar - western hemlock / salal	Not listed
RF	CWHk2/05	western redcedar - Sitka spruce / sword fern	Blue
SD	CWHk2/07	western redcedar - Sitka spruce / devil's club	Blue
SF	CWHk2/06	western redcedar - Sitka spruce / foamflower	Not listed
Wetland Units			
Ed	CWHk2/Ed01	tufted hairgrass - meadow barley estuarine meadow	Red
RC	CWHk2/13 (Ws54)	western redcedar - Sitka spruce / skunk cabbage swamp	Blue
YG	CWHk2/11	western redcedar - yellow cedar / goldthread bog forest	Not listed

Red Listed Ecological Community (100%)

Percent Blue Listed Ecological Communities

- > 60%
- 30% to 60%
- 1% to 30%

Local Assessment Area (magenta outline)

Project Development Area (grey outline)

Railway (dashed line)

Road (black line)

Watercourse (blue line)

Ecosystem Label
e.g. 5SHx7

5 = decile
SH = map code
x = map code modifier
7 = structural stage

Pacific North West LNG
Ecological Communities at Risk in the Local Assessment Area
EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; WorldView-2 Imagery, Imagery date: 2011.

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DATE: 20-NOV-14
FIGURE ID: 123110537-233
DRAWN BY: K. POLL

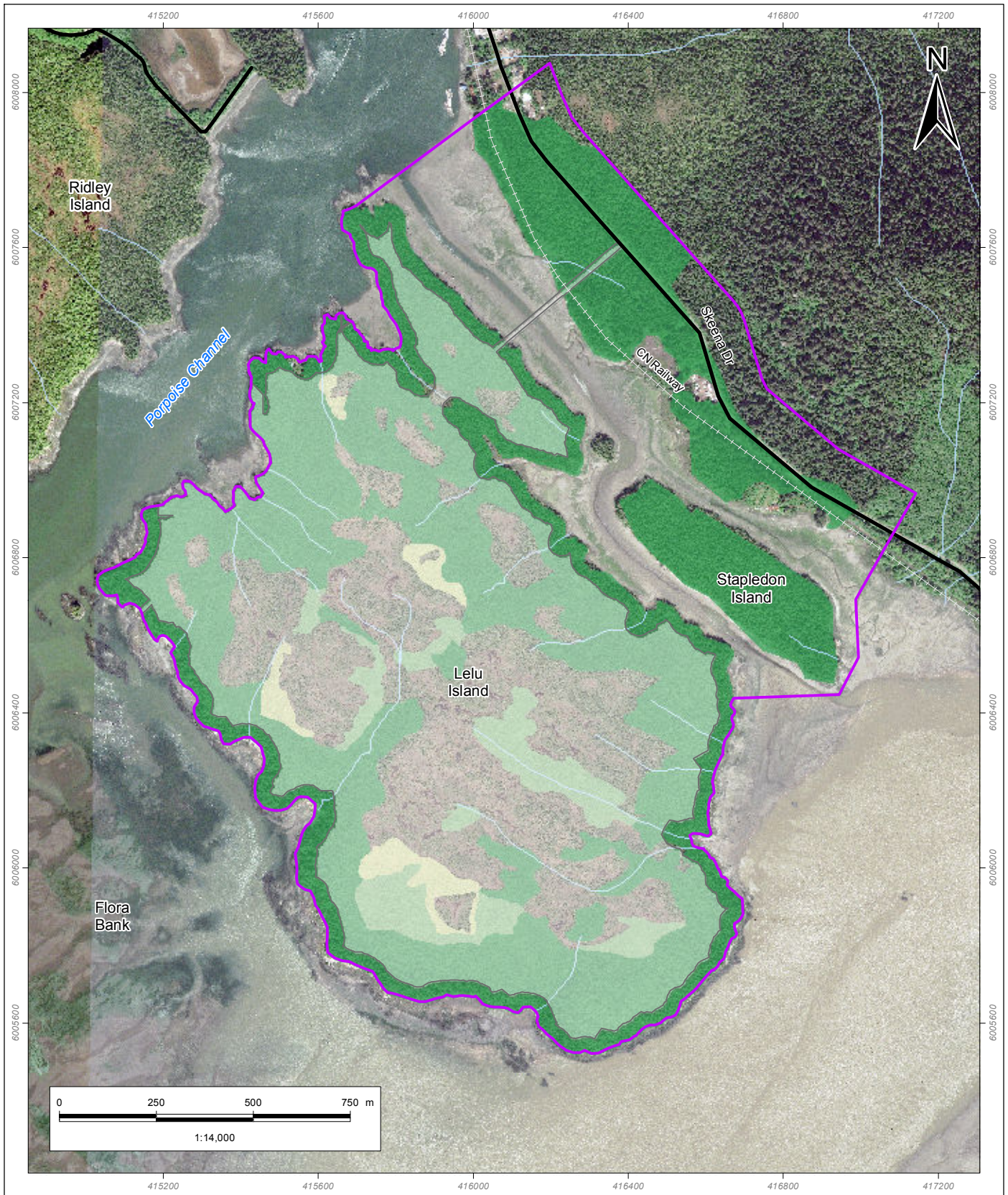
PROJECTION: UTM - ZONE 9
DATUM: NAD 83
CHECKED BY: C. LION

PREPARED BY:

