

PACIFIC NORTHWEST LNG - ADDENDUM TO THE ENVIRONMENTAL IMPACT STATEMENT

Terrestrial Wildlife and Marine Birds
December 12, 2014

11.0 TERRESTRIAL WILDLIFE AND MARINE BIRDS

The assessment of potential effects of the Project on terrestrial wildlife and marine birds was provided in Section 11 of the EIS. This section of the EIS Addendum provides:

- An update to the potential project and cumulative effects on the Terrestrial Wildlife and Marine Bird VC as a result of the project changes
- A summary of responses to requests for additional information from the federal government (August 14, 2014 and September 11, 2014)
- An updated list of mitigation measures for the Terrestrial Wildlife and Marine Birds VC
- Updated conclusions on the assessment of effects on the Terrestrial Wildlife and Marine Birds VC, taking into account project changes and the requested additional information.

Table 11-1 lists the documents applicable to Terrestrial Wildlife and Marine Birds previously 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of the environmental assessment process to date and identifies if information is either *updated by EIS Addendum*, *superseded*, *not relevant*, or *not affected* by information in the EIS Addendum.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 11-1. Figure 11-1 to Figure 11-14 have been updated from those provided in the EIS to reflect the project changes and any other applicable updates.

Table 11-1 Status of Previously Submitted Documents

Document Name	Status
Section 11 of the EIS (February 2014)	Updated by EIS Addendum
Appendix H of the EIS (February 2014)	Updated by EIS Addendum
Technical Memorandum: Effects of Shipping on Marine Bird Movement (June 2014)	Not affected
Technical Memorandum: Wildlife Habitat Modelling (June 2014)	Not affected
Technical Memorandum: Potential Effects of Project Lighting on Songbirds, Marine Birds, and Bats (June 2014)	Not affected
Technical Memorandum: Marbled Murrelet Habitat (June 2014)	Not affected
Technical Working Group Comments	Not affected

11.1 PROJECT EFFECTS ASSESSMENT UPDATE

11.1.1 Baseline Conditions

The marine terminal design mitigation results in the relocation of the marine terminal berth by about 510 m of the location described in the EIS. The marine terminal design includes the use of a clear-span suspension bridge over tidally exposed mudflats on Flora Bank. The marine terminal remains within the local assessment area (LAA) for the Terrestrial Wildlife and Marine Birds VC (Figure 11-1 of the EIS Addendum), within which baseline conditions were

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assessed. Existing conditions described previously within the EIS continue to accurately characterize current conditions for terrestrial wildlife and marine birds. Figure 11-2 to Figure 11-5 of the EIS Addendum illustrate baseline ecological community and habitat suitability modelling that was reported within the EIS and remains unchanged. Figure 11-6 to Figure 11-10 of the EIS Addendum illustrate baseline surveys and survey results that were reported within the EIS and remain applicable with the marine terminal design mitigation.

Additional baseline data on bat presence within the LAA was collected using ultrasonic acoustic recording units installed on Lelu Island during September and October, with data collection completed on October 11, 2014. The results of this baseline data collection are reported within the technical memo *Baseline Surveys for Bat Species for Pacific NorthWest LNG*.

In response to an Information Request (IR), an assessment of effects specific to bats was conducted using baseline data presented within the EIS and data collected in 2014. Baseline conditions described within the EIS remain accurate and applicable following the results of 2014 data collection, as no new bat species were detected or areas of high activity identified. Results of the effects assessment on bats are provided in Appendix F.5. The results of the additional baseline surveys and assessment on bats do not change conclusions regarding the effects of the Project on bat populations presented within the EIS. However additional discussions with Environment Canada regarding the effects on bats have resulted in identification of several mitigation measures to further reduce these effects (see Section 11.4.1).

As part of responses to IRs, additional baseline information was compiled on Terrestrial Wildlife and Marine Birds. In particular, Appendix F.3 (regarding *Assessment of Effects to Migratory Birds Information Request #3 and #5*) (see Section 11.3.3) provides additional baseline information that was compiled to address effects on migratory birds, and Appendix F.4 (regarding *Assessment of Terrestrial Wildlife and Marine Species-at-Risk*) (see Section 11.3.4) provides additional baseline information on federal terrestrial wildlife and marine bird species-at-risk with the potential to be present in the LAA or regional assessment area (RAA), to assess potential effects to these species.

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 Terrestrial Wildlife and Marine Birds VC (DM Cultural Services Ltd and Metlakatla First Nation 2014; Calliou Group 2014; Pulla 2014; Crossroads Cultural Resource Management Ltd. 2014; Inglis Consulting Services 2014) (see Section 21 and Appendix B of the EIS Addendum). Twenty-six mammal species/species groups and six bird species/species groups were identified as being important to First Nations. Seven of the mammal species were observed during project baseline surveys, and 26 bird species identified as important were observed in the LAA. Information from the Traditional Use Studies has been incorporated into this effects assessment and in the responses to information requests wherever applicable.

11.1.2 Effects Assessment

Potential effects of the Project on terrestrial wildlife and marine birds have been re-evaluated with the project changes, following the methods described in Section 11 of the EIS. The effects assessment considers: change in habitat, change in mortality risk, and alteration of movement and focuses on elements that have changed compared with the EIS.

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Figure 11-11 to Figure 11-14 of the EIS Addendum provides updates to the ecological community modelling presented in the EIS to reflect the marine terminal design mitigation. The results have been updated from those that were presented within the EIS.

11.1.2.1 Change in Wildlife Habitat Availability

Effects to loss or alteration of wildlife habitat in the LAA will be reduced from those reported in the EIS as a result of the marine terminal design mitigation. The relocation of the marine terminal berth removes the need for dredging, slope armoring, and breakwaters for the terminal. The use of a suspension bridge avoids construction activities or infrastructure on Flora Bank. Collectively, the marine terminal design mitigation will eliminate dredging at the marine terminal and subsequently avoid alteration to 87 hectares (ha) of ocean habitat and 2 ha of estuarine tidal flat habitat for marine wildlife (Table 11-2). This reduces direct effects to marine bird habitats, as well as reduces indirect effects to the abundance and distribution of marine bird prey (e.g., marine invertebrates and fish). This design change will be beneficial to many migratory bird species, as ocean and estuarine tidal flat habitats contained the greatest number of individuals and species during baseline surveys (see Section 11.3.3). Bats that forage over marine and estuarine tidal flat habitat will also benefit from the reduced project effect in these ecological communities (see Section 11.3.5). Figure 11-11 shows the project development area (PDA) with the marine terminal design mitigation in relation to ecological communities in the LAA.

Table 11-2 Total Area (ha) of each Ecological Community Removed during Construction within the PDA

Ecological Community	Area (ha) of each Ecological Community Removed		
	EIS PDA	Design Mitigation PDA	Change due to Design Mitigation
Anthropogenic	0	0	0
Forest – Old Coniferous	44	44	0
Forest – Seral Coniferous	0	0	0
Forest – Seral Deciduous	0	0	0
Marine – Ocean	92	5	-87
Wetland – Aquatic	1	1	0
Wetland – Estuarine Marsh	0	0	0
Wetland – Estuarine Meadow	0	0	0
Wetland – Estuarine Tidal Flat	5	3	-2
Wetland – Shrub Dominated Bog	76	76	0
Wetland – Treed Swamp or Bog	43	43	0
Total	261	172	-89

Mitigation measures will be employed to reduce the effects of change in habitat to terrestrial wildlife and marine birds. See Section 11.4 below for a complete description of mitigation, and Section 11.3.5 for specific mitigation measures for bats.

The marine terminal design mitigation is not predicted to change the characterization of residual effects to terrestrial wildlife and marine birds for change in habitat from the construction, operations, and decommissioning phases of the Project. Change in wildlife habitat availability will remain low in magnitude and occur locally, within

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the LAA. Habitat removal will occur once and will last for the duration of the lifetime of the Project. The likelihood of a residual effect occurring remains high, because the Project will still result in change in habitat. However, the Project is not expected to affect the sustainability of regional terrestrial wildlife or marine bird populations and is predicted to remain not significant. Confidence in the prediction for the determination of significance for change in habitat remains high after considering the project changes (see Table 11-5).

11.1.2.2 Change in Mortality Risk

The risk of mortality to birds may increase slightly with the construction of a suspension bridge as part of the marine terminal design mitigation, which includes towers and cables up to 140 m high above sea level. In general, collisions with anthropogenic structures can be a source of mortality to many avian species (Calvert et al. 2013). However the risk of collision is typically higher for structures with windows (Banks 1976; Bayne et al. 2012; Borden 2010), thin wires or cables (e.g., electrical transmission lines; APLIC 2012), or structures with constant or excessively bright lighting (APLIC 2012; Avery et al. 1976; Longcore et al. 2008; Gehring et al. 2009).

The marine terminal suspension bridge does not have any windows or other highly-reflective components, and the thickness and number of cables is expected to make them highly visible to birds in flight during regular weather conditions. During periods of low visibility such as inclement weather or heavy fog, birds fly lower and may not be able to see structures such as towers, buildings and bridges (EDAW 2009; APLIC 2012), which could cause a minor increase in the risk of collision.

Lighting on the suspension bridge has potential to increase mortality risk for birds, similar to the mortality risk related to lighting on other project structures that was discussed within the EIS and described in detail in the Technical Memorandum: *Potential Effects of Project Lighting on Songbirds, Marine Birds, and Bats* submitted in June 2014. As outlined within the EIS and in Section 11.4 below, lighting mitigation will be employed to reduce the risk of collision on birds and mitigate this effect.

Mitigation measures will reduce the mortality risk to terrestrial wildlife and marine birds from the Project. See Section 11.4 below for a complete description of mitigation.

The marine terminal design mitigation will cause a minor increase in mortality risk through the potential for avian collisions with the suspension bridge during inclement weather conditions. However this change in mortality risk is not expected to alter the characterization of residual effects to terrestrial wildlife and marine bird mortality risk from the construction, operations and decommissioning phases of the Project. Potential for bird mortality from collisions will be low to moderate in magnitude when facility structures are regularly lit during operations. Collision events are expected to occur irregularly and might increase under certain weather conditions (i.e., fog or precipitation) or during seasonal migratory periods when increased numbers of birds pass through the LAA. For secure populations, natural recruitment is expected to offset the loss of a few individuals within a regional population. For bird species of management concern, mortality may have medium or long-term effects on regional populations if mortality exceeds the rate at which natural recruitment could replace individuals within a species. The likelihood of a residual project effect remains moderate after considering the marine terminal design mitigation. The change in mortality risk will not affect the sustainability of regional terrestrial or marine bird populations, and thus this residual effect is predicted to remain not significant. Confidence in the prediction for the

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determination of significance for change in mortality risk remains moderate based on the effectiveness of mitigation measures (Table 11-5).

11.1.2.3 Alteration of Movement

Effects to terrestrial wildlife and marine bird movements are not expected to materially change from those reported in the EIS. The marine terminal and trestle realignment has greater potential to influence movement patterns of marine birds due to the span and height of the suspension bridge. However, these flight path alterations will be localized to the immediate area around the trestle and be similar to those effects described in the EIS. The design mitigation of the marine terminal will reduce dredging and disposal at sea requirements. The revised design will reduce the number of disposal at sea barge trips to 85 return trips (decreased from 1,280 return trips in the EIS). The reduction in project associated vessel traffic will reduce effects of disturbance and movement of marine birds along the potential shipping routes.

Mitigation measures will be employed to reduce the effect of the Project on terrestrial wildlife and marine bird movement. See Section 11.4 below for a complete description of mitigation.

The project changes are not expected to modify the characterization of residual effects to terrestrial wildlife from the construction, operations, and decommissioning phases of the Project. The marine terminal design mitigation will change the magnitude of residual effects on marine bird movement from negligible to low, as flight paths may be modified based on the height and span of the suspension bridge. Project infrastructure is expected to cause localized displacement, particularly of marine birds in areas directly adjacent to the marine terminal. Limiting dredging activities to areas outside of Flora Bank will promote continued access to key foraging and staging habitats used by marine bird species. The effect will remain restricted to the LAA, and continue to be multiple regularly-occurring events as individuals adjust daily or seasonal movement patterns in response to marine infrastructure and transiting vessels. Marine birds are generally expected to recover quickly from any disturbance effects from the marine terminal and trestle as they move away from the source of the disturbance (Schwemmer et al. 2011). The extent of any disturbance may decrease or reverse over time as individuals habituate to the regular presence of the infrastructure and vessels (Kaiser et al. 2006; Schwemmer et al. 2011, Speckman et al. 2004, Rodgers and Schwikert 2002). Marine birds are still expected to exhibit a moderate degree of resilience to any alteration of movement as a result of the Project.

The likelihood of a residual effect to marine bird movement remains high, as the Project will continue to cause marine birds to adjust their movement patterns. With the marine terminal design mitigation, the Project is still expected to not affect the sustainability of regional marine bird populations. The residual effect on marine bird movement is predicted to remain not significant. Confidence in the prediction for the determination of significance for alteration of marine bird movement remains high after considering the marine terminal design mitigation (Table 11-5).

11.1.2.4 Summary of Residual Effects Associated with the Marine Terminal

The project changes are not expected to 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

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the EIS. The overall determination of significance described in Section 11.5 of the EIS does not change as a result of the marine terminal design mitigation because the significance thresholds described in Section 11.2.7 of the EIS are not exceeded for any terrestrial wildlife or marine bird regional population (i.e., remains not significant). Table 11-5 contains a summary of the residual effects characterization for Terrestrial Wildlife and Marine Birds, including mitigation and follow-up programs.

Changes to the information presented in Table 11-5 (compared to Table 11-11 of the EIS) are identified with underlined text.

11.2 CUMULATIVE EFFECTS ASSESSMENT UPDATE

The cumulative effects assessment provided in the EIS 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.

Changes to the marine terminal were incorporated into a geographic information system (GIS) analysis of spatial data that was used to assess the past, present, and potential future cumulative effects on terrestrial wildlife and marine bird resources in the RAA. Historic and recent forestry activities in the RAA were spatially incorporated into the GIS analysis presented in the EIS using cutblock data available from Natural Resources Canada (NRCan) (2013), and remain unchanged. Detailed spatial data on future forestry activities and their effects on terrestrial wildlife and marine birds are unavailable and cannot be assessed quantitatively. Accordingly, cumulative effects from future forestry activities are discussed qualitatively in Section 11.2.1. Effects from past, present and future fisheries activities are discussed qualitatively as well.

The total area of disturbance is provided by ecological community within the RAA for past, present, and reasonably foreseeable future development in Table 11-3. Existing development features occupy 1,944 ha within the RAA (1% of the RAA). An additional 478 ha of development is planned in the reasonably foreseeable future (0.3% of the RAA). The contribution of the Project to overall development within the RAA, after including the project changes, is 172 ha (or 0.1%).

Table 11-3 Total Area of Each Ecological Community Removed by Vegetation Clearing within the Regional Assessment Area

Ecological Community ¹	Baseline Area of each Ecological Community in the RAA (ha)	Past and Present Disturbance in the RAA (ha)	Pacific NorthWest LNG Project	Foreseeable Future Development ²	Change in each Ecological Community (%)
Anthropogenic	1,591	1,591	0	0	100
Beach	4	0	0	0	0
Forest – Old Coniferous	20,969	71	44	111	1
Forest – Seral Coniferous	5,597	123	0	57	3
Forest – Seral Deciduous	546	1	0	0	< 1

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Ecological Community ¹	Baseline Area of each Ecological Community in the RAA (ha)	Past and Present Disturbance in the RAA (ha)	Pacific NorthWest LNG Project	Foreseeable Future Development ²	Change in each Ecological Community (%)
Marine – Ocean	106,232	41	8	40	< 1
River	21	0	0	0	0
Rock – Cliff, Outcrop, or Talus	1,009	0	0	0	0
Shrub – Subalpine	1,736	0	0	1	< 1
Wetland – Aquatic	1,784	8	1	3	1
Wetland – Shrub Dominated Bog	8,536	26	76	134	3
Wetland – Treed Swamp or Bog	8,186	83	43	132	3
Unknown	19	0	0	0	0
Total	156,230	1,944	172	478	-

NOTES:

¹ The extent of ecological communities for the cumulative effects analysis was determined through analysis of TEM data from the BC MFLNRO (2013) and may deviate slightly from the detailed modelling completed for the Project, presented in Section 11.5.2

² Reasonably foreseeable future projects and activities include those that have been publicly announced (AECOM 2013; TransCanada 2013; City of Prince Rupert 2012; Golder Associates 2012; Ecosystems Consulting 2009; PGEC 2007)

11.2.1 Cumulative Effects Assessment

Cumulative effects methods follow those described within the EIS. The Project is predicted to result in measurable and demonstrable residual effects on terrestrial wildlife and marine birds. These residual project effects are likely to act cumulatively with other projects and activities in the RAA.

