2.0 PROJECT DESCRIPTION

The Project description was provided in Section 2 of the EIS. This section of the EIS Addendum provides:

- Updates to the project description, including the project schedule for all project activities, as a result of the design mitigations
- Replacement of the alternative means analysis for aspects that will change as a result of the design mitigations
- Responses to relevant requests for additional information from the federal government (August 14, 2014).

Table 2-1 lists the documents applicable to the project description 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of the environmental assessment process to date and identifies if information is either *updated by EIS Addendum*, *superseded*, *not relevant*, or *not affected* by information in the EIS Addendum.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 2-1.

Table 2-1 Status of Previously Submitted Documents

Document Name	Status
Section 2 Project Description of the EIS (February 2014)	Updated by EIS Addendum
Responses to the Working Group (June 2014)	Not affected

2.1 PROJECT COMPONENTS

Table 2-2 provides a list of the project components listed in Section 2.2 of the EIS and indicates (with a checkmark) those that will be affected by the project changes. Descriptions of these project components are provided below.

Table 2-2 Overview of Project Components Affected by the Project Changes

Project Components			
LNG Trains		**Utilities and Offsite (cont'd)**	
Feed Gas Receiving Unit		Wastewater Treatment Systems	
Pressure Let Down Unit		Stormwater Management Infrastructure	
Gas Treatment Unit		Fire Control Infrastructure	
Gas Dehydration Unit		Nitrogen Generation System	
Mercury Removal Unit		Compressed Air System	
Fractionation Unit		**Non-Manufacturing Facilities**	
Liquefaction Unit		Materials Offloading Facility	✓
LNG Storage and Loading		Bridge and Roads	
Storage tanks		Administration and Maintenance Buildings	
Marine Terminal	✓	Site Fencing	
Loading and Vapour Return Arms		Site Lighting	✓
Utilities and Offsite		Fish Habitat Compensation	✓
Flare System		Wetland Compensation	
Electrical Power Supply		**Temporary Construction Facilities**	
Other Bulk Storage		Pioneer Dock	
Water Supply Infrastructure	✓	Temporary Construction Camp	✓

NOTE:
✓ indicates a project component that is affected by the project changes

2.1.1 Marine Terminal

The marine terminal design mitigation will move the marine berths from Agnew Bank out into deeper water in Chatham Sound. The new marine berth location is approximately 2.7 km southwest of the northwest corner of Lelu Island. Key elements of the design mitigation include:

- No project infrastructure (i.e., piles) will be constructed on Flora Bank (scour armouring for one bridge tower will impinge on the margin of Flora Bank)
- Construction activities directly touching Flora Bank will be limited to installation of scour protection in one location on the margin of the bank
- A clearance height of a minimum of 11.3 m above higher high water (HHW) to allow local vessels (e.g., gill netters) to transit Flora Bank via the use of the passage west of Lelu Island
- No dredging will be conducted at the marine berths
- The marine project development area will be reduced, thus reducing potential serious harm to fish habitat and the need to offset these effects.

The new design for the marine terminal includes a 2.7 km jetty that consists of a 1.6 km clear-span suspension bridge over Flora Bank from Lelu Island to Agnew Bank, and a 1.1 km conventional pipe pile trestle from the suspension bridge to the LNG carrier berths which form the final section of the marine terminal (Figure 2-1). The east bridge abutment will be on Lelu Island. The southwest bridge abutment will be just north of Flora Bank (on Agnew Bank). Construction of the bridge will eliminate most project infrastructure (i.e., piles to support the jetty) and construction activities on Flora Bank. Contact with Flora Bank will be limited to installation of scour protection in one location on the margin of the bank.

Changes to the marine terminal will not affect the terrestrial project development area on Lelu Island.

2.1.1.1 Suspension Bridge

The suspension bridge to support the jetty is 1.6 km in length. It includes a 128 m approach structure from Lelu Island, a 1.2 km suspended span over Flora Bank, and a 320 m suspended span over Agnew Bank (Figure 2-1). The jetty/bridge deck is approximately 24 m wide. The width of the jetty/bridge deck provides space for hanger cables, a vehicle access roadway, two walkway access corridors, LNG pipelines, thermal expansion loops and associated utilities. The bridge deck will be paved; stormwater and fluid spills from vehicles will be directed to a pipe and gutter collection system and pumped back to the LNG Facility for treatment and disposal.

The bridge is supported by two 128 m tall prefabricated steel towers designed for wind stability. The towers sit on a cast-in-place concrete base (up to 11.6 m tall). The total tower height is approximately 140 m above sea level. Each tower foundation is a rectangular (36 m by 20 m) concrete footing supported by 28 steel pipe piles; the outer piles are battered to provide lateral support (Figure 2-1). The tower footings and pile support structures for the suspension bridge avoid Flora Bank.

Suspension cables for the northeast tower will be anchored on Lelu Island, 260 m from the tower; the southwest tower will be anchored by a pile supported gravity anchor block 390 m from the tower, on Agnew Bank (Figure 2-1). Lighting on the bridge will include:

- Marine navigation and aviation lighting in accordance with Transport Canada requirements
- Deck lighting use shielding and directional fixtures to illuminate the jetty surface while limiting light spill into the water.

There will be a minimum vertical clearance height of approximately 11.3 m above HHW to allow passage for vessel up to gillnetter size. This clearance height is consistent with the clearance height of the jetty-trestle presented in the EIS. The suspension bridge follows an alignment similar to the jetty-trestle described in the EIS; it is at least 200 m from the navigation course of Porpoise Channel.

2.1.1.2 Trestle and Berths

The jetty extends from the west end of the suspension bridge and will consist of a 1.1 km conventional pipe pile trestle to the LNG carrier berths (Figure 2-1). The trestle design is similar to the design described in Section 2 of the EIS; it will be approximately 15 m wide with 27 m wide sections at approximately 200 m intervals to allow for pipe expansion loops. The trestle will support the jetty and the marine berths including the field control room, LNG carrier berths, loading arms, and insulated cryogenic piping.

The marine terminal design mitigation will move the LNG carrier berth from Agnew Bank out into deeper water (approximately 20 m below chart datum) and approximately 510 m from the location of the berth described in the EIS. The new LNG carrier berth location is approximately 2.7 km southwest of the northwest corner of Lelu Island. No dredging, slope armouring, or breakwaters will be required for the marine terminal at this location. The general design of the berth will be similar to the design described in Section 2 of the EIS, though the arrangement is linear, as opposed to the U-shaped arrangement presented in the EIS. The berth at the end of the trestle will be capable of supporting two 217,000 m^3 LNG carriers (Q-Flex) up to 315 m in length.

2.1.2 Water Supply Infrastructure

The accommodation camp is proposed to be relocated from Lelu Island to sites in Port Edward or the Prince Rupert general area (see Section 2.1.6). Removing the accommodation camp from Lelu Island also removes the need to trench water, wastewater, and utility pipelines through Lelu Slough. Utility pipelines from Port Edward will provide water and sewer services for the LNG facility during operations and will be attached to the permanent road bridge from Lelu Island to the mainland.

2.1.3 Materials Offloading Facility

The materials offloading facility (MOF) is similar to the description in the EIS except for a reduction in the estimate of marine sediment within the dredging area. The EIS assessed potential effects of dredging and disposal of approximately 790,000 m^3 of marine sediment from the MOF. Since submission of the EIS, updated engineering has determined that less than 200,000 m^3 of marine sediment at the MOF requires dredging and ocean disposal at the Brown Passage site; because of the mixture of material, this activity will now occur intermittently rather than continuously and will be completed within 10 months. Approximately 590,000 m^3 of rock will be removed from the site and used for project construction.