PREPARED FOR:

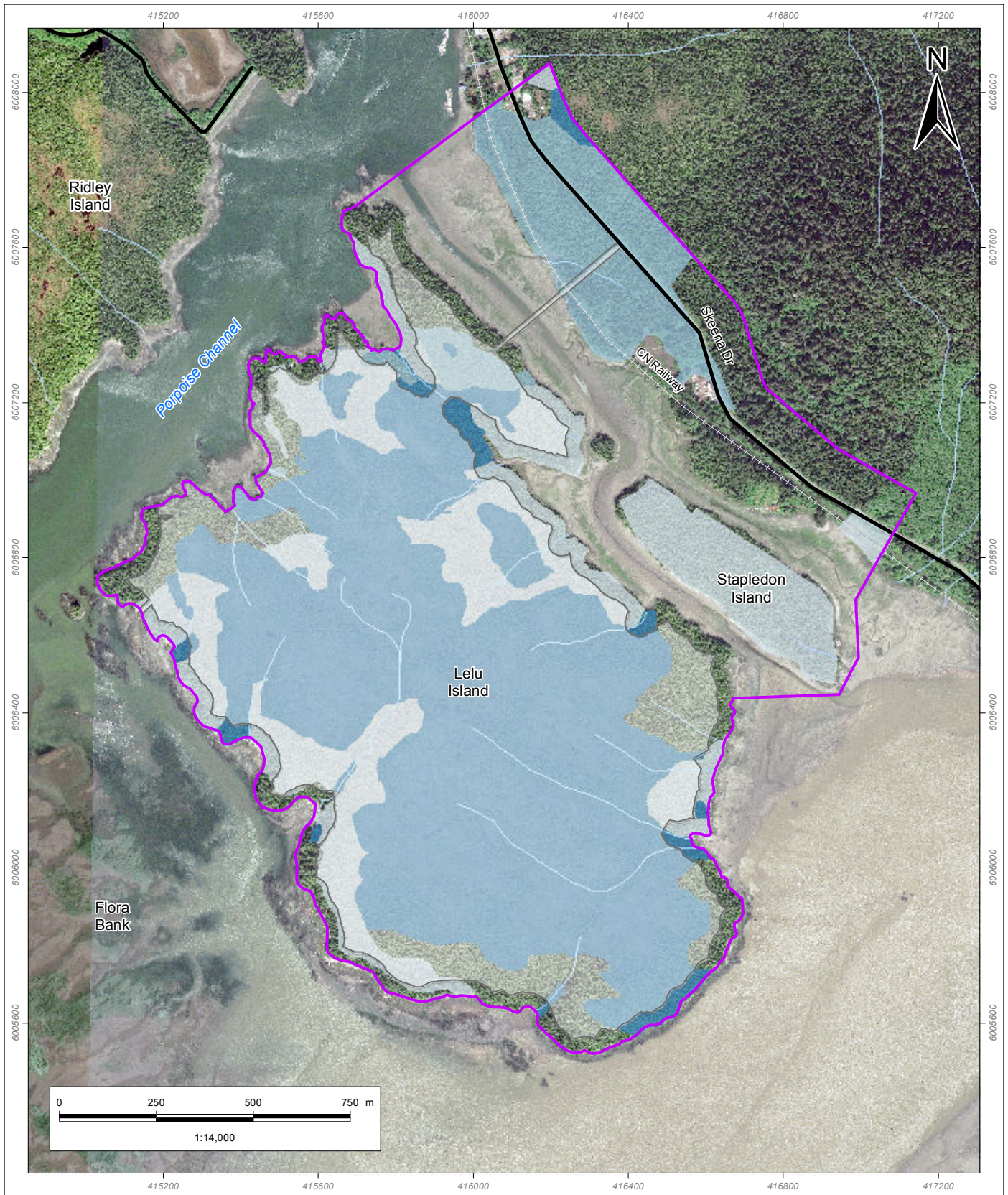
FIGURE NO:
10-4

11/20/2014 - 12:38:23 PM V:\nw\123110537\figures\EA_Addendum\Fig_123110537_ea_add_10_04_line_mre_000_ea.mxd



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<p>Old Forest Coverage</p> <ul style="list-style-type: none"> > 60% 30% to 60% < 30% 	<ul style="list-style-type: none"> Local Assessment Area Project Development Area Railway Road Watercourse 	<p>Pacific NorthWest LNG Old Forest in the Local Assessment Area <i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; WorldView-2 Imagery, Imagery date: 2011.</small></p> <p><small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p> <table style="width: 100%; border: none;"> <tr> <td style="border: none;">DATE: 20-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-232</td> <td style="border: none;">DATUM: NAD 83</td> </tr> <tr> <td style="border: none;">DRAWN BY: K. POLL</td> <td style="border: none;">CHECKED BY: C. LION</td> </tr> </table>	DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-232	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: C. LION	<p>PREPARED BY:</p> <p style="text-align: center;"> Stantec</p> <p>PREPARED FOR:</p> <p style="text-align: center;"> Pacific NorthWest LNG</p> <p>FIGURE NO:</p> <p style="text-align: center; font-size: 24px; font-weight: bold;">10-5</p>
DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9								
FIGURE ID: 123110537-232	DATUM: NAD 83								
DRAWN BY: K. POLL	CHECKED BY: C. LION								