11.2.1.1 Change in Wildlife Habitat Availability

With the incorporation of project changes, construction of the Project will account for the loss of 164 ha of terrestrial habitat and 8 ha of marine habitat in the RAA and will result in localized loss of shrub-dominated bog, treed swamps and bogs, and old coniferous forest (Table 11-3). Reasonably foreseeable future development will contribute an additional 478 ha of habitat loss. Cumulative effects of the Project on habitat with past, present, and reasonably foreseeable future activities will remain consistent with those presented within the EIS, with the exception of a reduction in marine cumulative habitat loss due to the project changes.

Future forestry activities will result in the loss or alteration of additional habitat for terrestrial wildlife, particularly for species that use old coniferous and seral coniferous forests. However the RAA will likely experience reduced harvesting compared to historic levels. The North Coast Timber Supply Area (within which the RAA is found) has had consistent reductions in Annual Allowable Cut since its peak in 1987 (Province of British Columbia 2014).

Fisheries activities within the RAA may affect marine bird habitat through reductions in fisheries prey availability. Fisheries that target forage fish such as herring may cause reductions in these fish populations, thus reducing

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available food for marine birds (Tasker et al. 2000). Historically, some species such as marbled murrelets are suspected to have had their populations affected in some areas due to overfishing (Norris et al. 2007). However this is not considered a contemporary threat to provincial murrelet populations (COSEWIC 2012).

The marine terminal design mitigation will reduce the amount of dredging required in marine ecological communities to 8 ha. Reduction in temporary or permanent alteration of marine habitats from construction of the marine terminal and materials off-loading facility (MOF) will limit the contribution of the Project to cumulative effects on change in the availability of foraging and staging habitats for marine birds than was predicted in the EIS. The EIS considered cumulative effects with respect to species-at-risk using marbled murrelets as an example. The *Assessment of Effects to Migratory Birds* (Appendix F.3) (see also Section 11.3.3) considers cumulative effects for migratory bird species. Appendix F.4 (regarding *Assessment of Terrestrial Wildlife and Marine Species-at-Risk*) (see also Section 11.3.4) considers cumulative effects on a species-by-species basis for other federally designated species-at-risk. Finally Appendix F.5 (regarding *Terrestrial Wildlife and Marine Birds IR#10*) (see also Section 11.3.5) considers cumulative effects for bats.

The Project is likely to result in residual effects contributing to cumulative changes in habitat for migratory birds, bats, and the following species-at-risk: little brown myotis (*Myotis lucifugus*), Keen's long-eared myotis (*Myotis keenii*), band-tailed pigeon (*Patagioenas fasciata*), common nighthawk (*Chordeiles minor*), great blue heron (*Ardea herodias*), horned grebe (*Podiceps auritus*), marbled murrelet (*Brachyramphus marmoratus*), northern goshawk (*Accipiter gentilis laingi*), olive-sided flycatcher (*Contopus cooperi*), western grebe (*Aechmophorus occidentalis*) and western screech-owl (see Sections 11.3.3, 11.3.4 and 11.3.5). Consistent with the assessment provided in the EIS, cumulative loss or alteration will result in the greatest change to availability of seral coniferous forest, shrub-dominated bog wetlands and treed swamp or bog wetlands within the RAA. The cumulative loss of the community types would affect species that are most likely to occur in the LAA, including little brown myotis, Keen's long-eared myotis, olive-sided flycatcher, and western screech-owl.

It is not expected that the contribution of the Project to habitat change will affect long-term sustainability of regional populations for any species. Accordingly, cumulative effects on habitat for terrestrial wildlife and marine birds are determined to be not significant. This conclusion is unchanged from that which was presented within the EIS.

11.2.1.2 Change in Mortality Risk

In addition to cumulative effects to mortality risk from projects and activities described in the EIS, traffic between the accommodation camp and the Project, as well as forestry and fisheries activities all have the potential to interact cumulatively with the Project to increase the cumulative change in risk of mortality.

The change in location of the accommodation camp will require transportation of workers from the camp to the Lelu Island worksite along existing roads. Busses will be used to transport workers. Based on the maximum peak number of construction workers in the camp (4,500), assuming 2 shift changes per day, and an average of 45 people per vehicle, traffic on Skeena Drive associated with camp relocation could amount to 100 shuttle round trips per day. No data is available on wildlife road mortality for Skeena Drive or other local roads. However reported wildlife mortality due to vehicle collisions along nearby Highway 16 between Kitwanga and Prince Rupert

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was 25-91 animals per year between 2000 and 2007 (0.1-0.4 animals per kilometer per year; Sielecki 2010). Road mortality on small, local roads is expected to be much lower due to lower speed limits and less traffic than on the highway. Wildlife mortality due to vehicle collisions will be managed through standard procedures and practices (e.g., adherence to speed limits), and the increase in traffic is not expected to result in a change to the mortality risk to wildlife.

Forestry activities can potentially cause mortality of terrestrial wildlife during vegetation clearing, particularly for terrestrial wildlife with a limited means of dispersal, such as amphibians, small mammals and breeding birds and their eggs or young. The extent of amphibian or small mammal mortality as a result of forestry is currently unknown. For birds, loss of nests with associated eggs and young is expected to be the primary form of mortality (Calvert et al. 2013; Hobson et al. 2013). The predicted change in mortality risk for the Project will act cumulatively with the change in mortality risk from forestry. However mitigation for the Project (e.g., implementing guidelines and restricting activities during sensitive wildlife periods, and conducting bird surveys if clearing is required during the breeding bird season) will reduce the contribution of the Project to cumulative mortality risk for terrestrial wildlife.

Fisheries activities can increase mortality of marine birds through by-catch of birds caught in fishing gear (Calvert et al. 2013; Ellis et al. 2013; Environment Canada 2014a). Rates of mortality vary amongst marine bird species, but diving piscivorous species (e.g., murre, murrelets, and mergansers) are likely at greater risk from entanglement with fishing gear, particularly gill nets (Calvert et al. 2013; Environment Canada 2014a). Nationally, fisheries by-catch does not have a drastic effect on marine bird populations (Ellis et al. 2013). In BC, estimates of marbled murrelet gill net by-catch range from 26 to 552 individuals per year (or 0.18 to 12.34% of the annual population recruitment; Smith and Morgan 2005). More recent data to update this estimate is not yet available, though future research is underway (Environment Canada 2014b).

Following consideration of the project changes and the application of appropriate mitigation, the contribution of the Project to cumulative risk of mortality is not expected to reduce the sustainability of regional populations, including species-at-risk. Consideration of cumulative effects of forestry and fisheries activities does not alter the conclusions for the overall cumulative effects of change in mortality from other past, present or reasonably foreseeable projects and activities that were presented in the EIS. This conclusion remains unchanged from that which was presented within the EIS (i.e., not significant).

11.2.1.3 Alteration of Movement

The project changes are not expected to materially change the contribution of the Project to cumulative effects on terrestrial wildlife movements. Effects from the Project on wide-ranging species that migrate to and from Lelu Island (e.g., black-tailed deer and coyote) are most likely to act cumulatively with other projects and activities. Traffic between the accommodation camp and Lelu Island could affect the general movement of wider-ranging species as well, acting cumulatively with project effects.

Forestry effects could interact cumulatively with the alteration of movement effect from the Project. However the alteration of wildlife movement by forestry is expected to be minor in comparison to effects caused by habitat

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alteration and loss, given the short-term nature of forestry activities related to individual cutblocks versus long-term habitat alteration (see Section 11.2.1.1).

For marine birds, the project changes will reduce the amount of marine vessel traffic from what was predicted within the EIS (primarily from a reduction in vessels to relocate and dispose of dredge-material), thus reducing the contribution of vessel traffic to cumulative effects on marine bird movement). The revised design will limit the number of barge trips for disposal at sea to 85 return trips (a reduction from 1,280 return trips in the EIS). In turn, this will limit the contribution of the Project to cumulative effects on marine bird movement from vessel traffic along the potential shipping routes. Fisheries vessel traffic may act cumulatively with both project related vessel traffic and other present and future regional marine activities to alter marine bird movement. However, many marine birds are already exposed to existing marine vessel traffic in the LAA and are expected to demonstrate a degree of habituation to current fisheries activities (Kaiser et al. 2006; Schwemmer et al. 2011; Speckman et al. 2004; Rodgers and Schwikert 2002).

The contribution of the Project to cumulative alteration of movement is not expected to reduce the sustainability of regional populations of terrestrial wildlife and marine birds, including species-at-risk. Consideration of cumulative effects of forestry and fisheries activities does not alter the conclusions for overall cumulative effects of alteration of movement from other past, present or reasonably foreseeable projects and activities that were presented in the EIS.

11.2.1.4 Summary of Cumulative Effects

With the incorporation of the project changes, the Project is expected to have a cumulative effect with other past, present and reasonably foreseeable projects and activities on terrestrial wildlife and marine birds. However, the design mitigation for the marine terminal will reduce the contribution of the Project to cumulative effects on change in habitat and movement by limiting alteration of marine ecological communities and vessel traffic to support disposal at sea. Overall, changes in the construction schedule for the Project have not affected the outcomes of the cumulative effects assessment for terrestrial wildlife and marine birds. Conclusions on significance of cumulative effects are based primarily on spatial overlap of project activities with habitats used by terrestrial wildlife and marine birds, rather than temporal overlaps. Accordingly, changes in the construction schedule do not affect conclusions on cumulative effects. Conclusions remain consistent with those presented within the EIS (i.e., remain not significant). Table 11-6 contains a summary of the cumulative effects characterization.

11.3 RESPONSES TO THE OUTSTANDING INFORMATION REQUESTS

This section summarizes the responses to outstanding information requests with regards to terrestrial wildlife and marine birds. The full responses can be found in Appendix F.1 through F.5 of the EIS Addendum.

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11.3.1 Terrestrial Wildlife and Marine Birds Information Request #1

11.3.1.1 Government of Canada – Outstanding Information

Agency: *The proponent did not conduct additional surveys as required in the information request, instead providing a rationale to support the adequacy of the information in the EIS. Further information is required to support the rationale that field surveys are not required as described below.*

EC: *Through its terrestrial ecosystem mapping and vegetation surveys the proponent advises that there is lack of suitable marsh habitat found on Lelu Island. The proponent's wetland bird call play-back surveys did not detect marsh bird species throughout the breeding period. The proponent also conducted acoustic recordings raptor surveys, and incidentally recorded approximately 59 wildlife species. Specify the minimum and maximum range of the acoustic recorders used in the acoustic recording surveys, and the likelihood that the recorder range would have allowed for incidental recording of any marsh bird species.*

11.3.1.2 Summary of Response

Call playback survey methods followed those outlined in Resources Inventory Committee (RIC) (1998) and Conway (2009). Although maximum and minimum detection ranges of the acoustic recording units (ARUs) are influenced by environmental variables, studies report that ARU detection is consistent up to 100 m from the sound source (Venier et al. 2012; Wildlife Acoustics 2014). Four ARUs were deployed on Lelu Island, all of which were within 100 m of treed swamp or bog habitat (see Table 2 of Appendix F.1 for distances between ARUs and wetland habitat).

The likelihood is high that marsh birds, if present on Lelu Island, would have been detected by ARUs for the following reasons:

- Call playback surveys conducted in shrub-dominated bog habitat observed no detections
- ARUs were installed in or directly adjacent to wetland habitat
- Data collected from ARUs includes 540 hours of recordings from dusk through dawn during the optimal timing window for reproductive vocalizations with no detections.

In addition to the above considerations, no suitable marsh habitat was detected on Lelu Island, and Lelu Island is outside the breeding range for all four target marsh bird species. Regionally, the target marsh bird species are considered rare; few occurrence records exist and only for American bittern and American coot. Based on this information, combined with baseline data collected from call playback surveys and ARUs, confidence in the methods and results of these surveys is high. See Appendix F.1 for further details regarding ARU detection and marsh bird surveys.

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11.3.2 Terrestrial Wildlife and Marine Birds Information Request #2

11.3.2.1 Government of Canada – Outstanding Information

Agency: *The proponent did not conduct additional surveys as requested, instead providing a rationale to support the adequacy of the information in the EIS and the supporting Technical Memo. Additional information is required to support the rationale that field surveys are not required and elaborate on the information in the memo.*

EC: *The proponent referenced the proposed Marbled Murrelet (MAMU) Recovery Strategy (RS) in its MAMU Habitat Technical Memo (the Memo) and advises that it will reassess upon finalization of the RS. The date of this memo is June 23, 2014, but the final RS was posted on June 3, 2014. There were no changes to the identification of critical habitat (CH) in the final RS; however, there were clarifications to the CH section, the addition of quantitative 2012 habitat levels for each Bird Conservation Region, and some clarification of the text in the population and distribution section. While CH polygon coverage as identified in the final MAMU RS does not include Lelu Island, the proponent should note that suitable habitat that qualifies as CH is likely to be added in the future. Specific timelines for future identification of CH has not been set. It is important to note that the 91 ha of moderately suitable nesting habitat identified on Lelu Island could in the future be identified as CH should it contain the necessary biophysical attributes for the species at that time.*

1. *Update the assessment for the Marbled Murrelet according to the final RS issued on June 3, 2014.*
2. *Identify proposed mitigation measures for Marbled Murrelet and explain how these measures are consistent with the recovery objectives outlined in the final recovery strategy.*
3. *It remains unclear whether the RISC 2002 methods were used to assess MAMU occupancy. This information is important as the proponent's survey indicates that MAMU forage in the adjacent marine environment. Identify which standard was used to assess Marbled Murrelet occupancy.*
4. *It is not evident how some information was assessed and interpreted to draw the conclusions as presented in the Memo. For example, the proponent concludes that disturbance to marine foraging areas can be managed through reduced vessel speed. This threat is not well understood for MAMU and, as such, is listed in the Recovery Planning table in the final RS as a threat requiring additional research. Provide the evidence (i.e., references and/or reports) that support the conclusion that disturbance to marine foraging areas can be managed through reduced vessel speed presented in the Marbled Murrelet Habitat Technical Memo.*
5. *Clarify the meaning of the term 'habitat management directives', per the Memo (first paragraph of the cumulative effects section, fourth sentence).*

11.3.2.2 Summary of Response

1) Assessment of Marbled Murrelet Habitat and the Recovery Strategy

In the final recovery strategy for marbled murrelet, areas of potentially suitable murrelet nesting habitat have been spatially delineated by the recovery team, but many of these areas have not been verified as suitable in the field. Critical marbled murrelet habitat is defined as "a state where greater than 70% of the 2002 suitable nesting habitat coast-wide remains". This includes at least 68% critical habitat retention in the conservation region in which the Project is located. Critical habitat will not be removed by clearing for the Project. Based on baseline survey data and terrestrial habitat suitability, there is low potential for marbled murrelet to occupy habitats on

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Lelu Island. The final recovery strategy did not identify any polygons within which critical habitat (i.e., ‘most likely’ and ‘moderately likely’ nesting habitat) with potential to support suitable marbled murrelet nesting on Lelu Island (see F.2 of the Addendum for details).

Critical marine habitat for marbled murrelet is not currently defined in the final recovery strategy, though the report describes important marine habitat as shallow nearshore or sheltered waters with sandy or gravel sea floors that support Pacific sand lance, their primary prey (Burger 2002; Environment Canada 2014b). Murrelets have been detected regularly in nearshore waters surrounding Lelu Island and are expected to represent residents and individuals that may be breeding in suitable habitat on the mainland. Following project changes, the loss of marine habitat for marbled murrelet will be restricted to 3 ha of estuarine tidal flat and 5 ha of marine habitat. The impacts of this will be further lessened through fish habitat offsetting which will replace eelgrass beds removed by the MOF (MOF; see Appendix F.2 for details).