2.1.4 Site Lighting

Lighting on the suspension bridge will include:

- Marine navigation and aviation lighting in accordance with Transport Canada requirements
- Deck lighting will be shielded and pointed downward at the jetty surface to reduce light spill into the water.

2.1.5 Fish Habitat Offsetting

The marine terminal design mitigation substantially reduces the area of potential serious harm to fish habitat; therefore smaller scale fish offsetting projects will be developed and presented as part of the *Fisheries Act* authorization for the Project.

2.1.6 Temporary Construction Camp

The accommodation camps will no longer be located on Lelu Island, and will not be developed, owned or operated by PNW LNG, nor be for the exclusive use of PNW LNG. Therefore PNW LNG is no longer directly responsible for commitments regarding the location, design or development area of the camp or commitments regarding potential effects of the camp on the environment (wildlife, vegetation, noise, fish and fish habitat, air quality, etc.), heritage, and health. These commitments will now be the responsibility of the third party camp service provider. PNW LNG has, however, established requirements for housing PNW LNG workers in the accommodation camps (through their EPCC contractor) to ensure the health and well-being of the workforce and to mitigate potential effects to the local communities. The EPCC Contractor must demonstrate to PNW LNG that the camp provider they have selected meets those requirements. These requirements apply to any camp site selected and include:

- Compliance with the Industrial Camp Regulations made pursuant to BC's *Public Health Act*
- Compliance with the Food Premises Regulation made pursuant to BC's *Public Health Act*
- Development and implementation of emergency plans and procedures (e.g., fire, earthquake, injury, spills) and evacuation routes
- Development and Implementation of a Traffic Management Plan
- Development and implementation of security measures at the facility to protect workers and assets
- The provision of appropriate medical facilities, personnel, and related prevention health services. The EPCC contractor must ensure that their worker accommodation service provider has staffed the medical facilities at the accommodation camp (and at the worksite on Lelu Island) with appropriate medical staff including nurse practitioners and advanced care paramedics supported by physicians, either on-site as required, or on-call remote support
- Prohibitions against worker use of illegal drugs or impairment by prescription drugs when in accommodation and at the work site
- Implementation of an Alcohol Management Plan prohibiting consumption of alcohol in worker's rooms and measures to limit consumption of beverages containing alcohol at any facility-provided and licensed alcohol serving facility
- Wellness and recreation facilities (e.g., sports facilities and activities)
- Accommodation camp "Code of Conduct"
- Accommodation camp management structures and appropriate stakeholder committees to manage and address temporary work force issues at the accommodation camp and with the surrounding community.

Effects from the transportation of workers to and from the project site are included in the cumulative effects assessment of the EIS Addendum for relevant VCs.

2.1.7 Summary of Changes to the Marine Infrastructure

Table 2-3 summarizes the changes to key project components compared to the components described in the EIS. An illustration of the updated marine terminal design (compared to the design submitted as part of the EIS [Option F]) is provided in Figure 2-2.

Table 2-3 Summary of the Project Components compared to the EIS Project Design

Project Component	EIS	Project Design Change
Berth Location	2.4 km southwest of Lelu Island on Agnew Bank	2.7 km southwest of Lelu Island off Agnew Bank in Chatham Sound
Length of the marine terminal (m) (from Lelu Island up to and including the berths)	2.4 km	2.7 km
Width of Jetty/Bridge Deck (m)	15 to 27 m	24 m (bridge) 15 to 27 m (trestle)
Dredge Slope Armouring at the Berth	21 ha	No armouring required at the berth
Breakwaters	5.4 ha	No breakwaters required
Marine Terminal Pile Numbers and Size	546 piles Approximately 635 m^2	464 piles Approximately 692 m^2
Dredging at the Berth	Approximately 7 million m^3 of sediment 84.6 ha area Duration: Approximately 12 months Maintenance dredging every 2 to 5 years	No dredging required for construction or maintenance.
Dredging at the MOF	Approximately 690,000 m^3 of sediment 5.4 ha Duration = Approximately 6 months Potential for maintenance dredging	Approximately 200,000 m^3 of sediment Approximately 590,000 m^3 of rock 6 ha Duration = Approximately 6 months No maintenance dredging required
Disposal at Sea	Approximately 8 million m^3 of sediment to be disposed of at Brown Passage over 27 months Approximately 1,280 return barge trips	~200,000 m^3 of sediment to be disposed of at Brown Passage over 6 months (weather dependent) Approximately 85 return barge trips
Temporary Construction Camp	Located on Lelu Island Developed, owned, and operated by PNW LNG Exclusive use of PNW LNG	Located in the Port Edward or Prince Rupert Area Developed, owned, and operated by third-party camp provider Will be available for use by other projects

2.2 PROJECT ACTIVITIES

The anticipated schedule for the Project is presented in Table 2-4. Timelines for cessation of operations are uncertain, but likely to exceed 30 years. Project activities remain similar to those described in the EIS. The project changes do result in some changes in construction activities (see Table 2-5.)