- | | |
|-------------------------|--------------------------|
| Wetland Coverage | Local Assessment Area |
| > 80% | Project Development Area |
| 50% to 80% | Railway |
| < 50% | Road |
| | Watercourse |

Pacific NorthWest LNG
Wetlands in the
Local Assessment Area

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; WorldView-2 Imagery, Imagery date: 2011.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 20-NOV-14
 FIGURE ID: 123110537-231
 DRAWN BY: K. POLL

PROJECTION: UTM - ZONE 9
 DATUM: NAD 83
 CHECKED BY: C. LION

PREPARED BY:

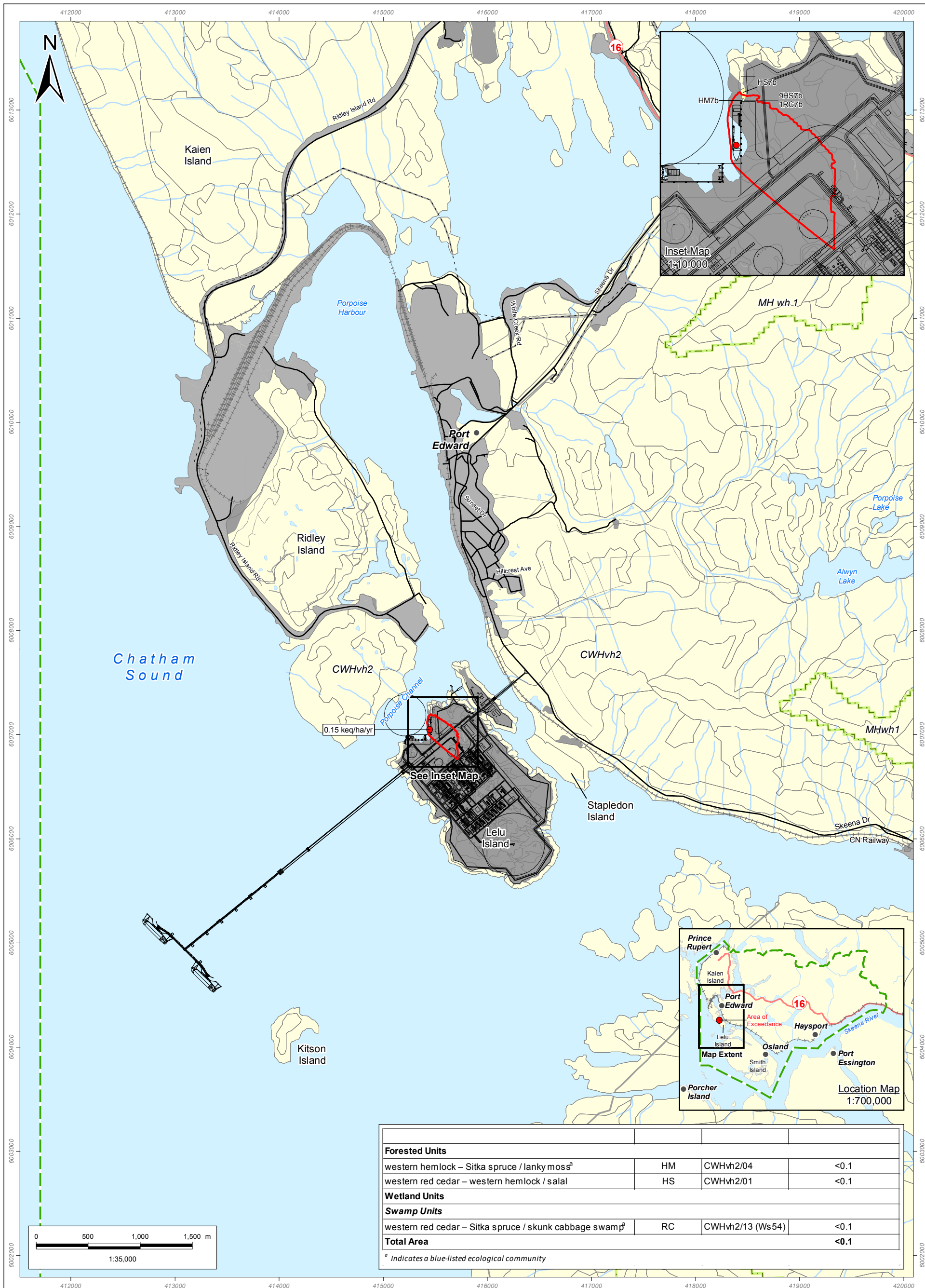


PREPARED FOR:

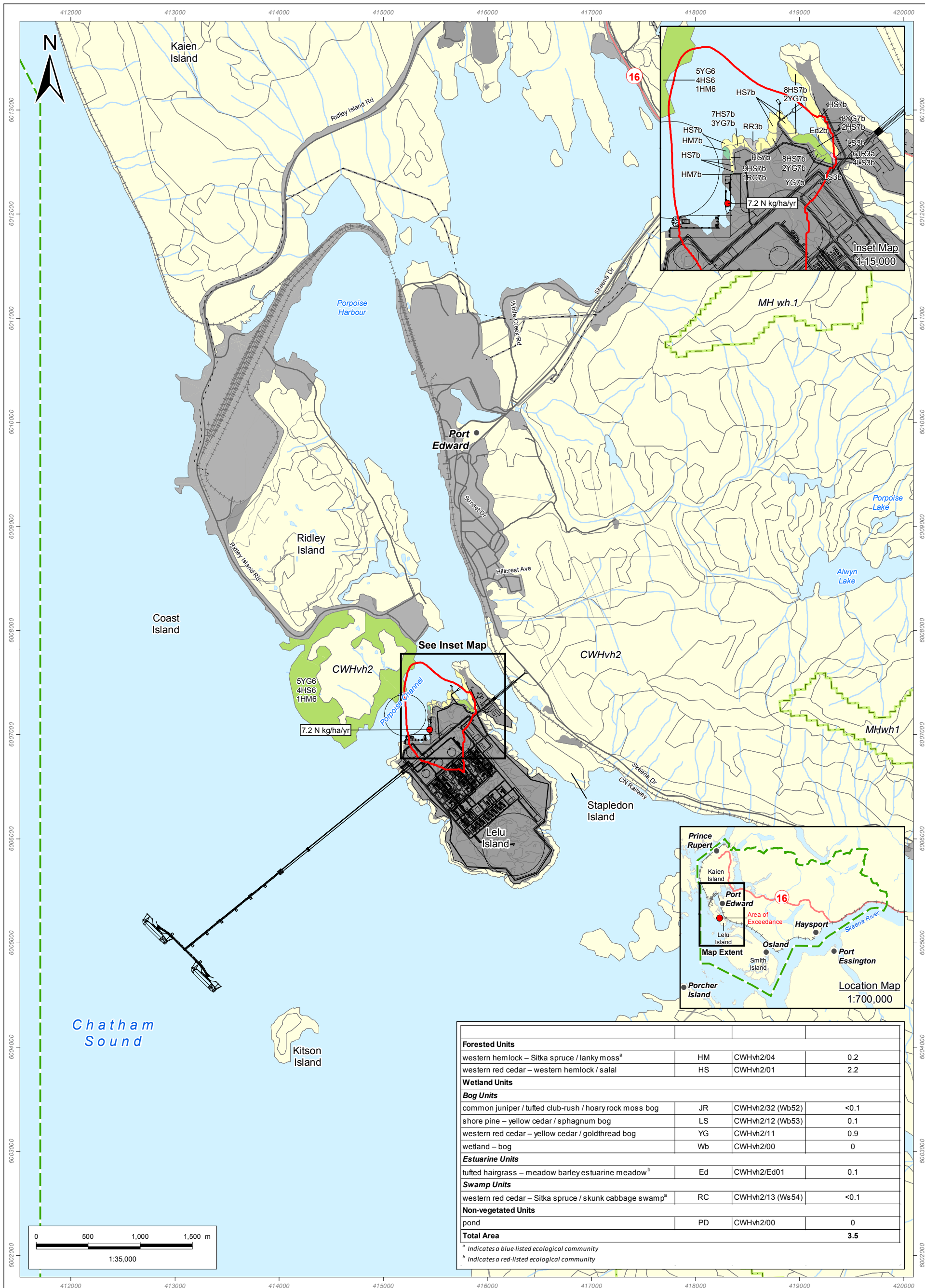


FIGURE NO:

10-6



Dominant Map Code HM HS Disturbance Acid Deposition Maximum Value (0.15 keq/ha/yr) Project Component Area Above Acid Deposition Critical Load (PAI ≥ 0.15 keq/ha/yr) Regional Assessment Area TEM Boundary	City or Town Electrical Power Transmission Line Railway Major Road Road Watercourse Biogeoclimatic Zone Boundary Waterbody	Ecosystem Label e.g. 5SHx7 5 = decile SH = map code x = map code modifier 7 = structural stage	<p align="center">Pacific NorthWest LNG</p> <p align="center">Areas above Acid Deposition Critical Loads – Application Case</p> <p align="center">EIS ADDENDUM</p> <p>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.</p> <p>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</p> <p>DATE: 20-NOV-14 FIGURE ID: 123110537-534</p> <p>PROJECTION: UTM - ZONE 9 DATUM: NAD 83</p> <p>DRAWN BY: K. POLL CHECKED BY: C. LION</p>	PREPARED BY: PREPARED FOR: FIGURE NO: <p align="center">10-7</p>
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Unit	Map Code	Area (ha)	Value
Forested Units			
western hemlock – Sitka spruce / lanky moss ^a	HM	CWHvh2/04	0.2
western red cedar – western hemlock / salal	HS	CWHvh2/01	2.2
Wetland Units			
Bog Units			
common juniper / tufted club-rush / hoary rock moss bog	JR	CWHvh2/32 (Wb52)	<0.1
shore pine – yellow cedar / sphagnum bog	LS	CWHvh2/12 (Wb53)	0.1
western red cedar – yellow cedar / goldthread bog	YG	CWHvh2/11	0.9
wetland – bog	Wb	CWHvh2/00	0
Estuarine Units			
tufted hairgrass – meadow barley estuarine meadow ^b	Ed	CWHvh2/Ed01	0.1
Swamp Units			
western red cedar – Sitka spruce / skunk cabbage swamp ^a	RC	CWHvh2/13 (Ws54)	<0.1
Non-vegetated Units			
pond	PD	CWHvh2/00	0
Total Area			3.5