2) Marbled Murrelet Mitigation Measures

Several mitigation measures for the Project support marbled murrelet recovery strategies described by Environment Canada (2014b) (Table 11-4).

Table 11-4 Federal Recovery Planning Approaches and Relevant Project Mitigation or Activity

Broad Recovery Strategy	PNW LNG Mitigation or Activity
Habitat Management	<ul style="list-style-type: none"> • A 30 m vegetation buffer will be retained around the perimeter of Lelu Island, except at access points (e.g., at the bridge, the MOF, trestle, and pipeline interconnection) • Boundaries of the PDA will be clearly marked and clearing, grading or dredging, construction, and temporary storage of materials of terrestrial and marine habitat will be limited to within the PDA boundaries • If temporary workspace or storage areas are required beyond the extent of the PDA, they will be located in existing cleared areas to the extent possible • Mitigations for the acoustic environment will reduce noise disturbance to adjacent terrestrial and marine habitats • Lighting mitigations will follow objectives contained within the Canada Green Building Council Leadership in Energy & Environmental Design (LEED) guidelines and the International Commission on Illumination. The use of exterior lighting [including portable lighting structures at the liquefied natural gas (LNG) facility, the MOF, marine terminal, trestle, berth, and on berthed vessels] will be limited where practical and permissible under federal safety and navigation regulations • The Habitat Offsetting Plan (Appendix G.10) will outline restoration and compensatory activities to recover the net loss of marine communities. The Conceptual Fish Habitat Offsetting Strategy will include measures to offset for estuarine tidal flats, supporting eelgrass beds removed by construction of the MOF to restore functional fish habitat used for foraging by marine birds.
Monitoring	<ul style="list-style-type: none"> • No mitigation is presented that relates to Marbled Murrelet monitoring.
Research	<ul style="list-style-type: none"> • Provide marbled murrelet habitat and seasonal occurrence data within the Local Assessment Area to the Canadian Wildlife Service to facilitate research, monitoring, and other recovery initiatives.

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Broad Recovery Strategy	PNW LNG Mitigation or Activity
Stewardship and Conservation	<ul style="list-style-type: none"> • Wildlife education and awareness training will be provided <ul style="list-style-type: none"> – Educational materials will be provided to all employees and contractors to increase awareness of lighting effects. Educational posters will be posted in public locations during peak migration periods to remind personnel to implement lighting mitigation during sensitive timing windows.

3) Marbled Murrelet Occupancy

RIC (2001) and Manley (2006) recommend the use of audio-visual surveys and radar surveys to detect murrelet occupancy and relative abundance in forest stands. The objective of baseline studies to support the EIS was to assess avian occupancy, but not relative abundance. To do this efficiently, multi-species survey methods were used, including breeding bird surveys and acoustic recorder surveys. Breeding bird surveys followed methods for conducting point counts outlined in RIC (1999).

Passive acoustic recording surveys are a relatively new method for sampling avian populations. Most Resource Information Standards Committee avian survey standards have not been updated recently, so new methods have not yet been formalized despite their beneficial use. No murrelets were recorded using terrestrial habitats in and around the PDA. However, the assessment of potential effects assumed that marbled murrelets were potentially present (but unconfirmed) where suitable habitat was identified as part of the effects assessment.

Marine bird surveys were conducted following protocols for vessel fixed-width transects and stationary counts outlined in RIC (1997a; 1997b; 2001) (see Appendix F.2 for further details).

4) Effects of Vessel Activity on Marbled Murrelets

Studies have found that marbled murrelet avoidance response to boat traffic decreases the time and efficiency of foraging (Bellefleur et al. 2009, Speckman et al. 2004). A consistent pattern appears across species showing that increased proximity to, and speed of transiting vessels cause higher rates of disturbance (Chatwin et al. 2013; Schwemmer et al. 2011; Bellefleur et al. 2009; and Speckman et al. 2004). Studies also indicate marine birds demonstrate greater habituation to vessels transiting at constant speeds along established shipping lanes than to those with unpredictable speed and course (Schwemmer et al. 2011; Speckman et al. 2004; Rodgers and Schwikert 2002). To reduce disturbance to marine birds, vessels will be restricted to designated shipping lanes and will transit at speeds less than 16 knots (see Appendix F.2 for further details).

5) Habitat Management Directives

For clarification, the term “habitat management directives” was referring to guidance in the recovery strategy on approaches (or directions) of specific recovery strategies, objectives, or actions described within the document (e.g., Environment Canada 2014b, p. 21).

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11.3.3 Terrestrial Wildlife and Marine Birds Information Request #3 and #5

11.3.3.1 Government of Canada – Outstanding Information

EC: The Project falls within Bird Conservation Region 5: Northern Pacific Rainforest. The proponent assessed effects to birds (covered under the MBCA and others) through a general assessment using ecological community modelling and through a more detailed assessment for three threatened species, two of which are migratory birds (Olive-sided Flycatcher and Marbled Murrelet). The Indicator species chosen by the proponent do not represent all bird guilds/groups and the ecological community modelling is too general. Further, the use of species at risk is problematic, as the reasons for listing can be specific, including in relation to habitat requirements and identified threats. In some instances, the reasons for a particular species decline is not well understood, including in relation to habitat needs and threats, suggesting again that caution be applied in using a listed species as an Indicator Species. Also, use of any species, whether listed or non-listed species, as an Indicator Species should be supported by a clear, robust, scientific rationale indicating how the life requisites of one species accounts for the many species of a species group. Provide a detailed assessment of effects to migratory birds and update the cumulative effect assessment accordingly.

The proponent could refer, for example, to the Bird Conservation Strategy for Bird Conservation Region 5 (BCR 5): Northern Pacific Rainforest for guidance on the selection of appropriate indicator species to assess the effects of the Project on the species identified on Lelu Island. The document is available at <http://nabci.net/Canada/English/pdf/BCR%205%20PYR%20FINAL%20Feb%202013.pdf>. Priority species in BCR 5 include species that are vulnerable due to population size, distribution, population trend, abundance and threats. Some widely distributed and abundant 'stewardship' species are included because they typify the national or regional avifauna and/or because they have a large proportion of their range and/or continental population in the sub-region. Finally, species of management concern (i.e., listed under schedule 1 of SARA) are also included as priority species in BCR 5. The proponent could consider grouping priority species together by their habitat niches (i.e., shorebird community, songbird community, waterfowl community, etc.) in order to conduct an effects assessment on these groups. Alternatively, the proponent could provide a science-based rationale for how the chosen indicator species have addressed likely effects to the species/groups identified in and around the Project area.

11.3.3.2 Summary of Response

Potential effects of change in habitat for migratory birds from the Project were assessed using habitat suitability modelling and ecological community modelling. Modelling methods were completed in accordance with guidance from several resources (BC MOFR and MOE 2010; RIC 1999; Hanson et al. 2009; Environment Canada 2013; BC MSRM 2005; CIT 2004). See Appendix F.3 further details.

Ecological community modelling is a method to assess potential project effects on migratory birds and other wildlife that share similar habitat requirements and ecological traits. The spatial area modelled includes eleven ecological community types that provide unique habitat attributes expected to support differing assemblages of migratory birds and other wildlife (see Table 1 of Appendix F.3). Ecological communities modelled in the

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assessment are consistent with broader habitat types that define habitat niches in the Bird Conservation Strategy for Bird Conservation Region 5 (Northern Pacific Rainforest) (see Table 2 of Appendix F.3).

Baseline surveys to characterize the abundance, diversity, and distribution of migratory bird species in the LAA were centered primarily on breeding bird surveys for terrestrial bird species, and shore and vessel-based surveys in nearshore waters around Lelu Island to target marine bird species. A total of 1,775 individual across 72 species of migratory bird were detected during baseline surveys. Across terrestrial ecological communities, the migratory bird community was generally uniform (i.e., similar numbers of individuals and species observed across multiple community types). Cumulatively, across all surveys and seasons, the greatest number of individuals and species were detected in estuarine tidal flats (885 birds of 37 species). The number of individuals of each migratory bird species observed in each ecological community is summarized in Table 3 of Appendix F.3.

Potential effects on migratory birds include change in habitat, change in mortality risk, and alteration of movement. After mitigation, a total of 172 ha of habitat will be removed by clearing for the PDA (see Appendix F.3 for details). Direct mortality is most likely to result during vegetation clearing in the PDA. Indirect mortality could also increase due to vegetation clearing by creating edge habitat and increasing access to interior forest areas by predators and parasitic species. Birds may be susceptible to lighting impacts, which are discussed in more detail in Section 11.1.2.2 of the EIS Addendum and in the Technical Memorandum: *Potential Effects of Project Lighting on Songbirds, Marine Birds, and Bats* submitted in June 2014. Noise emitted during vegetation clearing, project construction and operations could alter bird movements through avoidance behavior. See Appendix F.3 for a detailed discussion of these impacts and relevant mitigation actions.

11.3.4 Terrestrial Wildlife and Marine Birds Information Request #6, #7 and #9

11.3.4.1 Government of Canada – Outstanding Information

Agency: *Aside from three species at risk, the proponent did not provide an effects assessment specific to any other species at risk. Habitats were described generally for the remaining species and effects assessed through a general ecological community modelling. Even though the proponent states that the conclusions considered listed species, it is hard to determine potential effects to species at risk. No information is provided to contextualise what the loss of habitat on Lelu Island would mean to specific species at risk and how effects of other projects combined with this project would affect the sustainability of species at risk in the region.*

EC: *For each species listed under the Species at Risk Act or designated under COSEWIC potentially affected by the Project (including marine species) provide: a description of habitats in the LAA and RAA including residences, movement corridors and key habitat areas; general life history; an assessment of project effects; and mitigation measures consistent with available recovery strategies. This information needs to be provided on a species-by-species basis and not as part of a general assessment on wildlife. All species recorded during field studies and potentially occurring in the LAA based on literature review or other studies need to be assessed. The cumulative effects assessment should also be updated to reflect the information provided for species at risk.*

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The proponent is encouraged to contact the Species at Risk Recovery Unit of the Canadian Wildlife Service to request additional information on the SARA listed species found within the project RAA; specifically, information relating to draft recovery strategies.

Elaboration on Information Request #9

Eulachon are included in the marine species designated under COSEWIC that are potentially affected by the Project, and therefore form part of this request.

11.3.4.2 Summary of Response

The EIS assessed the effects on Terrestrial Wildlife and Marine Birds and Marine Resources VC in Sections 11 and 13 of the EIS. For terrestrial wildlife and marine birds, a combination of ecological community and habitat suitability modelling was completed to quantify change in habitat for species-at-risk. For marine resources, species-at-risk were included in the assessment of each valued component: marine fish and fish habitat and marine mammals.

Tables 1 and 8 presented in Appendix F.4 provide information on a species-by-species basis for *Species at Risk Act* (SARA) Schedule 1, 2, 3 listed and Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated species likely to occur in the local and regional assessment areas for terrestrial wildlife and marine birds, and marine resources including:

- Presence of suitable habitat in local and regional assessment areas
- Description of habitat requirements and general life history
- Assessment of project effects including a characterization of residual effects
- Mitigation measures consistent with any applicable recovery strategy and action plans
- Update to cumulative effects assessments, as applicable
- Overall prediction of significance for each species.

For each species, an initial assessment was performed to identify whether there is a potential pathway for interaction with a project effect (see Tables 1 and 8 of Appendix F.4). Species that have potential for an interaction with a project effect (i.e., at least one project effect has been identified) are carried forward to stage two for a detailed assessment. Information presented for individual species-at-risk are consistent with conclusions discussed for terrestrial wildlife and marine birds and marine resources valued components in Section 11 and Section 13 of the EIS, and updated within this EIS addendum.

11.3.5 Terrestrial Wildlife and Marine Birds Information Request #10

11.3.5.1 Government of Canada – Outstanding Information

To inform the assessment for listed species of bats potentially occurring in the LAA, conduct surveys using a combination of acoustic detectors and mist-netting in order to assess presence and distribution, and to support the development of avoidance, mitigation and/or compensation measures.

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11.3.5.2 Summary of Response

Habitat on and around Lelu Island could potentially support maternal roosting and foraging for 9 of the 16 bat species that occur in British Columbia, including one provincial and two federal species of concern: Keen's long-eared myotis (*Myotis keenii*) and little brown myotis (*Myotis lucifugus*; CDC 2014; see Table 1 of Appendix F.5). Eleven ecological community types within the LAA provide habitat attributes expected to support assemblages of bat species (see Figure 1 and Table 2 of Appendix F.5 for details). Baseline data collection in 2014 has confirmed the presence of myotis species as well as individuals of the big brown / silver-haired bat guild (see Appendix F.5 for detailed results).

Ecological community modelling was conducted to assess the areal extent of each habitat type removed by construction within the PDA (see Table 3 of Appendix F.5 for results). Vegetation clearing in the PDA will have the greatest effect on shrub-dominated bogs, followed by treed swamp or bog and old coniferous forests. Concerns regarding the impacts of project lighting on bats are addressed in the Technical Memorandum: *Potential Effects of Project Lighting on Songbirds, Marine Birds, and Bats* submitted in June 2014.

Mitigation measures have been identified to reduce impacts on bat habitat, to reduce bat mortality, and to limit alterations in movement for resident and migratory bats. Measures include maintaining a 30 m riparian buffer inland from the high-water mark, a wetland compensation plan, and installing bat houses and other roosting structures, and observing restricted activity periods (see Appendix F.5 for details).

Following mitigation, the Project will potentially affect only a small proportion of regional bat populations. There is potential for greater localized effects on species of management concern whose ecological requirements are supported by habitats available on or near Lelu Island (e.g., Keen's myotis). Based on this assessment, the Project will be in compliance with applicable federal and provincial regulations. Considered in combination with the Wetland Habitat Compensation Plan and other project mitigations, this Project will not have a significant effect on the sustainability of any local or regional bat species population.

11.4 MITIGATION

11.4.1 Changes to Mitigation Measures Presented in the EIS

Based on design changes to the Project and the feedback received during the environmental assessment process, the set of mitigation measures originally presented in the EIS to address potential effects to terrestrial wildlife and marine birds has been updated. The mitigation measures that have been added to the list of mitigation measures initially included in the EIS are provided below:

11.4.1.1 Change in Habitat

- PNW LNG will install bat houses, BrandenBark™, or other roosting structures to compensate for loss of bat roosting habitat. Roosting structures will be installed in suitable habitats in the Prince Rupert region to compensate for roosting habitat removed by the PDA. PNW LNG will invite appropriate federal, provincial, municipal agencies and/or research organizations to participate in determining the final locations.

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11.4.1.2 Change in Mortality Risk

- Educational materials will be provided to all employees and contractors to increase awareness of lighting effects on migratory birds. Educational posters will be posted in public locations during peak bird migration periods to remind personnel to implement lighting mitigation during sensitive timing windows. Guidance for this mitigation will be taken from Environment Canada's policy on *Incidental Take of Migratory Birds in Canada* (Environment Canada 2014c) and avoidance guidelines on *General Nesting Periods of Migratory Birds in Canada* (Environment Canada 2014d)
- Should an emergency flaring and LNG facility shutdown event occur during project operations (see Section 22 of the EIS) a carcass search will be performed to record avian mortality after the emergency event.

The following mitigation measure has been changed from:

- Guidelines for restricted activity periods to protect wildlife and marine birds will be followed. Clearing activities will occur outside of the breeding season for terrestrial birds, amphibians, and bats (April 15 through July 31), and will avoid the breeding period for raptors (January 5 through September 6)

To

- Guidelines for restricted activity periods to protect wildlife and marine birds will be followed. Clearing activities will occur outside of the breeding season for terrestrial birds, amphibians, and bats (April 9 through August 7), and will avoid the breeding period for raptors (January 5 through September 6).

11.4.2 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 terrestrial wildlife and marine birds 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 11.4.1). By implementing this full set of mitigation measures, PNW LNG is confident that the Project will not result in significant adverse effects to terrestrial wildlife and marine birds.