Table 2-4 Project Schedule

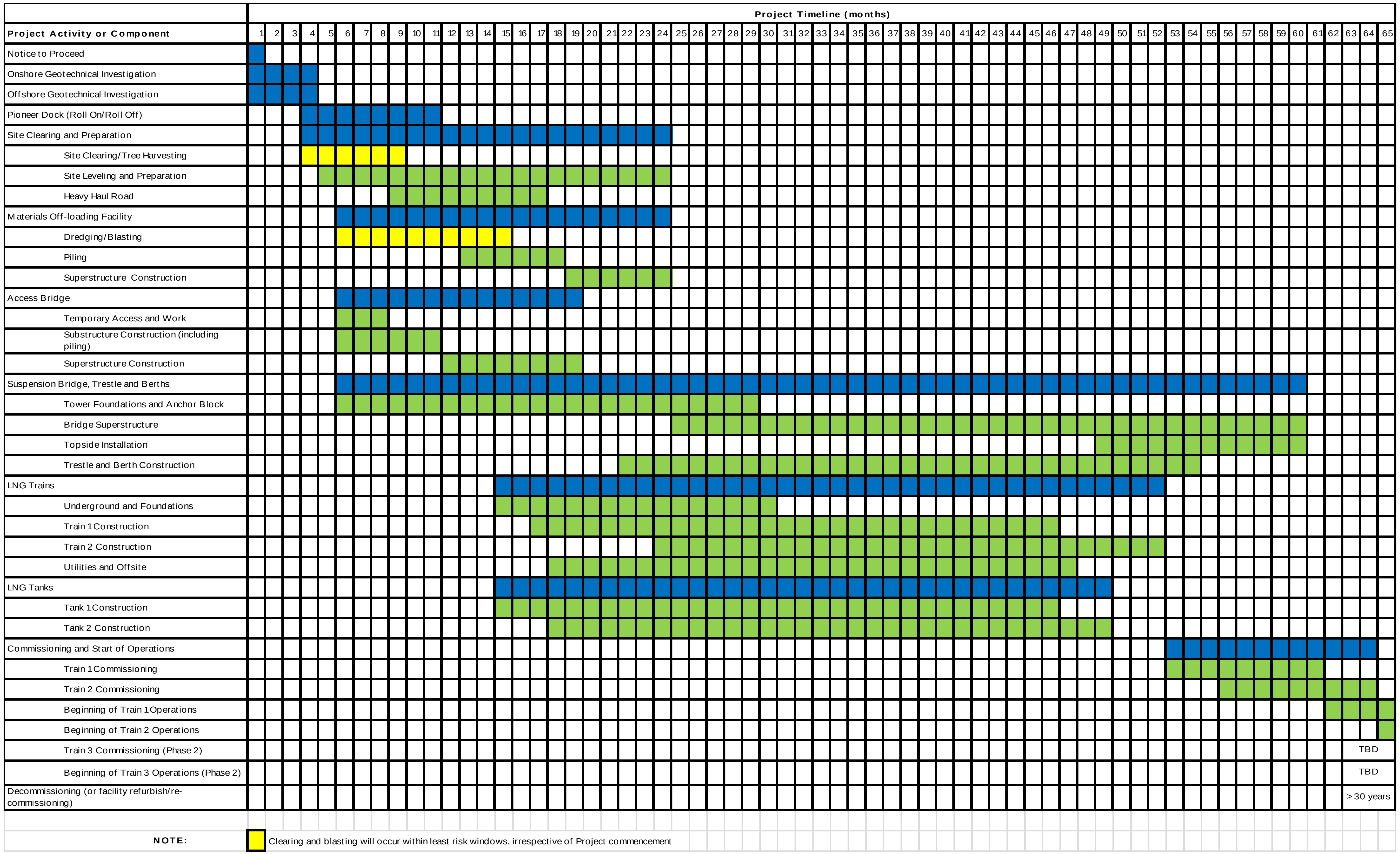


Table 2-5 Overview of Project Activities

Project Activities	Description of Activity (from Table 4-4 of the EIS)	Change in Activity from the Project Changes
Construction		
Site Preparation (land-based)	• Tree removal (including CMTs), vegetation clearing, peat removal, grading, and general site preparation within terrestrial project development area (including the facility on Lelu Island, the bridge, and road access to the mainland)	• No change
Onshore Construction	• Construction of a two-lane bridge connecting Lelu Island to the mainland (including bridge footings on the mainland)	• No change
	• Construction, operations, and decommissioning of a temporary camp that would accommodate 3,500 to 4,500 people at peak construction for the purposes of constructing the facility and all related infrastructure, services, and facilities	• The accommodation camp is no longer within the scope of the Project to be assessed except for cumulative effects of worker transportation.
	• Construction of a heavy-haul road for construction traffic and transport of facility modules	• No change
	• Construction of the LNG production facility (up to the point of connection with the natural gas transmission line), including: - Operation of a concrete batch facility - Excavating and pouring foundations - Installation of drainage systems - Constructing of the LNG trains (three 6.4 MTPA trains): ◦ Feed gas receiving unit ◦ Pressure let down unit ◦ Gas treatment unit ◦ Gas dehydration unit ◦ Mercury removal unit ◦ Fractionation Unit ◦ Liquefaction unit - Construction of LNG storage tanks (three 180,000 m^3 tanks) - Construction of utilities and offsite facilities: ◦ Flare system ◦ Electrical power supply ◦ Bulk storage ◦ Water supply infrastructure ◦ Wastewater treatment systems ◦ Storm water management infrastructure ◦ Fire control infrastructure ◦ Nitrogen generation system ◦ Compressed air system - Construction of non-manufacturing facilities: ◦ MOF ◦ Site roads ◦ Administrative and maintenance buildings ◦ Site fencing ◦ Site lighting.	• No change

Project Activities	Description of Activity (from Table 4-4 of the EIS)	Change in Activity from the Project Changes
Onshore Construction (cont'd)	• Air emissions, noise, and light from use of construction equipment	• No change
	• Power generation (use of diesel/generators)	• Diesel powered generators likely will not be used for accommodation camps located in Port Edward and/or in the Prince Rupert general area as electricity could be provided by local utilities.
Vehicle Traffic	• Use of the two-lane bridge connecting Lelu Island to the mainland by construction workers and vehicles • Use of roads on and offsite • Air emissions.	• Vehicle traffic will increase from daily transportation of workers from the accommodation camp over the bridge from the mainland to the Lelu Island worksite. Worker transportation to the worksite will be by bus.
Dredging	• Dredging within the MOF [~690,000 m^3] and for the marine terminal [~7 million m^3]	• Dredging of ~7 million m^3 of sediment will not be conducted at the marine terminal.
Marine Construction	• Construction of the pioneer dock • Construction of a two-lane bridge connecting Lelu Island to the mainland (including bridge footings in Lelu Slough) • Construction and use of the MOF - Pile driving - Berthing large roll-on-roll off barges and ships.	• No change
	• Construction of the marine terminal - 2.4 km conventional pipe pile supported trestle - Trestle and berth topside infrastructure including a control room, insulated cryogenic piping, pumping equipment, and LNG loading infrastructure - Two LNG carrier berths (capable of berthing two 217,000 m3 LNG carriers up to 315 m in length) - Two loading arms (one hybrid arm and one vapor return).	• Construction of the marine terminal - 2.7 km jetty/bridge deck consisting of: ◦ a ~1.6 km clear-span suspension bridge over Flora Bank from Lelu Island to Agnew Bank ◦ A ~1.1 km conventional pipe pile trestle from the suspension bridge to the marine berth in Chatham Sound - The other aspects of the marine terminal (i.e., topside infrastructure, berths, and loading arms) described in the EIS will not change.
	• Construction of breakwaters	• No breakwaters will be constructed

Project Activities	Description of Activity (from Table 4-4 of the EIS)	Change in Activity from the Project Changes
Waste Management and Disposal	• Disposal of cleared vegetation, peat, waste rock, and overburden • Wastewater treatment systems (for sewage and other oily effluent) and a pipe connecting the mainland and the Port Edward wastewater sewage treatment facility • Storm water management • Solid wastes (garbage removed from island) • Liquid wastes (effluents) • Hazardous wastes.	• Removing the accommodation camp from Lelu Island eliminates the need to trench water, wastewater, and utility pipelines through Lelu Slough • Utility pipelines from Port Edward will provide water and sewer services for the LNG facility and will be attached to the permanent road bridge from Lelu Island to the mainland • During initial construction (when the workforce is <100 people) potable water will be barged to Lelu Island and portable toilet facilities will be used. As the workforce increases modular construction-support buildings will be installed that include toilet facilities and sewage collection systems and storage capacity • Sewage and grey water from the toilets will be removed by septic truck and barge. Wastes will be discharged appropriately into waste water treatment facilities on the mainland.
Disposal at Sea	• Removal, transportation, and disposal of dredged sediments in Brown Passage [~7.7 million m^3 of marine sediment]	• The Project will require disposal at sea of approximately 200,000 m^3 of marine sediment dredged from the MOF • ~590,000 m^3 rock (removed from the MOF) will be used for project construction.
Operational Testing and Commissioning	• Air emissions • Noise emissions • Light emissions • Wastewater from tank commissioning.	• No change
Site Clean Up and Reclamation	• Post-construction site clean up • Re-vegetation (if appropriate).	• No change