^a Indicates a blue-listed ecological community
^b Indicates a red-listed ecological community

Dominant Map Code

- Ed
- HM
- HS
- JR
- LS
- RC
- RR
- YG
- Disturbance

Legend

- Nitrogen Deposition Maximum Value (7.2 kg/ha/yr)
- Project Component
- Area Above Nitrogen Deposition Critical Load (≥ 5 kg/ha/yr)
- Regional Assessment Area
- TEM Boundary
- City or Town
- - - Electrical Power Transmission Line
- +++ Railway
- Major Road
- Road
- Watercourse
- Biogeoclimatic Zone Boundary
- Waterbody

Ecosystem Label

e.g. 5SHx7

5 = decile
SH = map code
x = map code modifier
7 = structural stage

Pacific NorthWest LNG

Areas above Nitrogen Deposition Critical Loads – Application Case

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 20-NOV-14 PROJECTION: UTM - ZONE 9 DRAWN BY: K. POLL
FIGURE ID: 123110537-528 DATUM: NAD 83 CHECKED BY: C. LION

PREPARED BY:

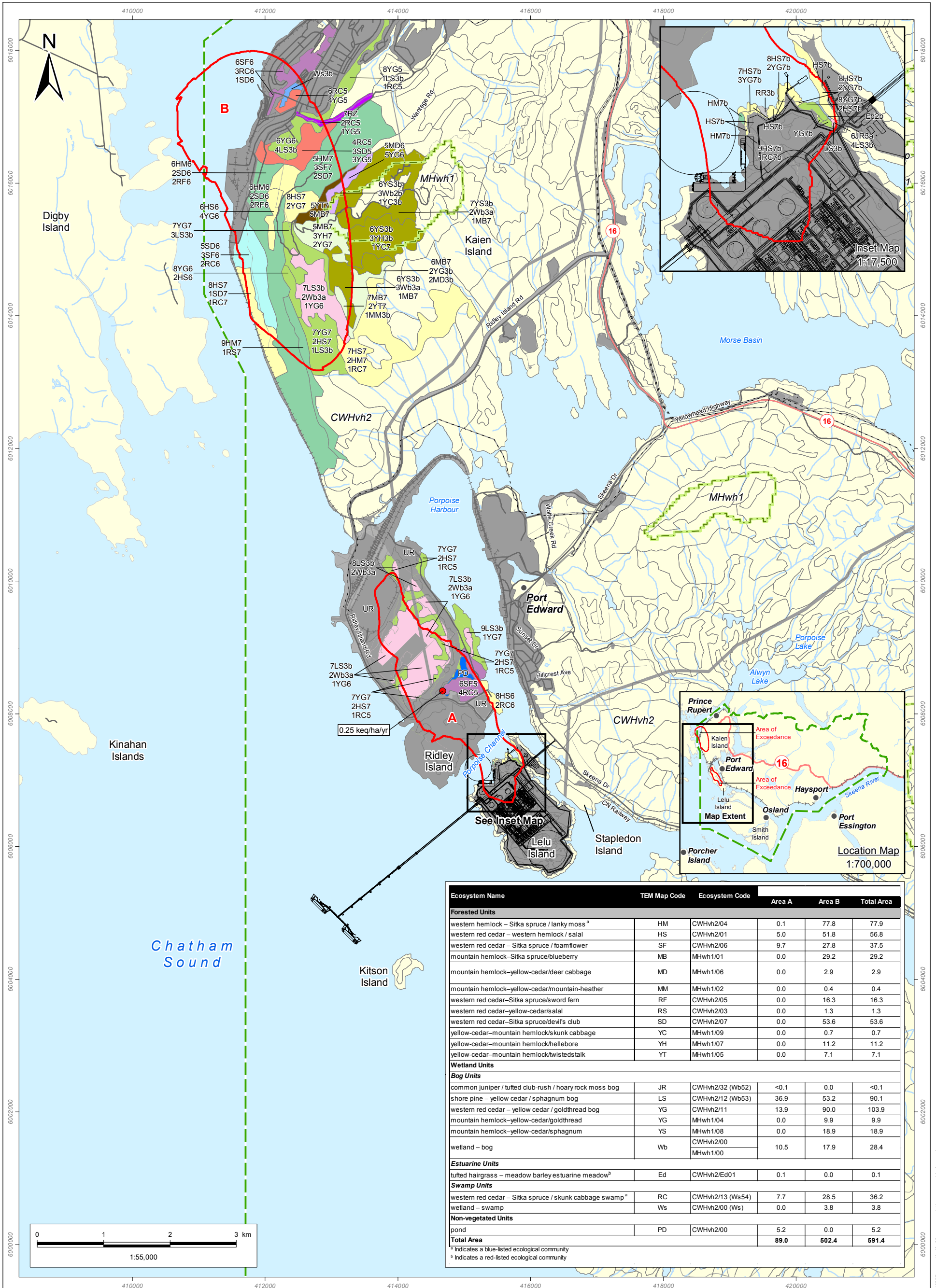
Stantec

PREPARED FOR:

Pacific NorthWest LNG

FIGURE NO:

10-8



Ecosystem Name	TEM Map Code	Ecosystem Code	Area A	Area B	Total Area
Forested Units					
western hemlock – Sitka spruce / lanky moss ^a	HM	CWHvh2/04	0.1	77.8	77.9
western red cedar – western hemlock / salal	HS	CWHvh2/01	5.0	51.8	56.8
western red cedar – Sitka spruce / foamflower	SF	CWHvh2/06	9.7	27.8	37.5
mountain hemlock–Sitka spruce/blueberry	MB	MHwh1/01	0.0	29.2	29.2
mountain hemlock–yellow-cedar/deer cabbage	MD	MHwh1/06	0.0	2.9	2.9
mountain hemlock–yellow-cedar/mountain-heather	MM	MHwh1/02	0.0	0.4	0.4
western red cedar–Sitka spruce/sword fern	RF	CWHvh2/05	0.0	16.3	16.3
western red cedar–yellow-cedar/salal	RS	CWHvh2/03	0.0	1.3	1.3
western red cedar–Sitka spruce/devil's club	SD	CWHvh2/07	0.0	53.6	53.6
yellow-cedar–mountain hemlock/skunk cabbage	YC	MHwh1/09	0.0	0.7	0.7
yellow-cedar–mountain hemlock/hellebore	YH	MHwh1/07	0.0	11.2	11.2
yellow-cedar–mountain hemlock/twistedstalk	YT	MHwh1/05	0.0	7.1	7.1
Wetland Units					
Bog Units					
common juniper / tufted club-rush / hoary rock moss bog	JR	CWHvh2/32 (Wb52)	<0.1	0.0	<0.1
shore pine – yellow cedar / sphagnum bog	LS	CWHvh2/12 (Wb53)	36.9	53.2	90.1
western red cedar – yellow cedar / goldthread bog	YG	CWHvh2/11	13.9	90.0	103.9
mountain hemlock–yellow-cedar/goldthread	YG	MHwh1/04	0.0	9.9	9.9
mountain hemlock–yellow-cedar/sphagnum	YS	MHwh1/08	0.0	18.9	18.9
wetland – bog	Wb	CWHvh2/00	10.5	17.9	28.4
		MHwh1/00			
Estuarine Units					
tufted hairgrass – meadow barley estuarine meadow ^b	Ed	CWHvh2/Ed01	0.1	0.0	0.1
Swamp Units					
western red cedar – Sitka spruce / skunk cabbage swamp ^a	RC	CWHvh2/13 (Ws54)	7.7	28.5	36.2
wetland – swamp	Ws	CWHvh2/00 (Ws)	0.0	3.8	3.8
Non-vegetated Units					
pond	PD	CWHvh2/00	5.2	0.0	5.2
Total Area			89.0	502.4	591.4

Dominant Map Code

Ed	RR	Major Road
HM	RZ	Road
HS	SD	Watercourse
JR	SF	Waterbody
LS	UR	Biogeoclimatic Zone Boundary
MB	Ws	Waterbody
MD	YG	
PD	YS	
RC	YT	
	Disturbance	

● Acid Deposition Maximum Value (0.25 keq/ha/yr)
 — Project Component
 □ Area Above Acid Deposition Critical Load (PAI ≥ 0.15 keq/ha/yr)
 □ Regional Assessment Area
 □ TEM Boundary
 ● City or Town
 --- Electrical Power Transmission Line
 +++ Railway

Ecosystem Label
 e.g. 5SHx7
 5 = decile
 SH = map code
 x = map code modifier
 7 = structural stage

Pacific NorthWest LNG

Areas above Acid Deposition Critical Loads – Cumulative Case

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 20-NOV-14
 FIGURE ID: 123110537-533