11.4.2.1 Change in Habitat

- Boundaries of the PDA will be clearly marked and clearing, grading or dredging, construction, and temporary storage of materials of terrestrial and marine habitat will be limited to within the PDA boundaries
- If temporary workspace or storage areas are required beyond the extent of the PDA, they will be located in existing cleared areas to the extent possible.
- A 30 m vegetation buffer will be retained around the perimeter of Lelu Island, except at access points (e.g., at the bridge, pioneer dock, MOF, trestle, and pipeline interconnection)
- Wetland habitat compensation will include restoration and compensatory activities to recover the loss of wetland habitat function to terrestrial mammals, amphibians, and birds
- Fish habitat offsetting will include restoration and compensatory activities for marine fish habitat used for foraging by marine birds

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- LNG carriers, tugs, and barges will not exceed a speed of 16 knots within the LAA
- Mitigations for the acoustic environment will reduce noise disturbance to adjacent terrestrial and marine habitats
- A Blasting Management Plan (see Appendix J.11) will be implemented
- PNW LNG will install bat houses, BrandenBark™, or other roosting structures to compensate for loss of bat roosting habitat. Roosting structures will be installed in suitable habitats in the Prince Rupert region to compensate for roosting habitat removed by the PDA. PNW LNG will invite appropriate federal, provincial, municipal agencies and/or research organizations to participate in determining the final locations.

11.4.2.2 Change in Mortality Risk

- A 30 m vegetation buffer will be retained around the perimeter of Lelu Island, except at access points (e.g., at the bridge, pioneer dock, MOF, trestle, and pipeline interconnection)
- Boundaries of the PDA will be clearly marked and clearing, grading or dredging, construction, and temporary storage of materials of terrestrial and marine habitat will be limited to within the PDA boundaries
- Guidelines for restricted activity periods to protect wildlife and marine birds will be followed. Clearing activities will occur outside of the breeding season for terrestrial birds, amphibians, and bats (April 9 through August 7), and will avoid the breeding period for raptors (January 5 through September 6)
- If clearing is required during these breeding periods, bird surveys will be conducted in advance of vegetation clearing by a BC-certified Registered Professional Biologist to comply with the Migratory Birds Regulations of the *Migratory Birds Convention Act* and the *BC Wildlife Act*. Buffers will be established around active nests and clearly marked to show the extent of clearing (BC MOE 2013). Guidance for this mitigation will be taken from Environment Canada's policy on *Incidental Take of Migratory Birds in Canada* (Environment Canada 2014c) and avoidance guidelines on *General Nesting Periods of Migratory Birds in Canada* (Environment Canada 2014d)
- If raptor nests are identified within the clearing limits of the PDA and require removal, this would be subject to permit approval under Section 34 of the *BC Wildlife Act*, where the Act applies
- Permanent fencing will be erected around the Project
- Feeding and harassment of wildlife will be prohibited
- Wildlife education and awareness training will be provided
- Traffic between Prince Rupert, Port Edward, and the project site will be reduced through the use of buses, crew cab trucks, water taxis, and other group transportation options when practical. This will primarily apply to travel required for shift changes
- Operators of project related ground and marine transportation will adhere to posted speed limits
- A project Waste Management Plan (see Appendix J.10) will be implemented and ensure that wastes and recycling materials will be temporarily stored on site in wildlife-proof containers and regularly transferred to an approved disposal or sorting facility
- To mitigate potential light-induced mortality, lighting mitigations will follow objectives contained within the Canada Green Building Council LEED guidelines and the International Commission on Illumination (LEED 2004; CIE 2003; Section 9). The use of exterior lighting (including portable lighting structures) at the LNG facility, the MOF, marine terminal, trestle, berth, and on berthed vessels will be limited where practical and permissible under federal safety and navigation regulations
- A Blasting Management Plan (see Appendix J.11) will be implemented
- Educational materials will be provided to all employees and contractors to increase awareness of lighting effects on migratory birds. Educational posters will be posted in public locations during peak bird migration

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periods to remind personnel to implement lighting mitigation during sensitive timing windows. Guidance for this mitigation will be taken from Environment Canada's policy on *Incidental Take of Migratory Birds in Canada* (Environment Canada 2014c) and avoidance guidelines on *General Nesting Periods of Migratory Birds in Canada* (Environment Canada 2014d)

- Should an emergency flaring and LNG facility shutdown event occur during project operations (see Section 22 of the EIS) a carcass search will be performed to record avian mortality after the emergency event.

11.4.2.3 Alteration of Movement

To mitigate alteration of movement to Terrestrial Wildlife and Marine Birds from the Project, the following technically and economically feasible mitigation measures were presented within the EIS:

- Boundaries of the PDA will be clearly marked and clearing, grading or dredging, construction, and temporary storage of materials of terrestrial and marine habitat will be limited to within the PDA boundaries
- LNG carriers, tugs, and barges will not exceed a speed of 16 knots within the LAA
- Mitigation for the acoustic environment will reduce noise disturbance to adjacent terrestrial and marine habitats
- Equipment will be properly maintained.

11.5 CONCLUSION

Project changes were assessed for potential effects, including cumulative effects, on terrestrial wildlife and marine birds. Based on this assessment, there are some minor changes to the potential adverse effects of the Project due to the project changes. However these changes are not expected to affect the sustainability of terrestrial wildlife or marine bird populations, and therefore residual effects are expected to remain not significant.

Habitat effects to marine birds will be reduced in the marine environment and on Flora Bank due to the project changes. Mortality risk will have a minor increase due to collision risk with the suspension bridge, but measures will be implemented to mitigate this effect (e.g., lighting mitigation presented in the EIS). These changes to the assessment of adverse effects do not alter the characterization of residual effects (i.e., context, magnitude, extent, duration, frequency, reversibility) from those identified in the EIS. The characterization of the residual adverse effects as a result of project changes are not expected to affect the long-term sustainability of a local or regional terrestrial wildlife or marine bird populations and the determination of significance of those effects remain the same as presented in the EIS (i.e., remain not significant) (see Table 11-5 below).

For the cumulative effects assessment, the inclusion of traffic related to the accommodation camp will have a minor effect on mortality risk in the RAA that may act cumulatively with the project residual effects. However these changes do not alter the conclusions regarding cumulative effects that were detailed within the EIS (see Table 11-6 below). Cumulative change in habitat, mortality risk, or alteration of movement is not expected to affect the long-term sustainability of a local or regional terrestrial wildlife or marine bird population. Therefore cumulative effects are expected to be not significant.

Finally, while addressing concerns raised within the IRs, additional mitigation has been presented to address specific potential effects of the Project.

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Table 11-5 Characterization of Residual Effects for Terrestrial Wildlife and Marine Birds

Project Phase	Mitigation Measures	Residual Effects Characterization						Likelihood	Significance	Confidence	Follow-up and Monitoring
		Context	Magnitude	Extent	Duration	Reversibility	Frequency				
Change in Wildlife Habitat Availability											
Construction	<ul style="list-style-type: none"> Maintain a 30 m vegetation buffer Limit clearing limits of the PDA and temporary work space Apply mitigation measures for acoustic environment Implement Wetland Habitat Compensation Plan and Habitat Offsetting Plan Vessels will not exceed a speed of 16 knots within the LAA Implement a Blasting Management Plan <u>Install bat houses or other roost structures.</u> 	M	M	LAA	LT	R	S	H	N	M	None
Operations		M	M	LAA	LT	R	C				
Decommissioning		M	M	LAA	LT	R	C				
Residual effects for all phases		M	M	LAA	LT	R	S				
Change in Mortality Risk											
Construction	<ul style="list-style-type: none"> Maintain a 30 m vegetation buffer Limit clearing to the PDA and temporary work space Clearing activities will occur outside of the breeding season for terrestrial birds, amphibians, and bats. If clearing is required during these breeding periods, bird surveys will be conducted in advance (Environment Canada 2014c, d) Removal of raptor nests within the clearing limits of the PDA will be subject to permit approval Erect permanent fencing around the Project Store waste and recycling materials on-site in wildlife-proof containers for permanent disposal at an approved facility Prohibit feeding and harassment of wildlife <u>Provide wildlife education and awareness information, including lighting effects (Environment Canada 2014c, d)</u> Reduce traffic between Prince Rupert, Port Edward, and the project site through the use of buses, crew cab trucks, water taxis, and other group transportation options when practical Adhere to posted speed limits on road and vessel transportation routes Apply lighting mitigations Implement Management Plans (e.g., <u>Transportation Management Plan</u>, <u>Blasting Management Plan</u>). 	M	M	LAA	ST	R	S	M	N	M	Follow-up Program: <ul style="list-style-type: none"> Aquatic Acidification and Eutrophication
Operations		M	M	LAA	LT	R	MI				
Decommissioning		M	L	LAA	ST	R	MI				
Residual effects for all phases		M	M	LAA	LT	R	MI				
Alteration of Movement											
Construction	<ul style="list-style-type: none"> Limit clearing limits of the PDA and temporary work space Vessels will not exceed a speed of 16 knots within the LAA Apply mitigation measures for acoustic environment Equipment will be properly maintained Implement Management Plans (e.g., <u>Transportation Management Plan</u>, <u>Blasting Management Plan</u>). 	M	L	LAA	ST	R	MI	H	N	H	None
Operations		M	L	LAA	ST	R	MR				
Decommissioning		M	L	LAA	ST	R	MI				
Residual effects for all phases		M	L	LAA	ST	R	MI/MR				

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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:</p> <p>L = Low resilience: occurs in a fragile ecosystem and/or highly disturbed environment</p> <p>M = Moderate resilience: occurs in a stable ecosystem and/or moderately disturbed environment</p> <p>H = High resilience: occurs in viable ecosystem and/or undisturbed environment</p>	<p>Magnitude:</p> <p>N = Negligible: no detectable change on individuals of a regional wildlife population or hectares of habitat</p> <p>L = Low: change detectable on a few individuals or hectares of habitat (i.e., < 10 ha) in a regional population</p> <p>M = detectable change on many individuals or hectares of habitat (i.e., 10 to 250 ha) in a regional population</p> <p>H = High: detectable change on the majority of individuals or hectares of habitat (> 250 ha) in a the regional population</p> <p>Extent:</p> <p>PDA = project development area</p> <p>LAA = local assessment area</p> <p>RAA = regional assessment area</p>	<p>Duration:</p> <p>ST = Short-term: effect less than one breeding season/generation</p> <p>MT = Medium-term: effect occurs for several breeding seasons/generations or a project phase</p> <p>LT = Effect occurs across multiple breeding seasons/generations or project phases</p> <p>P = Permanent: Effect permanent and unlikely to recover following project decommissioning and reclamation</p> <p>Reversibility:</p> <p>R = Reversible: will recover during lifetime of the Project or after project decommissioning and reclamation</p> <p>I = Irreversible: effects will persist after project decommissioning and reclamation</p> <p>Frequency:</p> <p>S = Single event</p> <p>MI = Multiple, irregular event</p> <p>MR = Multiple, regular event</p> <p>C = Continuous</p>	<p>Likelihood:</p> <p><i>Based on professional judgment.</i></p> <p>L = Low probability of occurrence</p> <p>M = Medium probability of occurrence</p> <p>H = High probability of occurrence</p> <p>Significance:</p> <p>S = Significant</p> <p>N = Not significant</p> <p>Confidence:</p> <p><i>Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation, and assumptions made.</i></p> <p>L = Low level of confidence</p> <p>M = Moderate level of confidence</p> <p>H = High level of confidence</p>								

Table 11-6 Summary of Cumulative Residual Environmental Effects on Terrestrial Wildlife and Marine Birds

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					
Change in Habitat	Cumulative Effect with Project (future case)	<ul style="list-style-type: none"> See Table 11-13 of the EIS Forestry Fisheries. 	None	M	M	RAA	LT	R	MI	H	N	M	None
	Project Contribution to Cumulative Effect (in RAA)	<p>Construction:</p> <ul style="list-style-type: none"> Site preparation (land-based) Onshore construction Vehicle traffic Dredging Marine construction Disposal at sea Site clean-up and reclamation. <p>Operations:</p> <ul style="list-style-type: none"> LNG facility and supporting infrastructure on Lelu Island Marine terminal use Shipping. <p>Decommissioning:</p> <ul style="list-style-type: none"> Dismantling facility and supporting Infrastructure Dismantling of marine terminal Site cleanup and reclamation. 	See Table 11-5 Characterization of Residual Effects for Terrestrial Wildlife and Marine Birds	M	M	LAA	LT	R	S	H	N	M	None
Change in Mortality Risk	Cumulative Effect with Project (future case)	<ul style="list-style-type: none"> See Table 11-13 of the EIS Forestry Fisheries. 	None	M	M	RAA	LT	R	MI	M	N	M	None
	Project Contribution to Cumulative Effect (in RAA)	<p>Construction:</p> <ul style="list-style-type: none"> Site preparation (land-based) Onshore construction Vehicle traffic Dredging Marine construction Disposal at sea Site clean-up and reclamation <u>Transportation of workers between the accommodation camp and Lelu Island.</u> <p>Operations:</p> <ul style="list-style-type: none"> LNG facility and supporting infrastructure on Lelu Island Marine terminal use Shipping. 	<ul style="list-style-type: none"> See Table 11-5 Characterization of Residual Effects for Terrestrial Wildlife and Marine Birds 	M	M	LAA	LT	R	MI	M	N	M	<p>Follow-up Program :</p> <ul style="list-style-type: none"> Aquatic Acidification and Eutrophication

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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				
Change in Mortality Risk (cont'd)	Project Contribution to Cumulative Effect (in RAA) (cont'd)	Decommissioning: <ul style="list-style-type: none"> Dismantling facility and supporting Infrastructure Dismantling of marine terminal Site cleanup and reclamation. 											
Alteration of Movement	Cumulative Effect with Project (future case)	<ul style="list-style-type: none"> See Table 11-13 for a complete list of projects and activities that interact cumulatively with the Project Forestry Fisheries. 	None	M	M	RAA	ST	R	MR	H	N	M	None
	Project Contribution to Cumulative Effect (in RAA)	Construction: <ul style="list-style-type: none"> Site preparation (land-based) Onshore construction Vehicle traffic Dredging Marine construction Disposal at sea Site clean-up and reclamation <u>Transportation of workers between the accommodation camp and Lelu Island.</u> Operations: <ul style="list-style-type: none"> LNG facility and supporting infrastructure on Lelu Island Marine terminal use Shipping. Decommissioning: <ul style="list-style-type: none"> Dismantling facility and supporting Infrastructure Dismantling of marine terminal Site cleanup and reclamation. 	See Table 11-5 Characterization of Residual Effects for Terrestrial Wildlife and Marine Birds	M	L	LAA	ST	R	MR	H	N	H	None

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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>KEY</p> <p>Context:</p> <p>L = Low resilience: occurs in a fragile ecosystem and/or highly disturbed environment</p> <p>M = Moderate resilience: occurs in a stable ecosystem and/or moderately disturbed environment</p> <p>H = High resilience: occurs in viable ecosystem and/or undisturbed environment</p>	<p>Magnitude:</p> <p>N = Negligible: no detectable change on individuals of a regional wildlife population or hectares of habitat</p> <p>L = Low: change detectable on a few individuals or hectares of habitat (i.e., < 10 ha) in a regional population</p> <p>M = detectable change on many individuals or hectares of habitat (i.e., 10 to 250 ha) in a regional population</p> <p>H = High: detectable change on the majority of individuals or hectares of habitat (> 250 ha) in a the regional population</p> <p>Extent:</p> <p>PDA = project development area</p> <p>LAA = local assessment area</p> <p>RAA = regional assessment area</p>	<p>Duration:</p> <p>ST = Short-term: effect less than one breeding season/generation</p> <p>MT = Medium-term: effect occurs for several breeding seasons/generations or a project phase</p> <p>LT = Effect occurs across multiple breeding seasons/generations or project phases</p> <p>P = Permanent: Effect permanent and unlikely to recover following project decommissioning and reclamation</p> <p>Reversibility:</p> <p>R = Reversible: will recover during lifetime of the Project or after project decommissioning and reclamation</p> <p>I = Irreversible: effects will persist after project decommissioning and reclamation</p> <p>Frequency:</p> <p>S = Single event</p> <p>MI = Multiple, irregular event</p> <p>MR = Multiple, regular event</p> <p>C = Continuous</p>							<p>Likelihood:</p> <p><i>Based on professional judgment.</i></p> <p>L = Low probability of occurrence</p> <p>M = Medium probability of occurrence</p> <p>H = High probability of occurrence</p> <p>Significance:</p> <p>S = Significant</p> <p>N = Not significant</p> <p>Confidence:</p> <p><i>Based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation, and assumptions made.</i></p> <p>L = Low level of confidence</p> <p>M = Moderate level of confidence</p> <p>H = High level of confidence</p>			