Project Activities	Description of Activity (from Table 4-4 of the EIS)	Change in Activity from the Project Changes
Operations		
LNG Facility and Supporting Infrastructure on Lelu Island	• Operate 24 hours per day, 365 days per year • LNG production and storage: - Up to three identical 6.4 MTPA liquefaction trains (two to be constructed in Phase 1 with provision for a third train in Phase 2) - Up to three 180,000 m3 full containment LNG storage tanks (two to be construction in Phase 1 with a provision for a third in Phase 2) - Two or more nitrogen generation and vaporization packages with liquid nitrogen storage - Instrument and facility compressed air system - Storage and use of additional facility materials • Operation of gas-fired turbines capable of producing up to 1,100 MW of combined mechanical and electrical power (including spare units) • Facility maintenance and testing - Maintenance of equipment to ensure safe and reliable operations - Inspection of equipment and facilities to maintain mechanical integrity and performance - Road and site maintenance - Inspection and maintenance of safety, civil structures, and environmental monitoring devices.	• No change
Marine Terminal Use	• Berthing and hoteling LNG carriers (315 m Q-Flex LNG carriers) • Loading of LNG on LNG carriers	• No change
Shipping	• For Phase 1 of the Project, one LNG carrier would be calling at the terminal approximately every two days • For Phase 2 (at full build out) this would increase to approximately one LNG carrier per day and 350 per year calls on the terminal • Ship and tug activities (including moorage and transit) between the terminal and the Triple Island pilotage station.	• No change

Project Activities	Description of Activity (from Table 4-4 of the EIS)	Change in Activity from the Project Changes
Waste Management and Disposal	• Facility Emissions and Waste: - Air emissions of NOx, CO, SO2, PM, VOCs, HAPs, and GHGs - Storm water runoff - Solid wastes (domestic waste, paper, cardboard, wood and metal) - Liquid waste (liquid effluent treated onsite, treated effluent transported to Port Edward municipal system) - Hazardous wastes (solvents, trace mercury, catalyst, oil, medical and biological waste)Physical and chemical management of vegetation on Lelu Island and the mainland • Vegetation Management: - Herbicides and disposal of vegetation • Shipping waste: - Waste from shipping will be managed in accordance with MARPOL and other applicable regulations.	• No change
Fish Habitat Offsetting	• Fish habitat constructed as part of the fish habitat offsetting strategy	• The marine terminal design reduces the area of serious harm to fish habitat; therefore smaller scale fish offsetting projects will be presented.
Wetland Habitat Compensation	• Wetland habitat constructed or enhanced as a component of the wetland compensation strategy	• No change
Decommissioning		
Dismantling Facility and Supporting Infrastructure	• Dismantle/recycle facility equipment and supporting infrastructure	• No change
Dismantling of Marine Terminal	• Terminal and MOF likely to remain in place • Associated infrastructure (piping etc.) would be dismantled	• No change; however, since submission of the EIS PNW LNG has entered into a Project Development Agreement with the Prince Rupert Port Authority (PRPA) which gives PRPA the option to keep marine infrastructure (e.g., access bridge to mainland, MOF and marine terminal) in place after decommissioning
Waste Disposal	• Facility components recycled or disposed of	• No change
Site Clean Up and Reclamation	• Preparation of the disturbed portion of Lelu Island for other industrial purposes or reclamation to restore ecological values in consultation with PRPA	• No change

Appendix G.20 provides a description of examples of the methods likely to be used for construction of the marine infrastructure. The design completed to date is considered preliminary. Although the marine infrastructure design has been advanced to a sufficient level for planning and permitting, considerable engineering effort is still required to complete the design and finalize the design details to a stage that is ready to be constructed.

The final engineering design is subject to change pending the results of further geotechnical studies and other site investigations. The design of the marine foundations especially, is highly dependent on the results obtained from any further geotechnical and geophysical work. As detailed design is completed; various design details will change from the current designs. These are described in Appendix G.20.

2.3 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

This section provides an update to the following alternative means of carrying out the Project as a result of the project changes:

- Alternative site location
- Alternative placement of marine infrastructure
- Alternatives to disposal at sea of marine sediments.

Because the accommodation camps will no longer be developed, owned or operated by PNW LNG, nor be for the exclusive use of PNW LNG, the CEA Agency has determined that the construction and operations of the camps is not a component of the Project for the purposes of the federal environmental assessment. Therefore alternative construction camp locations are no longer included as part of the assessment of alternative means of carrying out the Project.

2.3.1 Alternative Site Location

The search for a suitable site for the Project started in 2011 with a general survey of areas near shale-gas production areas and an ice-free port. The west coast of BC between Alaska and the northern tip of Vancouver Island was identified as the general area to investigate. Within this geographic extent, 20 potential sites were identified for consideration; site selection workshops conducted by PNW LNG used environmental and technical criteria to evaluate potential sites. Economic and technical criteria and potential for environmental effects were used by PNW LNG to confirm the final site selection.

2.3.1.1 Analysis of Alternatives

Any site that might affect a protected area or was deemed inaccessible to the LNG feed pipeline (i.e., sweet natural gas pipeline), was eliminated. Based on these two considerations, the number of feasible sites was reduced to five: Port Edward (Lelu Island), Georgetown Mills, Port Simpson, Gobeil Bay, and Kitimat. Technical and economic aspects of each of these five potential sites were considered in detail by a team consisting of geotechnical specialists, environmental consultants, mariners, project development engineers, pipeline routing engineers and PNW LNG before the final site was selected.

2.3.1.2 Technical Considerations

The technical considerations used during the site selection workshops to select the site included:

- Hazards from an earthquake related to strong ground shaking
  - Hazards from surface fault rupture
  - Soils liquefaction hazard
  - Tsunami wave run-up (sea surge)
- Potential for mass-wasting and flooding
- Shoreline stability/erosion
- Land availability
- Navigation issues
  - Marine traffic
  - Navigation channel
  - Dredging volume (safe clearance for LNG carrier vessels)
  - Navigation distance
- Construction issues
  - LNG pipeline length
  - LNG trestle length
  - MOF trestle length
- Onshore traffic.

These criteria were further refined in the design of the Project (see Section 2, Project Description of the EIS).

2.3.1.2.1 Port Edward (Lelu Island)

Port Edward is located 12 km south of Prince Rupert in a geotechnically low risk area for an earthquake that would result in strong ground shaking or surface faulting. Lelu Island is relatively flat throughout and could experience flooding during extreme high tide events or sea surge (i.e., moderate wave caused by mass-wasting elsewhere or by an earthquake); due to the geography of the area, a tsunami is unlikely. The marine soils may be subject to liquefaction hazard in the event of an earthquake.

Lelu Island is an unused site currently designated for industrial development by the Prince Rupert Port Authority. It is located in an area where marine traffic is managed by the Prince Rupert Port Authority, is unlikely to experience marine traffic conflicts, and has no complex marine navigation issues (i.e., lengthy or narrow navigation channel). The travel distance (40 km) for LNG carriers from the Triple Island Pilotage Station is the shortest of the other sites. With the reduction of dredging volume, this site's disposal volume (200,000 m^3) is now equivalent to two of the other four sites; at 11 million m^3, earthworks (cut and fill) are the lowest of all five sites. Being located near airports (Prince Rupert and Terrace), railway, and transportation corridors (12 km to Prince Rupert) reduces construction constraints. Although the LNG trestle length is long (2.7 km), the MOF trestle length (105 m) is shorter than three of the other sites. The supply pipeline length from Terrace, BC (146 km) is roughly in the middle between all the five sites.