PROJECTION: UTM - ZONE 9
 DATUM: NAD 83

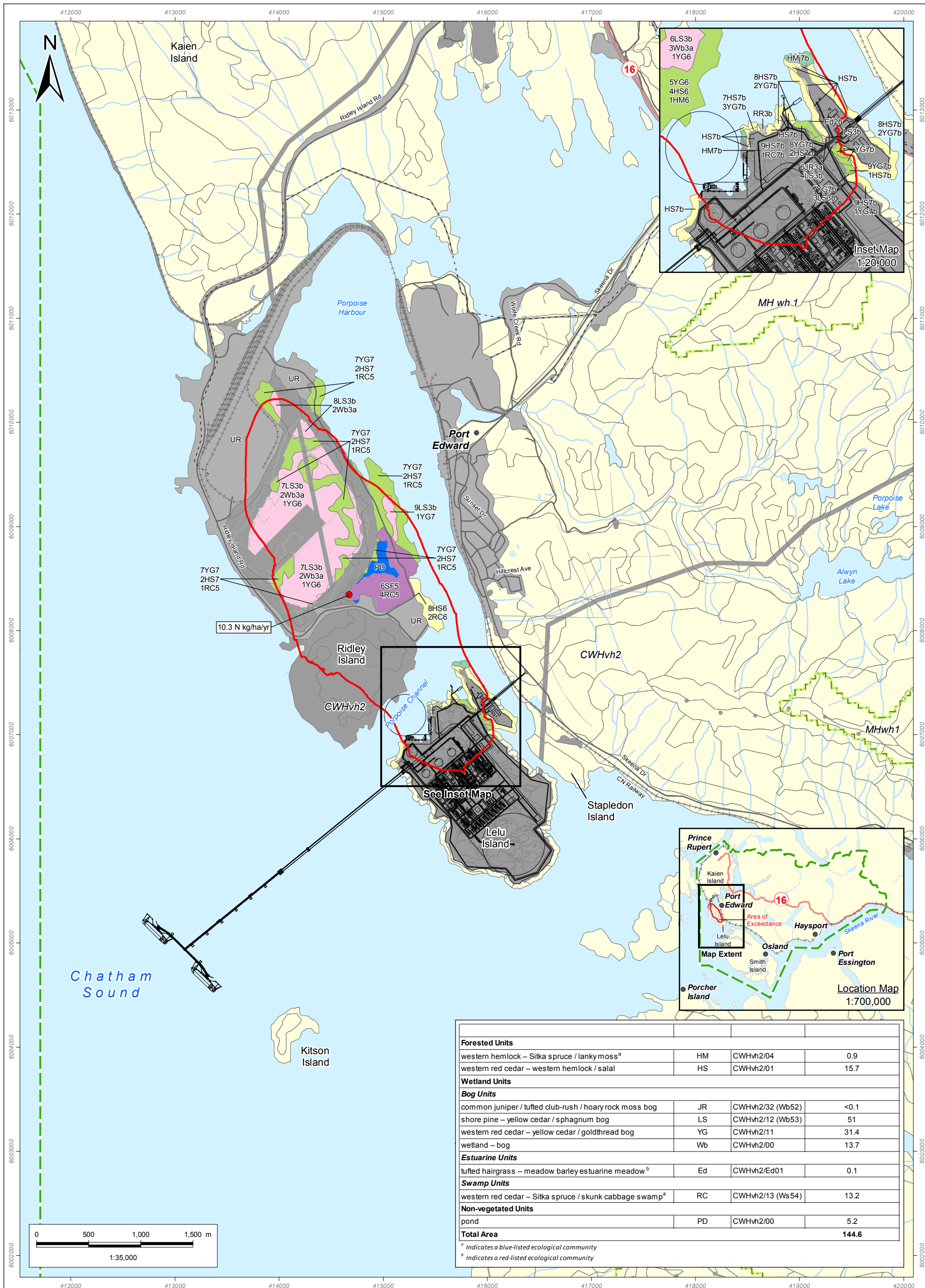
DRAWN BY: K. POLL
 CHECKED BY: C. LION

PREPARED BY:

PREPARED FOR:

FIGURE NO:
10-9

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Unit Type	Community	Code	Value
Forested Units	western hemlock – Sitka spruce / lanky moss ^a	HM CWHvh2/04	0.9
	western red cedar – western hemlock / salal	HS CWHvh2/01	15.7
Wetland Units			
Bog Units			
	common juniper / tufted club-rush / hoary rock moss bog	JR CWHvh2/32 (Wb52)	<0.1
	shore pine – yellow cedar / sphagnum bog	LS CWHvh2/12 (Wb53)	51
	western red cedar – yellow cedar / goldthread bog	YG CWHvh2/11	31.4
	wetland – bog	Wb CWHvh2/00	13.7
Estuarine Units			
	tufted hairgrass – meadow barley estuarine meadow ^b	Ed CWHvh2/Ed01	0.1
Swamp Units			
	western red cedar – Sitka spruce / skunk cabbage swamp ^a	RC CWHvh2/13 (Ws54)	13.2
Non-vegetated Units			
	pond	PD CWHvh2/00	5.2
Total Area			144.6

^a Indicates a blue-listed ecological community
^b Indicates a red-listed ecological community

Dominant Map Code

Ed	RC	Nitrogen Deposition Maximum Value (10.3 N kg/ha/yr)	Major Road
HM	RR		
HS	SF	Project Component	Road
JR	UR	Area Above Nitrogen Deposition Critical Load (≥ 5 N kg/ha/yr)	Watercourse
LS	YG	Regional Assessment Area	Biogeoclimatic Zone Boundary
PD	Disturbance	TEM Boundary	Waterbody

Ecosystem Label
 e.g. 5SHx7
 5 = decile
 SH = map code
 x = map code modifier
 7 = structural stage

--- Electrical Power Transmission Line
 --- Railway

Pacific NorthWest LNG

Areas above Nitrogen Deposition Critical Loads – Cumulative Case

EIS ADDENDUM

Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.