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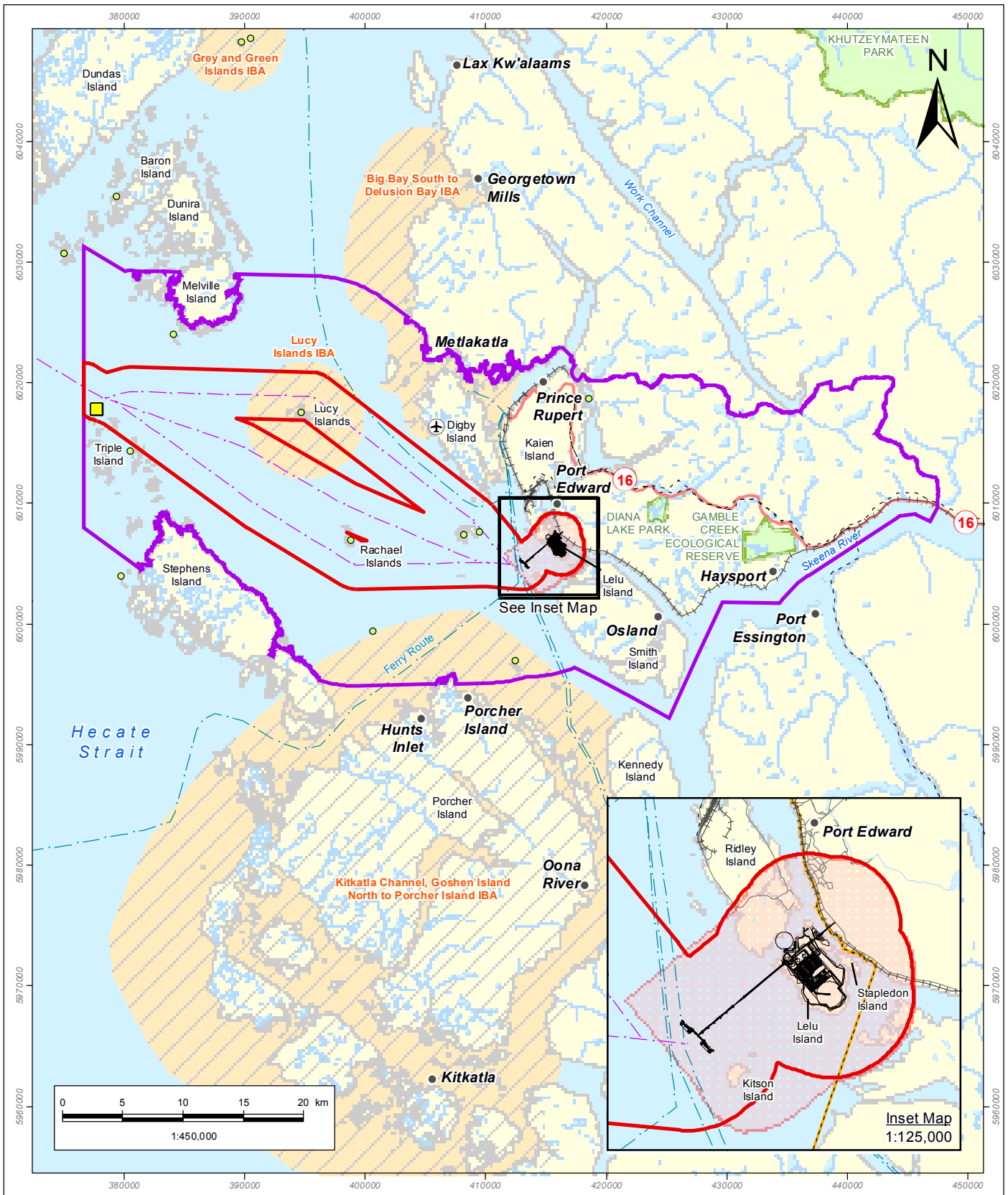
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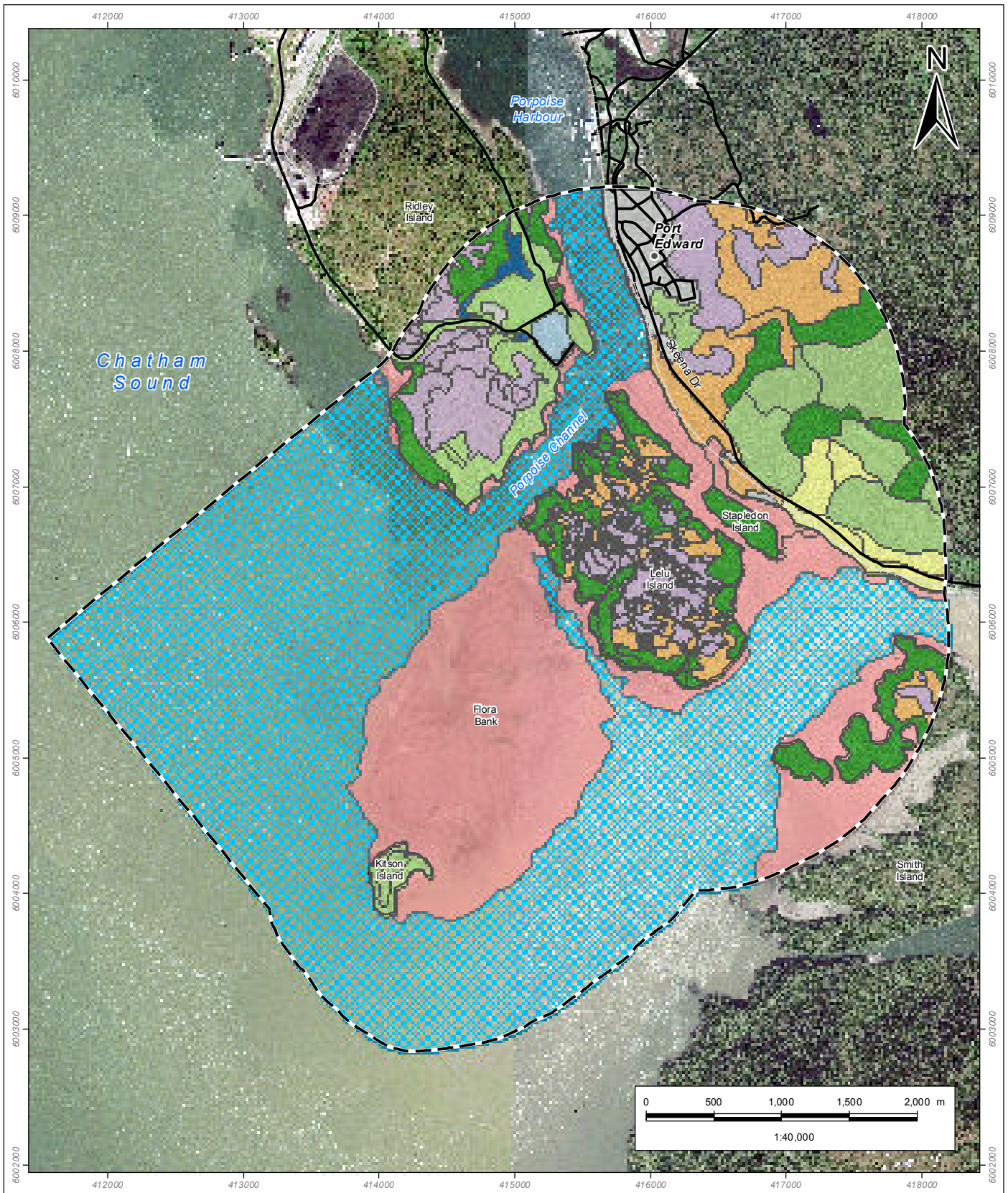
11.7 FIGURES

Please see the following pages.



<ul style="list-style-type: none"> Local Assessment Area Regional Assessment Area Marine Bird Colony Important Bird Area (IBA) <p>Terrestrial Wildlife and Marine Birds Assessment Areas</p> <ul style="list-style-type: none"> Habitat Modelling Limits 	<ul style="list-style-type: none"> Project Component Potential Shipping Route Airport Pilotage Station Electrical Power Transmission Line Ferry Route Highway 	<ul style="list-style-type: none"> Railway Watercourse Protected Area Waterbody 	<p align="center">Pacific NorthWest LNG Terrestrial Wildlife and Marine Birds Assessment Areas EIS ADDENDUM</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; IBA Canada - Important Bird Areas, 2013; Canadian Wildlife Service, 2013.</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"> <tr> <td>DATE: 12-NOV-14</td> <td>PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td>FIGURE ID: 123110537-237</td> <td>DATUM: NAD 83</td> </tr> <tr> <td>DRAWN BY: K. POLL</td> <td>CHECKED BY: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-237	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE	<p>PREPARED BY: </p> <p>PREPARED FOR: </p> <p>FIGURE NO: 11-1</p>
DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9									
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DRAWN BY: K. POLL	CHECKED BY: M. WILLIE									

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Ecological Communities	
	Anthropogenic
	Forest - Old Coniferous Forest
	Forest - Seral Coniferous Forest
	Forest - Seral Deciduous Forest
	Marine - Estuarine Tidal Flat
	Marine - Ocean
	Wetland - Aquatic
	Wetland - Estuarine Marsh
	Wetland - Estuarine Meadow
	Wetland - Shrub-dominated Bog
	Wetland - Treed Swamp or Bog

	City or Town
	Railway
	Road
	Habitat Modelling Limits
	Shoreline

Please refer to the Vegetation and Wetlands TDR for detailed descriptions of vegetation communities.

Pacific NorthWest LNG

Ecological Communities at Baseline

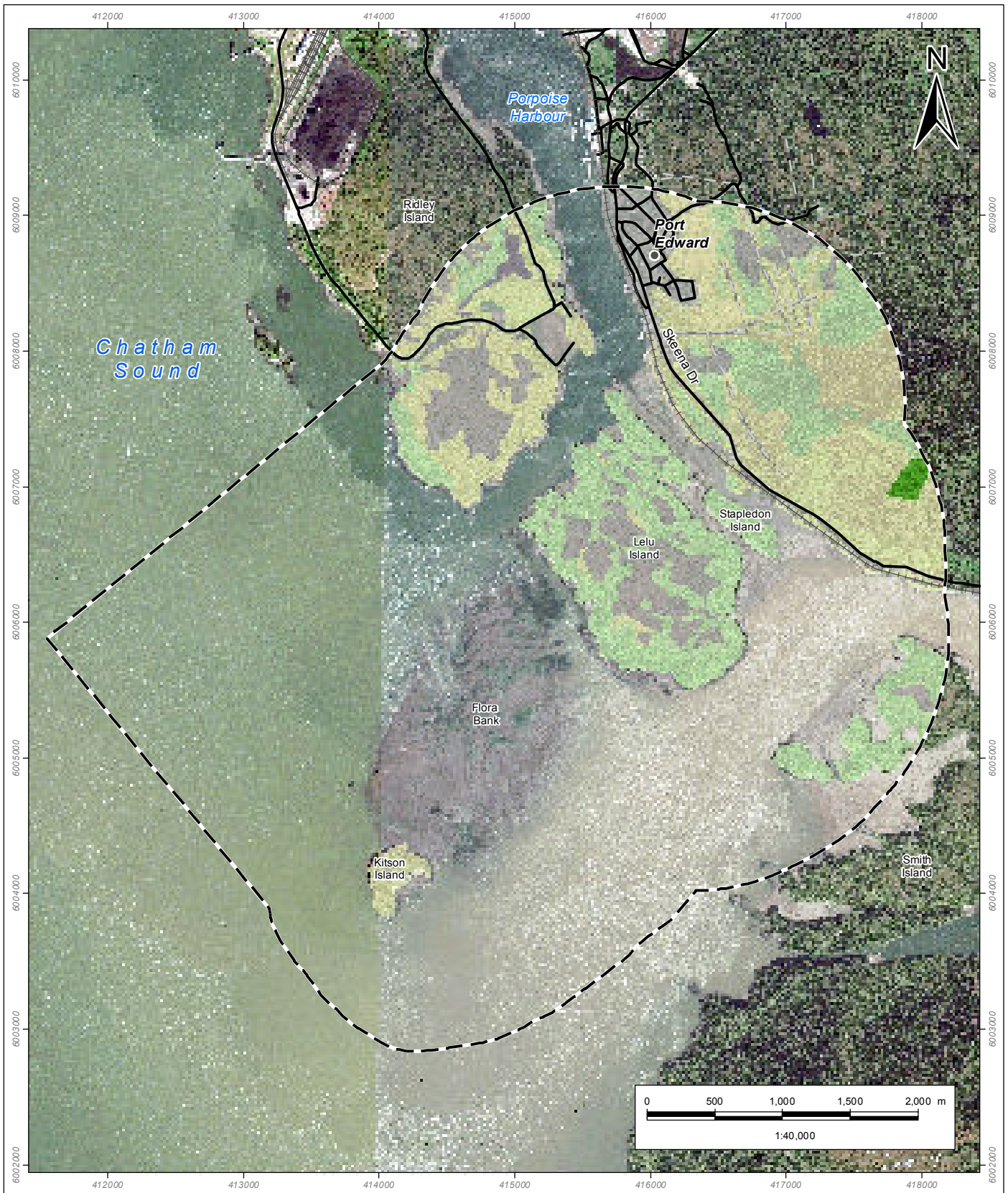
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Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. WorldView-2 Imagery, Imagery date: 2011.

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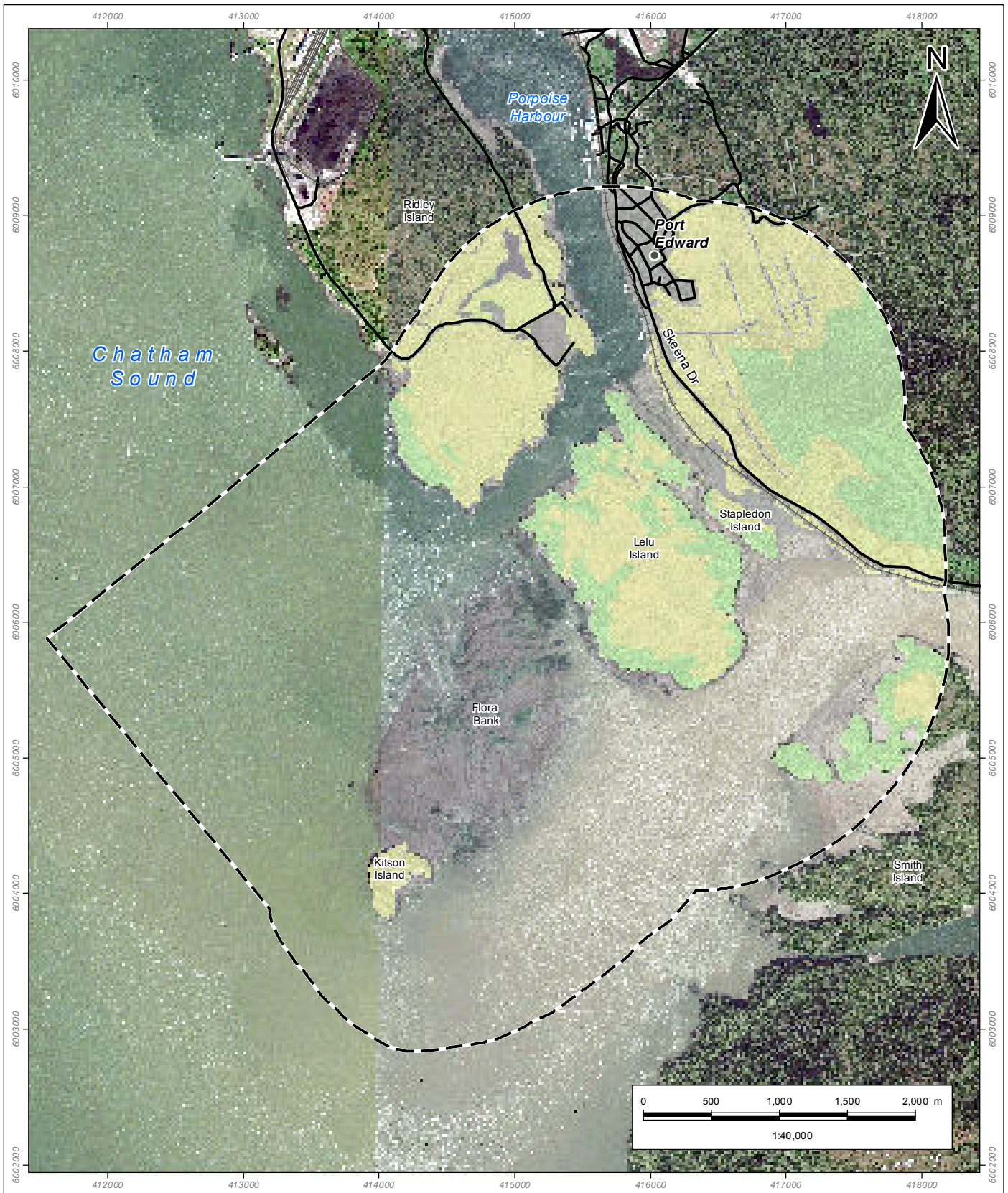
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PREPARED BY:	
PREPARED FOR:	
FIGURE NO:	11-2