Overall, Port Edward (Lelu Island) was ranked as moderate risk for technical concerns, due mainly to the trestle length and dredgeate volume.

2.3.1.2.2 Georgetown Mills

Georgetown Mills is located approximately 30 km north of Prince Rupert at an old sawmill site in a geotechnically low risk area for an earthquake that would result in strong ground shaking or surface faulting. The shoreline is relatively flat throughout and could experience flooding during extreme high tide events or tsunami (i.e., large wave caused by an earthquake). Mass wasting is unlikely as the area is not mountainous. The marine soils are at low risk of liquefaction hazard in the event of an earthquake.

Georgetown Mills is an unused former lumber mill site. It is located in an area where it is unlikely to experience marine traffic conflicts, but a large number of marine rocks in the navigation channel make it unsafe for LNG carriers. The travel distance for LNG carriers from the Triple Island Pilotage Station is the second shortest of the other sites (47 km). This site's disposal volume is equivalent to two of the other four sites (219,991 m^3); earthworks (cut and fill) are the second lowest (15 million m^3) of all five sites. It is only accessible by marine transportation, being located in an isolated area that is not near airports, railway, and transportation corridors, adding construction constraints which must take into consideration inclement weather and seas for equipment and materials transport. The LNG trestle length (284 m) is the second longest and the MOF trestle length (346 m) is the longest of the other sites. The supply pipeline length (181 km) is one of the longest of all the five sites.

Overall, Georgetown Mills was ranked as high risk for technical concerns, due to its remote location, navigation issues, lack of infrastructure and lengthy supply pipeline.

2.3.1.2.3 Port Simpson

Port Simpson, also known as Lax Kw'alaams, is located approximately 25 km north of Prince Rupert in a geotechnically low risk area for an earthquake that would result in strong ground shaking or surface faulting. The shoreline is relatively flat and could experience flooding during extreme high tide events or tsunami (i.e., large wave caused by an earthquake). The marine soils are at high risk of liquefaction hazard in the event of an earthquake.

Port Simpson is an available greenfield site. It is located in an area where it is unlikely to experience marine traffic conflicts; however, the navigation channel is subject to a 7 knot current and a large number of marine rocks in the navigation channel make it unsafe for LNG carriers. The travel distance for LNG carriers from the Triple Island Pilotage Station (52 km) is roughly equal to two of the other sites and considerably lower than two sites. This site's disposal volume (204,461 m^3) is equivalent to two of the other four sites; earthworks (cut and fill) are in the middle (34 million m^3) of all five sites. It is only accessible by float plane or marine transportation, being located in an isolated area that is not near airports, railway, and transportation corridors adding construction constraints which must take into consideration inclement weather and seas for equipment and materials transport. The LNG trestle length (170 m) is the second shortest and the MOF trestle length (88 m) is the shortest of the other sites. The supply pipeline length (182 km) is one of the longest of all the five sites.

Overall, Port Simpson was ranked as moderate to high risk for technical concerns, due mainly to navigation issues, its remote location and lengthy supply pipeline.

2.3.1.2.4 Gobeil Bay

Gobeil Bay is located approximately 100 km south of Kitimat in Douglas Channel in a geotechnically low risk area for an earthquake that would result in strong ground shaking or surface faulting. The shoreline is relatively flat and could experience flooding during extreme high tide events or sea surge (i.e., moderate wave caused by an earthquake). The marine soils are at moderate risk of liquefaction hazard in the event of an earthquake.

Gobeil Bay is an available greenfield site. It is located in a remote area where it is unlikely to experience marine traffic conflicts, but has complex marine navigation issues (i.e., lengthy and narrow navigation channel). The travel distance for LNG carriers from the Triple Island Pilotage Station (350 km) is the second longest (Kitimat being the longest). This site's disposal volume is unidentified as it is so remote it was not possible to make this calculation; earthworks (cut and fill) are the largest (75 million m^3). It is only accessible by marine transportation, being located in an isolated area that is not near airports, railway, and transportation corridors, adding construction constraints which must take into consideration inclement weather and seas for equipment and materials transport. The LNG trestle length (222 m) is a middle distance and the MOF trestle length (160 m) is the second longest of the other sites. The supply pipeline length (80 km) is the second shortest of all the five sites.

Overall, Gobeil Bay was ranked as moderate to high risk for technical concerns, due mainly to the long travel distance for LNG carriers to the Triple Island Pilotage Station through a complex navigation channel, large earthworks volume and its remote location.

2.3.1.2.5 Kitimat

Kitimat is located in a wide, flat area at the head of Douglas Channel in a geotechnically low risk area for an earthquake that would result in strong ground shaking or surface faulting. The shoreline is relatively flat and could experience flooding during extreme high tide events or sea surge (i.e., moderate wave caused by an earthquake). The marine soils are at low risk of liquefaction hazard in the event of an earthquake.

Kitimat has limited site availability due to plans for other industrial development (e.g., LNG Canada facility). It is located in an area where there could be marine traffic conflicts due to predicted increased marine traffic, and a lengthy navigation channel. The travel distance for LNG carriers from the Triple Island Pilotage Station (363 km) is the longest of all the sites. This site's disposal volume (20,740 m^3) is the lowest; earthworks (cut and fill) are in the middle (34 million m^3) of all five sites. Being located near airports (Prince Rupert and Terrace), railway, and transportation corridors (short road distance to Terrace) reduces construction constraints. The trestle length (55 m) is the shortest. The supply pipeline length (67 km) is the shortest of all the five sites.

Overall, Kitimat was ranked as moderate risk for technical concerns, due mainly to a lack of marine navigation oversight and the lengthy travel distance for LNG carriers to the Triple Island Pilotage Station through a complex navigation channel.

2.3.1.3 Economic Considerations

Economic considerations used by PNW LNG in the site selection process included:

- Dredging volumes (i.e., cost of transporting dredge material)
- Worker accommodation and access

- Availability of regional economic infrastructure
- Proximity to major airport, railway and highway
- Proximity to communities.

Economic criteria were used to identify the best opportunity for the Project and for local economic development (see the EIS: Economic Environment, Section 14; Navigation and Marine Resource Use, Section 15; Infrastructure and Services, Section 16; Community Health and Well-Being, Section 18).

2.3.1.3.1 Port Edward (Lelu Island)

Lelu Island will require handling the largest volume of dredged material (rock and sediment) of the five sites; however, disposal at sea will be slightly below the volume of two of the other sites (i.e., approximately 200,000 m^3), meaning that the number of trips to the disposal site is slightly less than these two sites. The distance to the disposal site at Brown Passage is the shortest from Lelu Island; thus, the cost of transporting the dredgeate is the least of all sites. The original project concept included an on-site worker accommodation camp, which would have cost roughly the same to build and operate as the Kitimat site, but would have been considerably less than the other three sites. Now that a worker accommodation camp will be built within Port Edward by an independent third party, the Project will only bear the cost of transportation of employees to Lelu Island, making this more cost effective than Kitimat. Lelu Island is situated within the Skeena Queen Charlotte Regional District which provides ready access to regional economic infrastructure, such as hospitals and schools. The site is close to major airports, railway and highways for convenient and timely transport of construction materials which is the same as Kitimat and considerably less expensive than three of the other sites. Being only 12 km from Prince Rupert and beside Port Edward, the Project is conveniently situated for access to community support.

Overall, Lelu Island was ranked as low risk for economic concerns, with the exception of moderate risk for the disposal of dredgeate.