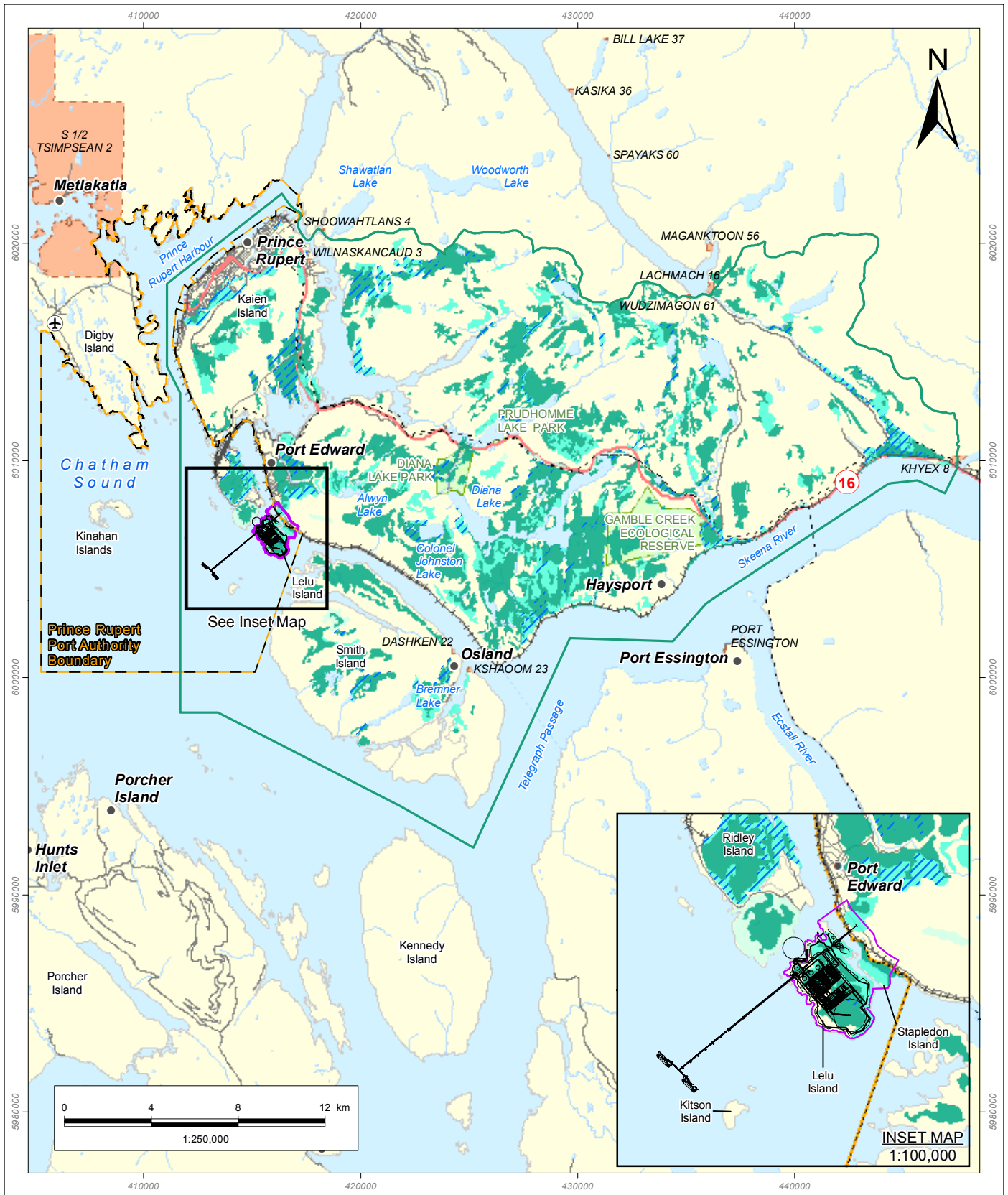
Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9	DRAWN BY: K. POLL
FIGURE ID: 123110537-527	DATUM: NAD 83	CHECKED BY: C. LION

PREPARED BY: **Stantec**

PREPARED FOR: **Pacific NorthWest LNG**

FIGURE NO: **10-10**



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<p>Blue Listed Ecological Communities At-risk</p> <p>Wetland Ecosystem</p> <ul style="list-style-type: none"> Less than 50% Between 50% and 80% Greater than 80% Local Assessment Area Regional Assessment Area 	<ul style="list-style-type: none"> Project Component Airport City or Town Electrical Power Transmission Line Highway Railway Secondary Road Watercourse Indian Reserve Prince Rupert Port Authority Boundary Protected Area Waterbody 	<p>Pacific NorthWest LNG</p> <p>Wetlands in the Regional Assessment Area</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd.</small></p> <p><small>Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.</small></p> <table style="width: 100%; border: none;"> <tr> <td style="border: none;">DATE: 20-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-234</td> <td style="border: none;">DATUM: NAD 83</td> </tr> <tr> <td style="border: none;">DRAWN BY: K. POLL</td> <td style="border: none;">CHECKED BY: C. LION</td> </tr> </table>	DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-234	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: C. LION
DATE: 20-NOV-14	PROJECTION: UTM - ZONE 9							
FIGURE ID: 123110537-234	DATUM: NAD 83							
DRAWN BY: K. POLL	CHECKED BY: C. LION							
		<p>PREPARED BY:</p> <p> Stantec</p> <p>PREPARED FOR:</p> <p> Pacific NorthWest LNG</p> <p>FIGURE NO:</p> <p style="font-size: 24pt; font-weight: bold; text-align: center;">10-11</p>						