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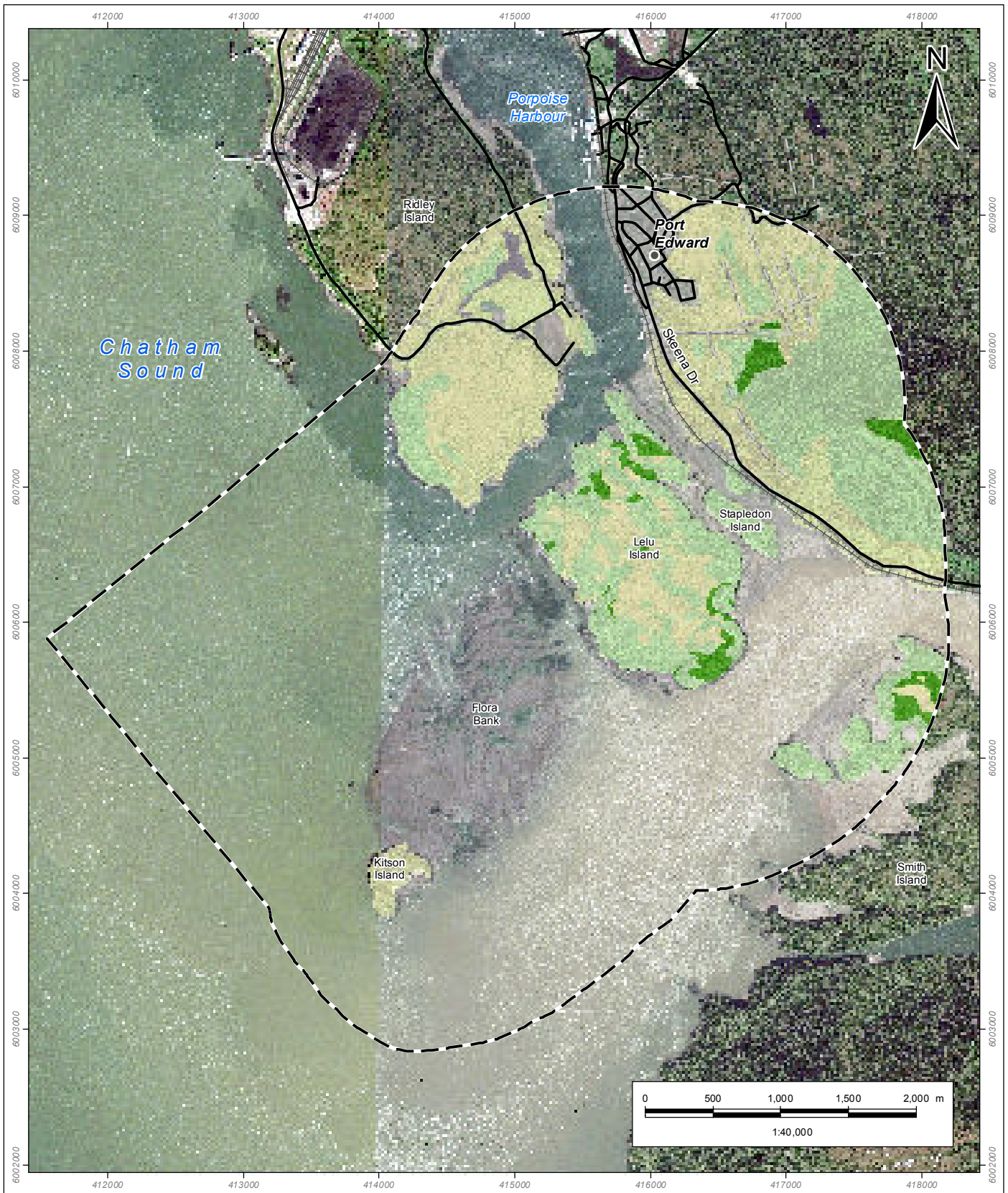
<p> Habitat Modelling Limits</p> <p>Habitat Suitability Class</p> <p> High</p> <p> Moderate</p> <p> Low</p> <p> Nil</p>	<p> City or Town</p> <p> Outline or Seismic Line</p> <p> Railway</p> <p> Road</p>	<p>Pacific NorthWest LNG</p> <p>Baseline Breeding Habitat Suitability of Marbled Murrelet</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 12-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-242</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: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-242	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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FIGURE ID: 123110537-242	DATUM: NAD 83							
DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							
		<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;">11-3</p>						



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<p> Habitat Modelling Limits</p> <p>Habitat Suitability Class</p> <ul style="list-style-type: none"> High Moderate Low Nil 	<ul style="list-style-type: none"> City or Town Outline or Seismic Line Railway Road 	<p>Pacific NorthWest LNG</p> <p>Baseline Breeding Habitat Suitability of Northern Goshawk, <i>laingi</i> subspecies</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 50%;">DATE: 12-NOV-14</td> <td style="width: 50%;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td>FIGURE ID: 123110537-243</td> <td>DATUM: NAD 83</td> </tr> <tr> <td>DRAWN BY: K. POLL</td> <td>CHECKED BY: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-243	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							
		<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;">11-4</p>						

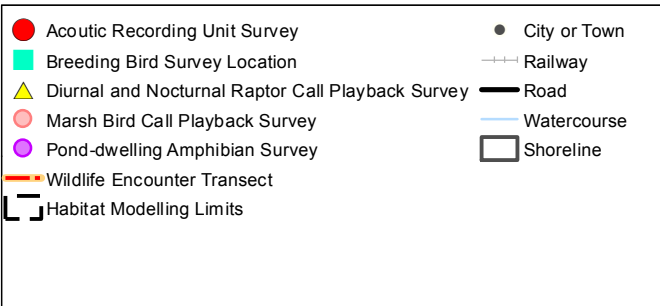
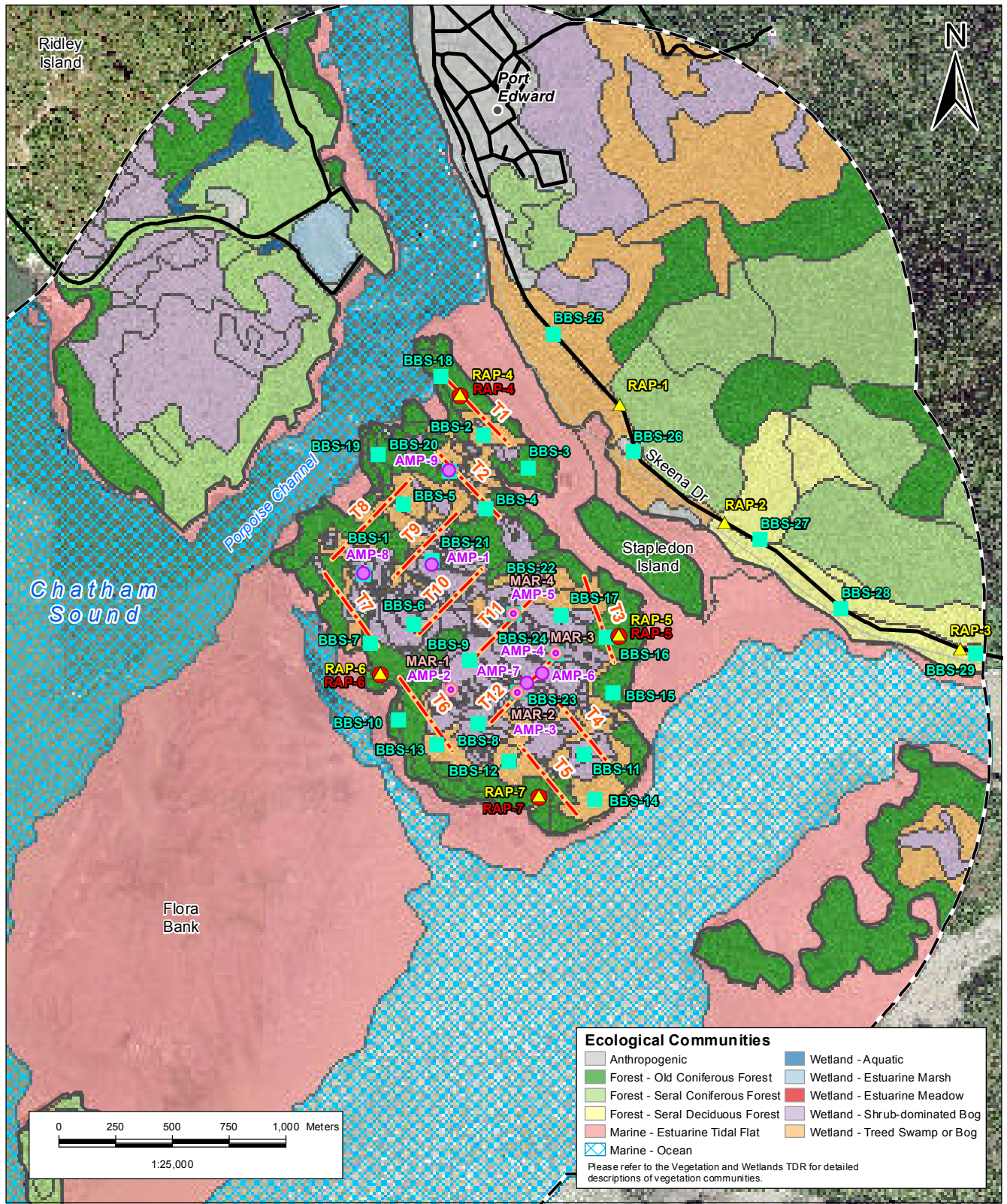
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<p> Habitat Modelling Limits</p> <p>Habitat Suitability Class</p> <ul style="list-style-type: none"> High Moderate Low Nil 	<ul style="list-style-type: none"> City or Town Outline or Seismic Line Railway Road 	<p>Pacific NorthWest LNG</p> <p>Baseline Breeding Habitat Suitability of Olive-sided Flycatcher</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 50%;">DATE: 12-NOV-14</td> <td style="width: 50%;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td>FIGURE ID: 123110537-244</td> <td>DATUM: NAD 83</td> </tr> <tr> <td>DRAWN BY: K. POLL</td> <td>CHECKED BY: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-244	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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FIGURE ID: 123110537-244	DATUM: NAD 83							
DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							
		<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;">11-5</p>						

11/12/2014 - 12:27:47 PM



Pacific NorthWest LNG

Terrestrial Wildlife Survey Locations

EIS ADDENDUM

Sources: Government of British Columbia; Prince Rupert Port Authority; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd; IBA Canada - Important Bird Areas, 2013; Canadian Wildlife Service, 2013.

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: 12-NOV-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-238	DATUM: NAD 83
DRAWN BY: K. POLL	CHECKED BY: M. WILLIE