2.3.1.3.2 Georgetown Mills

Georgetown Mills will require disposal at sea of roughly the same volume (219,991 m^3) as two of the other sites, meaning that the number of trips to the disposal site is approximately the same as these two sites. The distance to the disposal site at Brown Passage is longer than from Lelu Island, making the cost of transporting the dredgeate more. Due to its remote location, an on-site worker accommodation camp would be required which would cost considerably more to build and operate than the Port Edward (Lelu Island) or Kitimat sites. Georgetown Mills is situated within the Skeena Queen Charlotte Regional District, but access to regional economic infrastructure, such as hospitals and schools is constrained by transportation logistics (i.e., marine vessel transportation only). The site is not close to major airports, railway or highways as it is only accessible by marine vessels, making it inconvenient, unreliable and expensive for transport of construction materials. Being an abandoned lumber mill, Georgetown Mills no longer has access to community support.

Overall, Georgetown Mills was ranked as high risk for economic concerns, due mainly to its remote location and lack of infrastructure.

2.3.1.3.3 Port Simpson

Port Simpson will require disposal at sea of roughly the same volume (204,461 m^3) as two of the other sites, meaning that the number of trips to the disposal site is approximately the same as these two sites. The distance to

the disposal site at Brown Passage is longer than from Lelu Island, making the cost of transporting the dredgeate more. An on-site worker accommodation camp would be required which would cost considerably more to build and operate than either Port Edward (Lelu Island) or Kitimat sites. Port Simpson is situated within the Skeena Queen Charlotte Regional District, but access to regional economic infrastructure, such as hospitals and schools is constrained by transportation logistics (i.e., marine vessel or float plane transportation only). The site is not close to major airports, railway or highways as it is only accessible by marine vessels, making it inconvenient, unreliable and expensive for transport of construction materials. Port Simpson has access to limited community support.

Overall, Port Simpson was ranked as moderate to high risk for economic concerns, due mainly to its remote location and limited infrastructure.

2.3.1.3.4 Gobeil Bay

No estimate of dredgeate disposal was undertaken for Gobeil Bay. It is remote and will require an on-site worker accommodation camp which would cost considerably more to build and operate than either Port Edward (Lelu Island) or Kitimat sites. Gobeil Bay is situated within the Kitimat-Stikine Regional District, but access to regional economic infrastructure, such as hospitals and schools is constrained by transportation logistics (i.e., marine vessel transportation only). The site is not close to major airports, railway or highways as it is only accessible by marine vessels, making it inconvenient, unreliable and expensive for transport of construction materials. There is no access to community support as the closest community is Kitimat, accessible by marine vessel.

Overall, Gobeil Bay was ranked as high risk for economic concerns.

2.3.1.3.5 Kitimat

Kitimat will require handling the least volume of dredged material (20,740 m^3) of the five sites with likely no disposal at sea; however, the distance to the disposal site at Brown Passage is the longest (363 km). The Kitimat site would include an on-site worker accommodation camp, which would have cost roughly the same to build and operate as the Lelu Island site, and considerably less than the other three sites. Now that a worker accommodation camp will be built within Port Edward by an independent third party, the Kitimat site will cost more to operate than the Lelu Island site. Kitimat is situated within the Kitimat-Stikine Regional District which provides ready access to regional economic infrastructure, such as hospitals and schools. The site is close to major airports, railway and highways for convenient and timely transport of construction materials which is the same as Lelu Island. Kitimat has ready access to community support.

Overall, Kitimat was ranked as low risk for economic concerns.

2.3.1.4 Potential for Environmental Effects

Georgetown Mills, Port Simpson and Gobeil Bay were eliminated from further consideration as they were considered neither technically nor economically feasible. The potential for environmental effects were considered for Port Edward (Lelu Island) and Kitimat using the following criteria:

- Removal of riparian vegetation
- Removal of terrestrial and marine habitat
- Environmental effects of an accident or malfunction.

The above criteria were used to identify key environmental issues for the Project (see the EIS: Vegetation and Wetland Resources, Section 10; Terrestrial Wildlife and Marine Birds, Section 11; Marine Resources, Section 13).

2.3.1.4.1 Port Edward (Lelu Island)

Dredging of 790,000 m^3 will impact approximately 60,000 m^2 of fish habitat, and along with other marine construction will result in serious harm to fish habitat (11,300 m^2), which will require a habitat offset plan. Development of the MOF and LNG trestle area will affect marine habitat utilized by marine birds. Removal of terrestrial vegetation (115 ha) on Lelu Island will affect wildlife terrestrial habitat and vegetation (no species at risk); and, the effect will remain the same with relocation of the worker accommodation camp to Port Edward as the area that would have been occupied by the camp on Lelu Island will still be developed for the Project. Due to the shortest distance to the Triple Island Pilotage Station (40 km), a marine channel free of navigation hazards and the oversight of the Prince Rupert Port Authority in managing marine vessel traffic, the risk of a marine navigation accident is considered low, with a low risk of an environmental effect. Collision of an LNG carrier vessel with a marine mammal is possible, though unlikely.

2.3.1.4.2 Kitimat

Dredging will impact 20,740 m^3, and may result in serious harm to fish habitat. Development of the MOF and LNG trestle area will affect marine habitat utilized by marine birds. Although some of the Kitimat site would be located on a previously disturbed industrial area, removal of terrestrial vegetation will affect wildlife terrestrial habitat. Due to the considerable distance to the Triple Island Pilotage Station (350 km), the complex geometry of the navigation channel, and the lack of oversight for marine navigation (i.e., no involvement of PRPA), the risk of a marine navigation accident is considered moderate; and, the potential for an environmental effect is also considered moderate. Collision of an LNG carrier vessel with a marine mammal is more likely than the Port Edward site due to the much longer navigation distance.

2.3.1.5 Summary of Selection Criteria Assessment

The plans to build the LNG Canada Project and the Enbridge Pipeline in Kitimat would restrict access to available industrial land in Kitimat (there may no longer be a site available in Kitimat) and introduce considerably more tanker traffic within a complex geographic corridor. There is no marine traffic oversight (i.e., Prince Rupert Port Authority) that would manage tanker traffic navigation issues within the Kitimat port area, increasing the risk of an accident or malfunction. While the environmental effects are similar for both Port Edward (Lelu Island) and Kitimat, the risks appear to be more manageable for Port Edward (Lelu Island).

Based on the assessment of technical and economic criteria and consideration of the potential for environmental effects and the discussion noted above, Lelu Island is the preferred project location.

2.3.2 Alternative Placement of Marine Infrastructure

The EIS included a marine terminal with a 2.4 km long trestle to the LNG carrier berth on Agnew Bank. This design was chosen to minimize potential wave and weather impacts on the LNG carriers at berth.

As described in Section 2.1.1 (of the EIS Addendum) the marine terminal design mitigation will move the marine terminal and berths from Agnew Bank out into deep water in Chatham Sound. The new marine berth location is approximately 2.7 km southwest of the northwest corner of Lelu Island. Key elements of the design mitigation include:

- No project infrastructure (i.e., piles) will be constructed on Flora Bank
- No construction activities will be conducted on Flora Bank
- A clearance height of a minimum of 11.3 m above higher high water (HHW) to allow local vessels (e.g., gill netters) to transit Flora Bank via the use of the passage west of Lelu Island
- No dredging will be conducted at the marine berths
- The marine project development area will be reduced, thus reducing potential serious harm to fish habitat, and thereby reducing the need to offset effects on fish habitat.