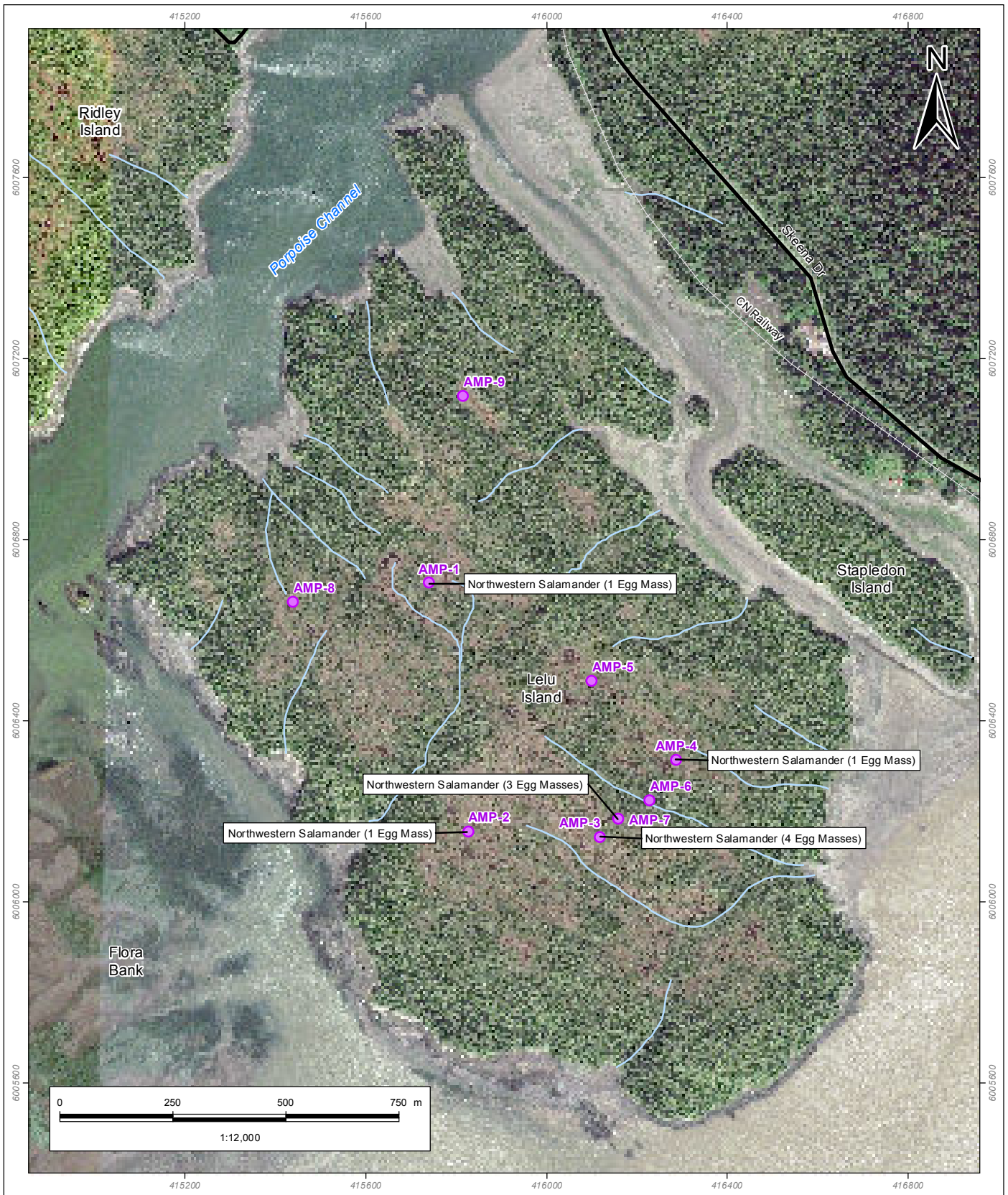
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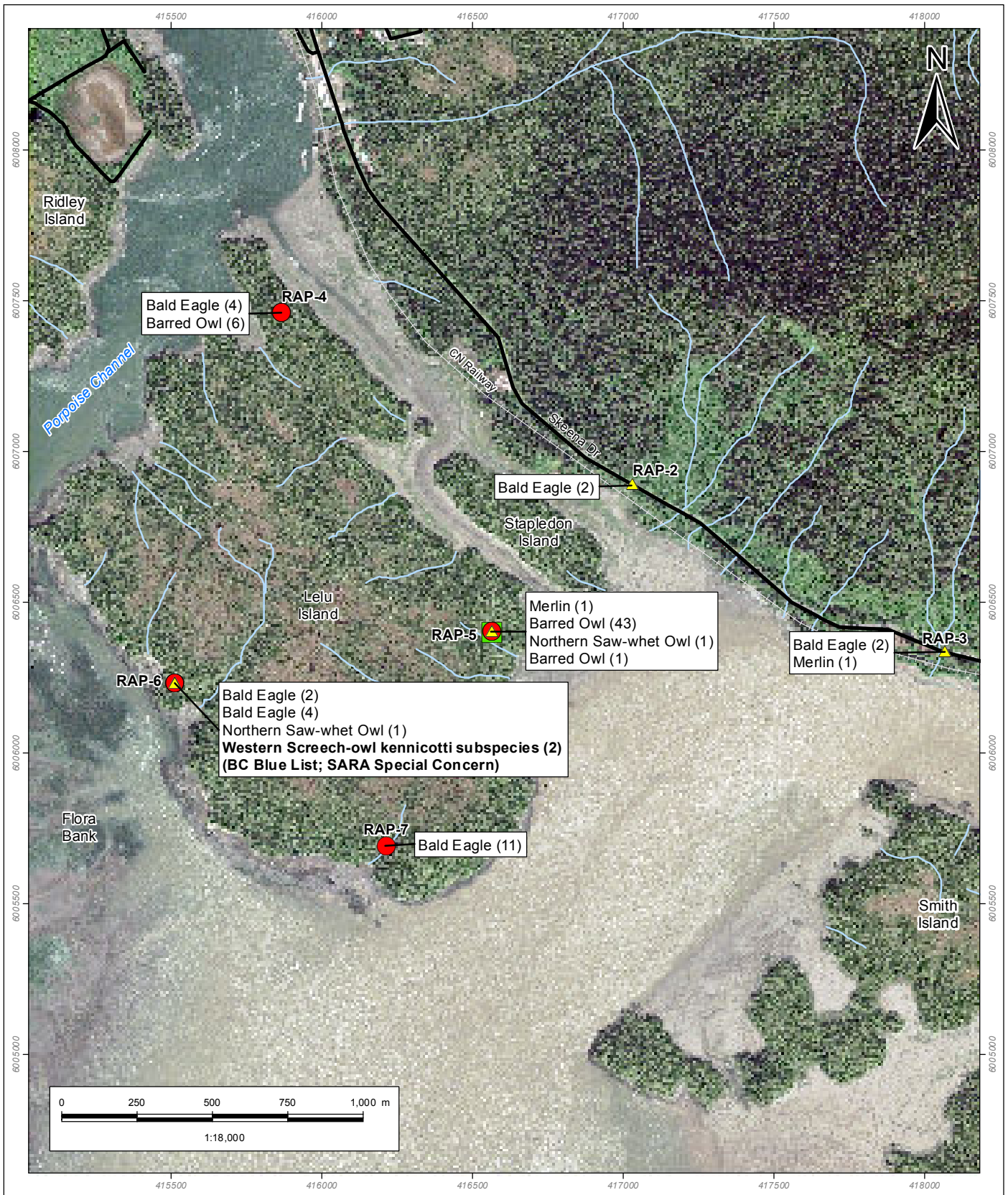
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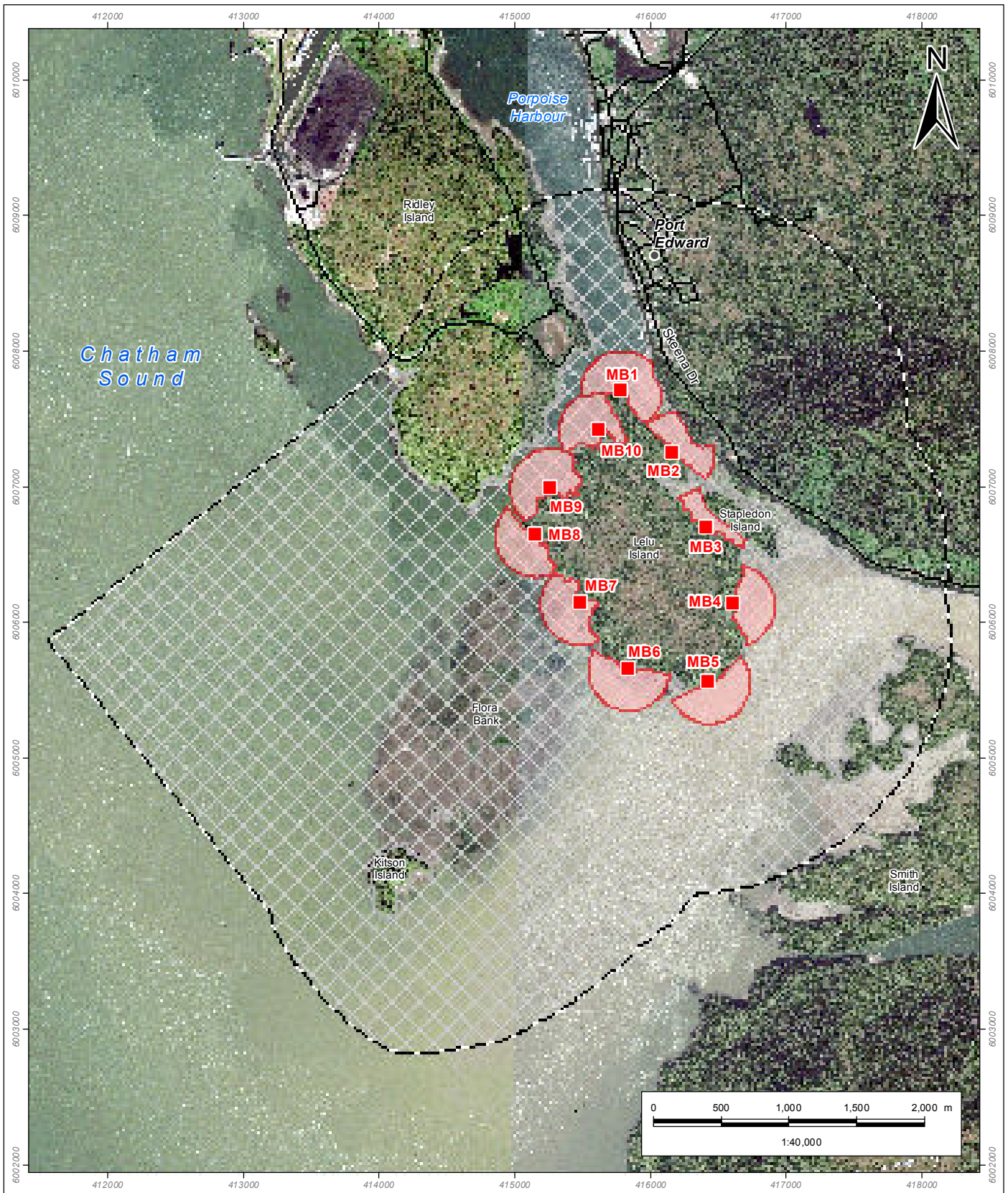


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<ul style="list-style-type: none"> ● Pond-dwelling Amphibian Survey Railway Road Watercourse 	<p>Pacific NorthWest LNG</p> <p>Amphibian Survey Results</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, 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 border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">DATE: 12-NOV-14</td> <td style="width: 50%;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td>FIGURE ID: 123110537-346</td> <td>DATUM: NAD 83</td> </tr> <tr> <td>DRAWN BY: K. POLL</td> <td>CHECKED BY: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-346	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE	<p>PREPARED BY:</p> <p style="text-align: center;"> Stantec</p> <p>PREPARED FOR:</p> <p style="text-align: center;"> Pacific NorthWest</p> <p>FIGURE NO:</p> <p style="text-align: center; font-size: 24pt; font-weight: bold;">11-7</p>
DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9							
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DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							

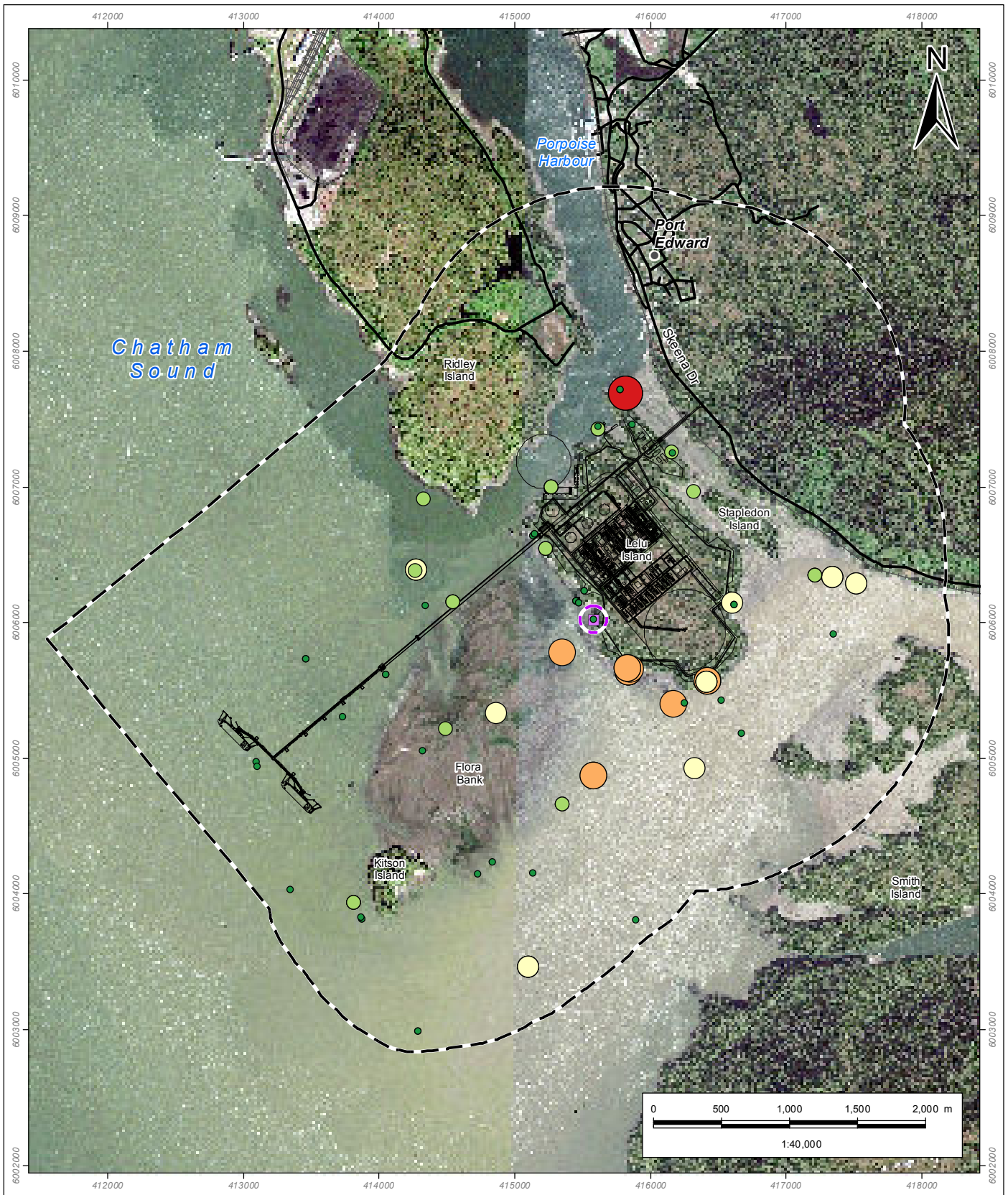


<ul style="list-style-type: none"> ● Acoustic Recording Unit Survey ▲ Diurnal Call-Playback Survey ■ Nocturnal Call-Playback Survey --- Railway — Road — Watercourse 	<p>Pacific NorthWest LNG Raptor Call-Playback and Acoustic Recording Unit Survey Results <i>EIS ADDENDUM</i></p> <p><small>Sources: Government 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>	<p>PREPARED BY:</p> <p style="text-align: center;"></p> <p>PREPARED FOR:</p> <p style="text-align: center;"></p> <p>FIGURE NO:</p> <p style="text-align: center; font-size: 24pt;">11-8</p>	
	<p>DATE: 12-NOV-14</p> <p>FIGURE ID: 123110537-347</p> <p>DRAWN BY: K. POLL</p>	<p>PROJECTION: UTM - ZONE 9</p> <p>DATUM: NAD 83</p> <p>CHECKED BY: M. WILLIE</p>	
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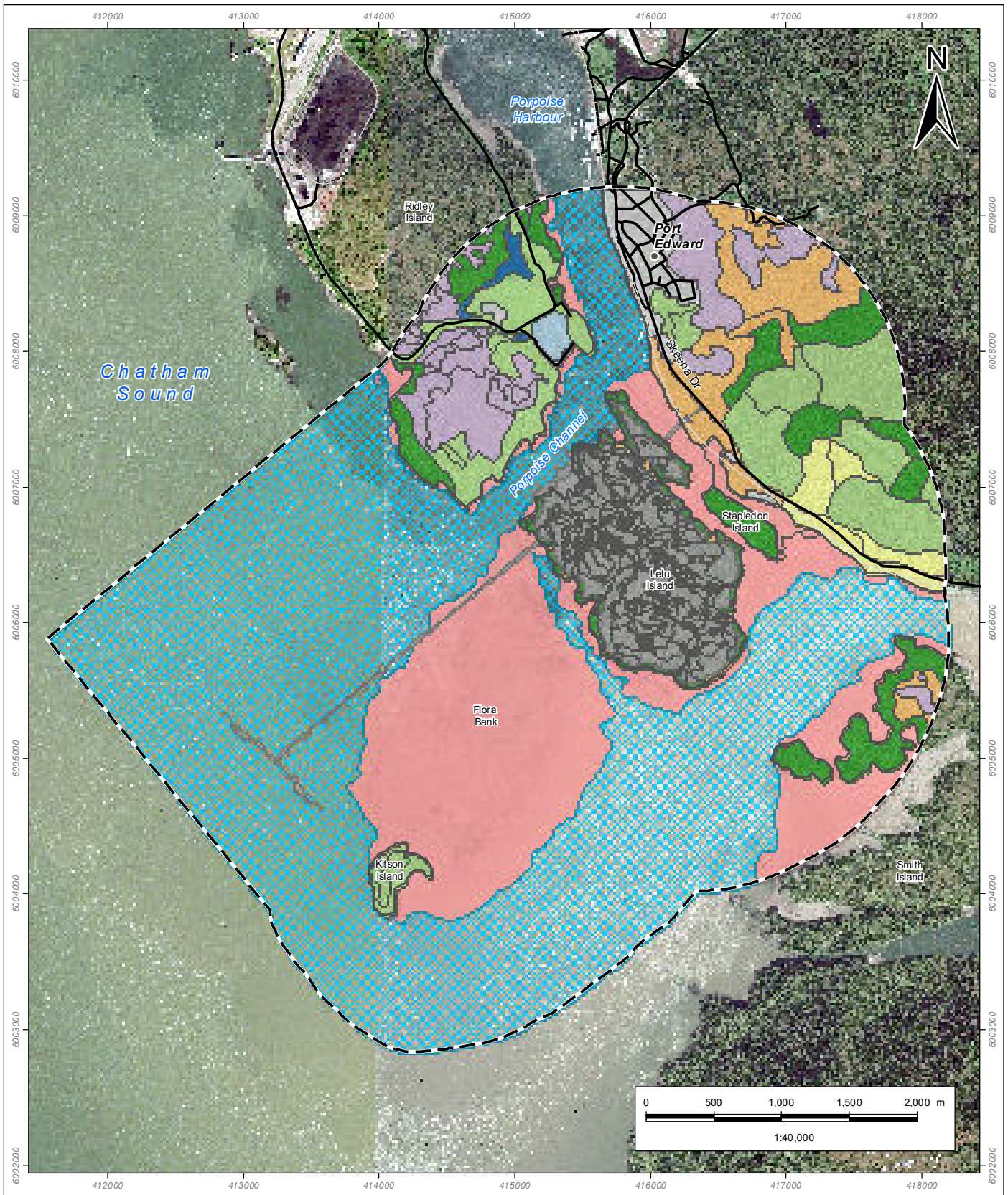
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<ul style="list-style-type: none"> ■ Marine Bird Stationary Count Habitat Modelling Limits Marine Bird Station 300 m Radius Vessel Fixed-width Transect Survey Area City or Town Railway Road 	<p>Pacific NorthWest LNG</p> <p>Marine Bird Stationary Count and Fixed-width Vessel Transect Survey Area</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 12-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-239</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: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-239	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE	<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;">11-9</p>
DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9							
FIGURE ID: 123110537-239	DATUM: NAD 83							
DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							



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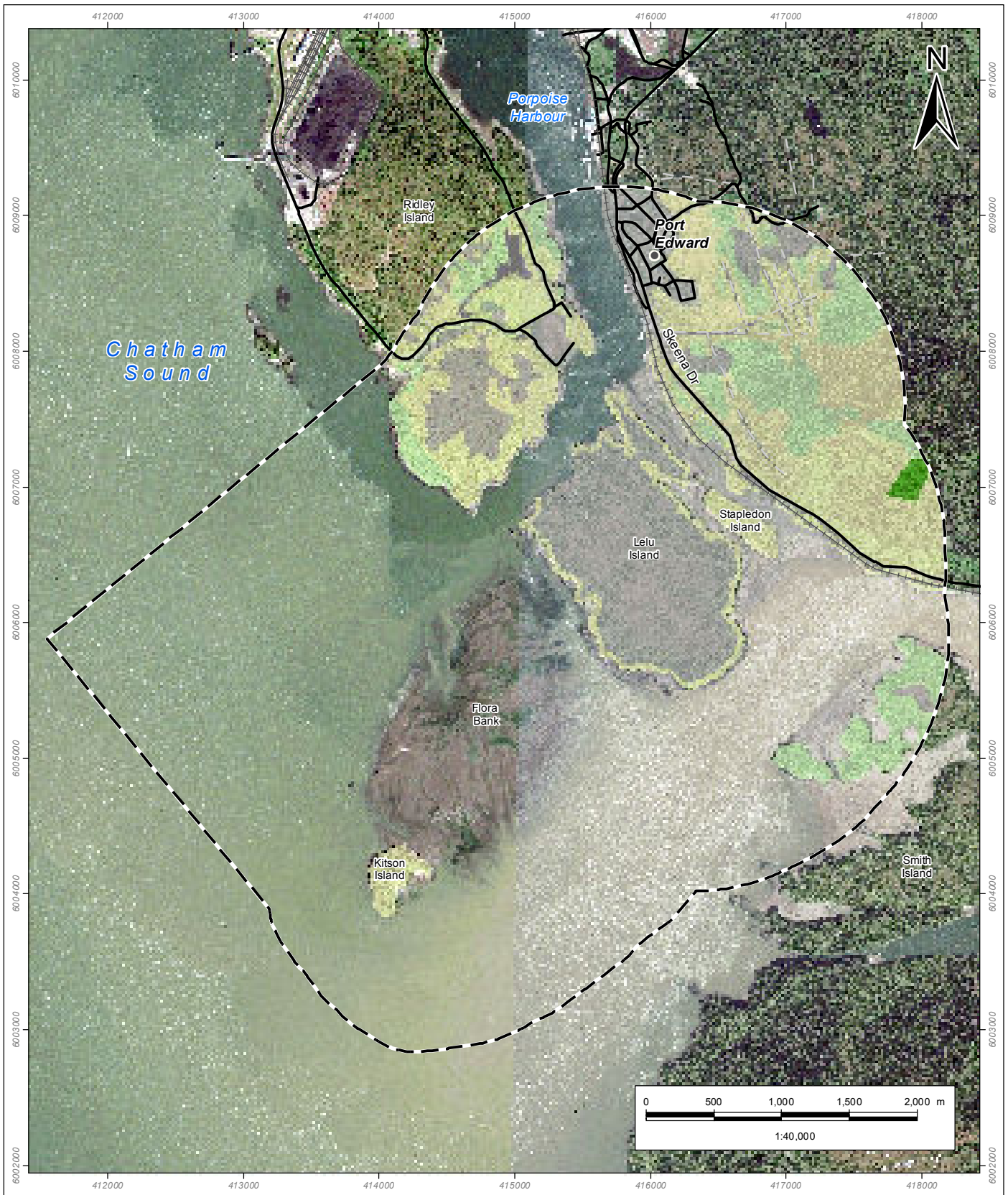
<ul style="list-style-type: none"> ● Bald Eagle Nest Number of Individuals of Species of Management Concern ● 1 - 3 ● 4 - 6 ● 7 - 13 ● 14 - 20 ● 21 - 49 	<ul style="list-style-type: none"> Project Component Bald Eagle Nest 100 m Buffer Habitat Modelling Limits ● City or Town + + + Railway — Road 	<p>Pacific NorthWest LNG</p> <p>Observations of Important Wildlife Habitat Features and Species of Management Concern</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 12-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-240</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: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-240	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							
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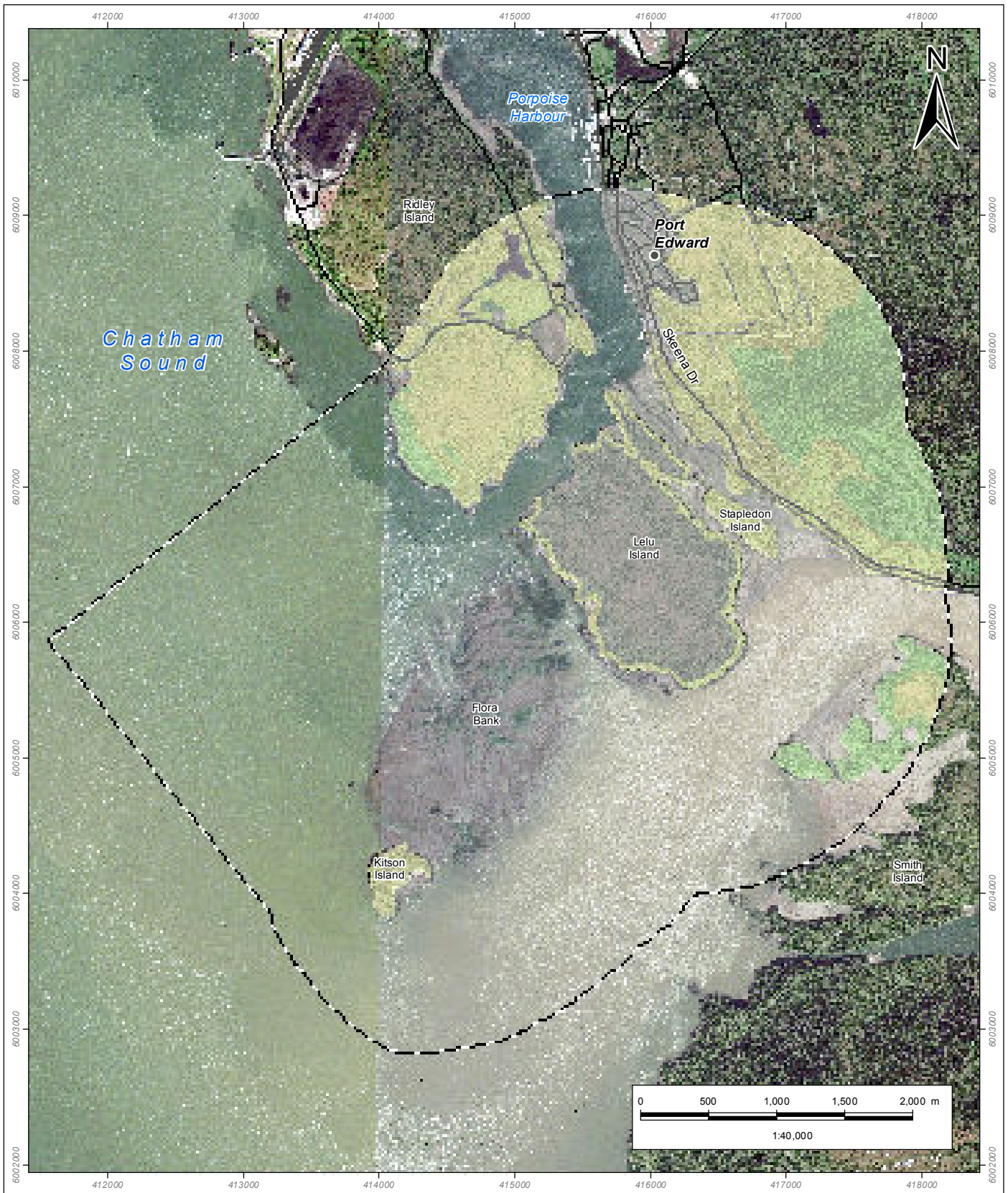
<p>Ecological Communities</p> <ul style="list-style-type: none"> Anthropogenic Forest - Old Coniferous Forest Forest - Seral Coniferous Forest Forest - Seral Deciduous Forest Marine - Estuarine Tidal Flat Marine - Ocean Project Development Area Wetland - Estuarine Meadow Wetland - Shrub-dominated Bog Wetland - Aquatic Wetland - Treed Swamp or Bog Wetland - Estuarine Marsh 	<p>Habitat Modelling Limits</p> <ul style="list-style-type: none"> City or Town Railway Road Shoreline 	<p>Pacific North West LNG Ecological Communities at Project Build-out</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 12-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-245</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: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-245	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE	<p>PREPARED BY:</p> <p style="text-align: center;"></p> <p>PREPARED FOR:</p> <p style="text-align: center;"></p> <p>FIGURE NO:</p> <p style="text-align: center; font-size: 24px;">11-11</p>
DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9								
FIGURE ID: 123110537-245	DATUM: NAD 83								
DRAWN BY: K. POLL	CHECKED BY: M. WILLIE								

Please refer to the Vegetation and Wetlands TDR for detailed descriptions of vegetation communities.



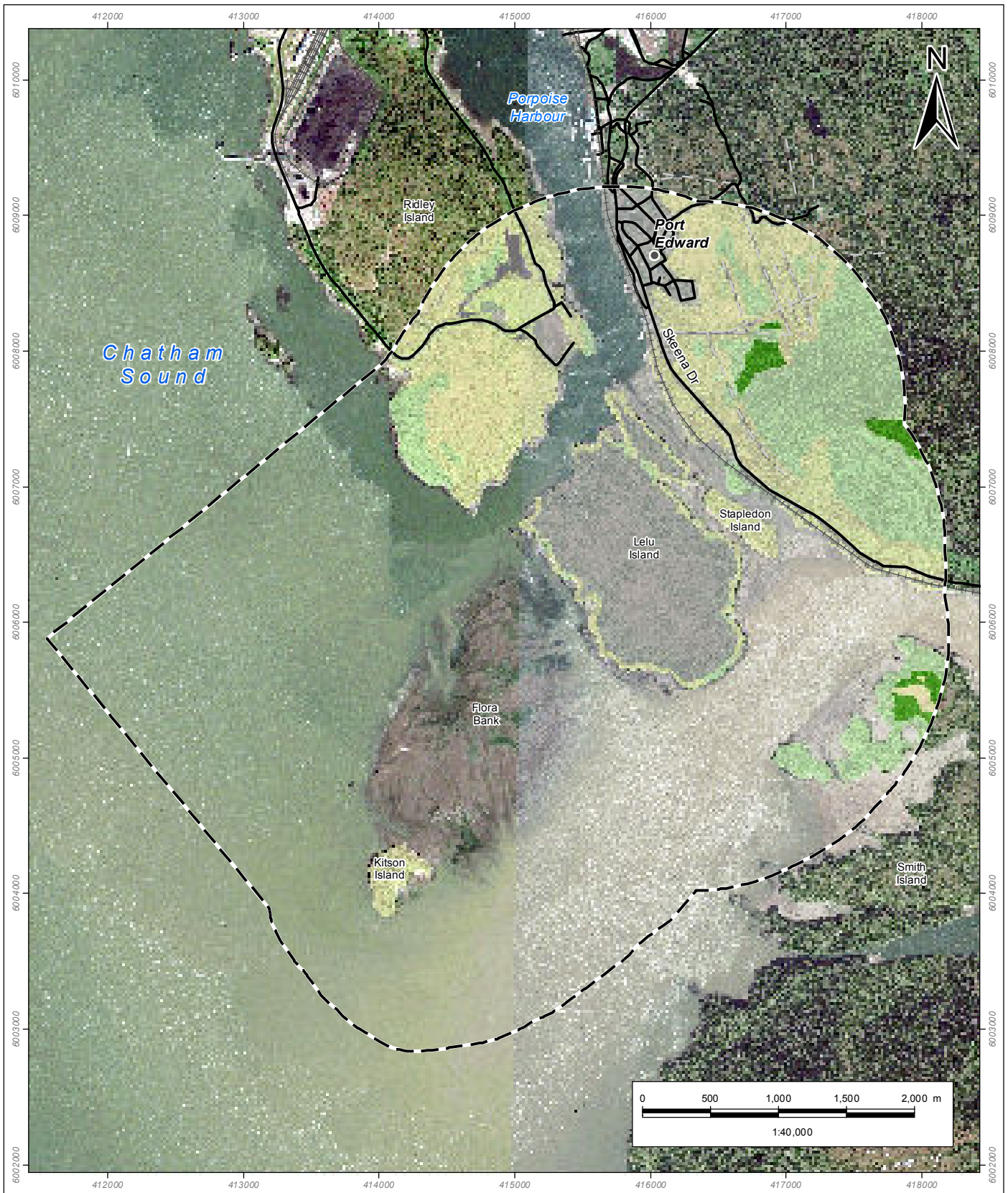
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<p>Habitat Suitability Class</p> <ul style="list-style-type: none"> High Moderate Low Nil Habitat Modelling Limits 	<ul style="list-style-type: none"> City or Town Outline or Seismic Line Railway Road 	<p>Pacific NorthWest LNG Project Build-out Breeding Habitat Suitability of Marbled Murrelet <i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 50%;">DATE: 12-NOV-14</td> <td style="width: 50%;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td>FIGURE ID: 123110537-246</td> <td>DATUM: NAD 83</td> </tr> <tr> <td>DRAWN BY: K. POLL</td> <td>CHECKED BY: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-246	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							
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<p>Habitat Suitability Class</p> <ul style="list-style-type: none"> High Moderate Low Nil Habitat Modelling Limits 	<ul style="list-style-type: none"> City or Town Outline or Seismic Line Railway Road 	<p>Pacific NorthWest LNG</p> <p>Project Build-out Breeding Habitat Suitability of Northern Goshawk, <i>laingi</i> subspecies</p> <p><i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 12-NOV-14</td> <td style="border: none;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td style="border: none;">FIGURE ID: 123110537-247</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: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-247	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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		<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;">11-13</p>						



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<p>Habitat Suitability Class</p> <ul style="list-style-type: none"> High Moderate Low Nil Habitat Modelling Limits 	<ul style="list-style-type: none"> City or Town Outline or Seismic Line Railway Road 	<p>Pacific NorthWest LNG Project Build-out Breeding Habitat Suitability of Olive-sided Flycatcher <i>EIS ADDENDUM</i></p> <p><small>Sources: Government of British Columbia; Government of Canada, Natural Resources Canada, Centre for Topographic Information; Progress Energy Canada Ltd. 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: 50%;">DATE: 12-NOV-14</td> <td style="width: 50%;">PROJECTION: UTM - ZONE 9</td> </tr> <tr> <td>FIGURE ID: 123110537-248</td> <td>DATUM: NAD 83</td> </tr> <tr> <td>DRAWN BY: K. POLL</td> <td>CHECKED BY: M. WILLIE</td> </tr> </table>	DATE: 12-NOV-14	PROJECTION: UTM - ZONE 9	FIGURE ID: 123110537-248	DATUM: NAD 83	DRAWN BY: K. POLL	CHECKED BY: M. WILLIE
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FIGURE ID: 123110537-248	DATUM: NAD 83							
DRAWN BY: K. POLL	CHECKED BY: M. WILLIE							
		<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;">11-14</p>						