The marine terminal design mitigation includes a 2.7 km jetty that consists of a 1.6 km clear-span suspension bridge over Flora Bank from Lelu Island to Agnew Bank, and a 1.1 km conventional pipe pile trestle from the suspension bridge to the LNG Carrier berths. The east bridge abutment will be on Lelu Island. The west bridge abutment will be just north of Flora Bank and is on Agnew Bank. Construction of the bridge will eliminate any project infrastructure (i.e., piles to support the jetty) and construction activities on Flora Bank.

Following site selection, a site study was carried out to determine the best location and layout of the trestle, berth and the MOF.

2.3.2.1 Feasibility of Alternatives

Feasibly criteria for placement of marine infrastructure were:

- Constructability
- Economic and environmental feasibility of required dredging
- Economic feasibility of trestle construction.

Effects on the Marine Resources VC were considered in the feasibility criteria. Eleven alternatives for placement of the trestles, berths and MOF were considered: five on the south of the Lelu Island and six on the north, along Porpoise Channel (Figure 2-3).

South Options:

- Marine Terminal Option 1: The LNG terminal placed 185 m offshore, with the trestle extending from the south side of Lelu Island along Inverness Passage. The terminal shares a turning basin with the MOF, on the southwest corner of the island
- Marine Terminal Option 2: The LNG terminal placed 4,060 m offshore, southwest of Lelu Island, with the berth at a 15 m natural contour outside of Horsey Bank, near the mouth of Inverness Passage. MOF on the southeast side of the island

- Marine Terminal Option 3: The LNG terminal placed 4,060 m offshore, southwest of Lelu Island, with the berth at a 15 m natural contour outside of Horsey Bank, near the mouth of Inverness Passage. MOF near the mouth of the Inverness Passage at a 10 m natural contour outside of Horsey Bank, several hundred metres northeast of the terminal
- Marine Terminal Option 4: The LNG terminal placed 4,060 m offshore, southwest of Lelu Island, with the berth at a 15 m natural contour outside of Horsey Bank, near the mouth of Inverness Passage. MOF is along Inverness Passage inside Horsey Bank in an area dredged to a depth of 10 m. MOF is approximately midway between the island and the terminal
- Marine Terminal Option 6: The LNG terminal placed 4,060 m offshore, southwest of Lelu Island, with the berth at a 15 m natural contour outside of Horsey Bank, near the mouth of Inverness Passage. MOF is on the northwest corner of the island, between the island and Flora Bank, south of the Porpoise Channel. The MOF turning basin is within Porpoise Channel.

North Options:

- Marine Terminal Option 6a: The LNG terminal is placed along the south side of Porpoise Channel, along the north side of Lelu Island. MOF is on the northwest corner of the island, between the island and Flora Bank, south of the Porpoise Channel. The MOF turning basin is within Flora Bank
- Marine Terminal Option 8a: The LNG terminal is placed close to the northeast side of Lelu Island, in the mudflats between the island and the rail line. MOF is in a small cove off the south side of Porpoise Channel, on the north side of the island
- Marine Terminal Option 8b: The LNG terminal is placed 830 m west of Lelu Island, with the berth facing the inside of Porpoise Channel. MOF is in a small cove, oriented parallel to Porpoise Channel
- Marine Terminal Option 8b1: The LNG terminal is placed 830 m west of Lelu Island, with the berth facing the inside of Porpoise Channel. MOF is in a small cove, oriented parallel to Porpoise Channel
- Marine Terminal Option 8c: The LNG terminal is placed 2,720 m offshore, west of Agnew Bank, at a 15 m natural channel outside of Porpoise Channel. MOF is in a small cove, oriented parallel to Porpoise Channel
- Marine Terminal Option 8c1: The LNG terminal is placed 2,720 m offshore, west of Agnew Bank, at a 15 m natural channel outside of Porpoise Channel. MOF is in a small cove, oriented parallel to Porpoise Channel
- Marine Terminal Option F: The LNG terminal is placed 2,400 m offshore, on Agnew Bank, immediately northwest of Flora Bank, with berths directed northwest into a 5 m deep natural channel southwest of Porpoise Channel. MOF is in a small cove, oriented parallel to Porpoise Channel
- Marine Terminal Design Mitigation: The LNG terminal is placed approximately 2,700 m offshore, west of Agnew Bank, at a 15 m natural channel outside of Porpoise Channel. The terminal includes a 2.7 km jetty that consists of a 1.6 km clear-span suspension bridge over Flora Bank from Lelu Island to Agnew Bank, and a 1.1 km conventional pipe pile trestle from the suspension bridge to the LNG Carrier berths. The east bridge abutment will be on Lelu Island. The west bridge abutment will be just north of Flora Bank and is on Agnew Bank. It includes MOF is in a small cove, oriented parallel to Porpoise Channel.

Table 2-6 Comparison of Marine Infrastructure Options

Option #	Dredging Volume (m^3)	Trestle Length (m)	Key Concerns
South Options			
1	13,128,800	185	High dredging cost Potential effects from dredging
2	2,158,100	4,060	High trestle cost Potential effects from trestle shading and piles Trestle acts as substantial barrier to navigation
3	-	4,060	High trestle cost Potential effects from trestle shading and piles Trestle acts as substantial barrier to navigation
4	2,361,100	4,060	High trestle cost Potential effects from trestle shading and piles Trestle acts as substantial barrier to navigation
6	1,113,800	4,060	High trestle cost Potential effects from trestle shading and piles Trestle acts as substantial barrier to navigation
North Options			
6a	2,880,500	4,060	High trestle cost Potential effects from trestle shading and piles Trestle acts as substantial barrier to navigation Potential environmental effects of turning basin on Flora Bank
8a	-	-	High dredging cost Potential effects from dredging Would require mitigation to prevent undermining of railroad and highway
8b	7,368,900	830	High dredging cost Potential effects from dredging Potential navigation risk
8b1	6,977,300	830	High dredging cost Potential effects from dredging Potential navigation risk
8c	2,376,100	2,720	Potential effects from trestle shading and piles Trestle acts as a barrier to navigation
8c1	1,492,700[a]	2,720	Potential effects from trestle shading and piles Trestle acts as a barrier to navigation
F	6,484,500[b]	2,400	High dredging cost Potential effects from dredging Potential effects from trestle shading and piles
Design Mitigation	200,000	2,720	High cost of suspension bridge construction Potential effects from trestle shading and piles

NOTE:

[a] Since site selection studies, dredging volumes for this option have reduced to 690,000 m^3.

b Since site selection studies, dredging volumes for this option have increased to 7.7 million m^3.

Those options with a 4,060 m trestle (1, 3, 4, 6, 6a) were not considered feasible because of the construction cost for a trestle of this length increase the potential environmental effects on fish habitat from pile installation and shading. These options would also create a substantial barrier to navigation, forcing significant diversion of vessels entering Inverness Passage or Tsum Tsadai Inlet, particularly those approaching from the north or west.

Option 8a was eliminated because of the high potential construction costs and effects from dredging. Options 8b and 8b1 were also not considered feasible due to requirements for substantial dredging, with associated costs and potential for effects, and potential vessel navigation risk associated with maneuvering in Porpoise Channel.

2.3.2.2 Selection Criteria Assessment

The following were the selection criteria for the remaining marine terminal options:

- Potential environmental effects from dredging and construction
- Effects on the marine environment and navigation
- Cost of construction.

Potential effects on the Marine Resources VC, potential effects on the Navigation and Marine Resource Use VC were all considered during selection. The remaining Options 8c, 8c1, F, and the marine terminal design mitigation each create a barrier to navigation, but effects would mostly be limited to vessels traveling from Porpoise Channel and Porpoise Harbour toward Inverness Passage or Tsum Tsadai Inlet. There would also be limited effects on vessels approaching these areas from the north. Option F and the design mitigation had the least potential for effects on navigation, and could potentially be reduced further by allowing vessels to pass under the trestle near Lelu Island. The design mitigation option reduces vessel traffic (and potential interference with navigation) from dredging and disposal at sea compared to option F.

Options 8c, 8c1, F, and the marine terminal design mitigation each affect the Marine Resources VC, however, potential environmental effects of the design mitigation on the marine environment are considerably lower compared to the other options (see Section 2.1.7 for a comparison of Option F and the design mitigation).

Dredging volumes and the associated costs and potential effects were substantially less for the marine terminal design mitigation, option 8c1 and to a lesser extent for 8c. Option F also had lower construction costs that either 8c or 8c1 because of short construction length and avoiding deeper piling; however, this was offset by the higher dredging cost.

The marine terminal design mitigation does not require any dredging at the LNG carrier berth; therefore costs associated with dredging and disposal at sea will be reduced. However, construction of the marine terminal suspension bridge increase costs considerably (likely more than the cost savings of no dredging) and the cost of the construction of the design mitigation option is likely higher overall compared to the other options.

2.3.2.3 Preferred Alternative

The marine terminal design mitigation, although more costly than other options, is the preferred option due to reduced potential effects of the Project on the environment.

2.3.3 Alternatives to Disposal at Sea

Marine sediment excavated during any dredging activities needs to disposed of. PNW LNG currently anticipates that approximately 200,000 m^3 of marine sediment will need to be disposed of from dredging for construction of the MOF.

2.3.3.1 Feasibility of Alternatives

Feasibly criteria for disposal at sea of dredged sediments were:

- Disposal capacity feasibility
- Environmental feasibility of disposal.

Terrestrial disposal and disposal at sea were considered for disposal of dredged marine sediment. Potential effects on the Marine Resources VC are relevant to the environmental feasibility of disposal at sea. Concerns with salinity makes terrestrial disposal of marine sediment problematic. Terrestrial disposal of marine sediment can result in effects on groundwater, surface water, vegetation and wetlands, and terrestrial wildlife.

2.3.3.2 Preferred Alternative

Disposal at sea is considered the only feasible option for disposal of marine sediments from dredging. If other viable alternatives can be identified, they will be preferred over disposal at sea.

2.4 RESPONSES TO THE OUTSTANDING INFORMATION REQUESTS

This section responds to the request for Outstanding Information received from the CEA Agency on August 14, 2014.

2.4.1 Introduction and Project Description Information Request #1

2.4.1.1 Government of Canada – Outstanding Information

Agency: T*he site selection process does not need to be repeated but rather the information and analysis should be updated to reflect the current project design. Currently, it is not clear from the analysis why the Lelu Island location is the preferred alternative based on the information presented in Chapter 2.4.5 of the EIS. A clear description of the proponent's analysis in conducting the alternatives assessment, including consideration of technical, economic and environmental aspects, is required to support the rationale for why the proposed site location is the preferred alternative.*

2.4.1.2 Response

Updates to the design of the marine terminal have resulted in changes to the marine terminal design and to the dredge volumes for the Project. The new design has a trestle length of 2.7 km which does not require dredging. Dredging is still required for the MOF. The new dredging volume is 790,000 m^3, including approximately 200,000 m^3 of marine sediment to be disposed of at sea. These project design changes do not affect the selection of Lelu Island, Port Edward for construction of the Project.

Section 2.3.1 (Alternative Project Site Locations) provides a detailed description of the alternative site analysis that was conducted, including technical and economic considerations and potential for environmental effects. Table 2-7 summarizes the main points that were considered.

2.4.2 Introduction and Project Description Information Request #3

This section and Figure 2-4 respond to the request for Outstanding Information received from the CEA Agency on August 14, 2014.

2.4.2.1 Government of Canada – Outstanding Information

Agency: T*he depths at the alternative disposal sites vary considerably. Please indicate the minimum/maximum depth range that was considered when identifying a candidate site. The size of a disposal site must consider the total volume of material proposed for disposal. Please provide additional information on why the site boundaries were based on depth contours rather than a consideration of the size required to accommodate the proposed disposal volume. In addition, please identify the Zone of Siting Feasibility that was used to consider alternative disposal sites (i.e., how big was the area that was examined?).*

2.4.2.2 Response

The minimum depths considered when identifying candidate sites were 150 m. No maximum depths were considered.

Following redesign of the Project and additional engineering studies, the total volume of material for disposal is 200,000 m^3. Table 2-7 provides the estimated disposal volumes available at each of the alternative disposal sites considered in the assessment. The estimated disposal volumes are based on 100 m raster grid bathymetry data from the BC Marine Conservation Analysis. Depth contours were used to initially identify potential disposal sites that would limit effects on surrounding topography, and would contain sediment within a deep area. After initial identification, depth and area were used as proxies for potentially available disposal volumes in the EIS, as detailed bathymetry of the sites was not available at the time of the assessment of alternatives. Each of the four sites identified in the EIS that were considered feasible has sufficient capacity to accept disposal of the sediment that was proposed to be disposed of at sea. With the design mitigation which has reduced the volume of sediment for disposal at sea to 200,000 m^3, seven sites are now feasible, based solely on dredge volume.

Table 2-7 Estimated Disposal at Sea Capacities at Potential Alternative Disposal Sites

Site No.	Alternative Disposal at Seas Sites Considered in the EIS	Estimated Disposal Capacity (m^3)	Site Feasibility as Determined in the EIS	Site Feasibility based on 200,000 m^3 Disposal Volume	Updated Site Feasibility
1	Offshore Coast Island	415,554	Not feasible	Feasible	Not feasible
2	Offshore from Barrett Rock	11,402	Not feasible	Not feasible	Not feasible
3	Southwest Kinahan Islands	29,012,378	Feasible	Feasible	Feasible
4	Northwest Kinahan Islands	3,508,128	Not feasible	Feasible	Not feasible
5	Southwest corner of PRPA boundaries	10,007,350	Feasible	Feasible	Feasible
6	North Porcher Island	20,588	Not feasible	Not feasible	Not Feasible
7	Between Rachael Islands - Gull Rocks	3,227,980	Not feasible	Feasible	Not feasible
8	Stephens Island	10,616,555	Feasible	Feasible	Feasible
9	Brown Passage	42,731,097	Feasible	Feasible	Feasible

Though Sites 1, 4, and 7 are considered feasible based on disposal volume alone, due to other factors they are considered not feasible overall. Sites 1 and 4 are close to or overlap a shipping lane; as such these sites were considered not feasible because that would pose hazards to, or interfere with, navigation. Site 7 was deemed not feasible because of the potential for the disposal sediment plume to affect rock fish conservation areas.

The Zone of Siting Feasibility used to consider the nine alternative disposal sites is approximately 35 km from Lelu Island (see Figure 2-4).

2.5 FIGURES

Please see the following pages.

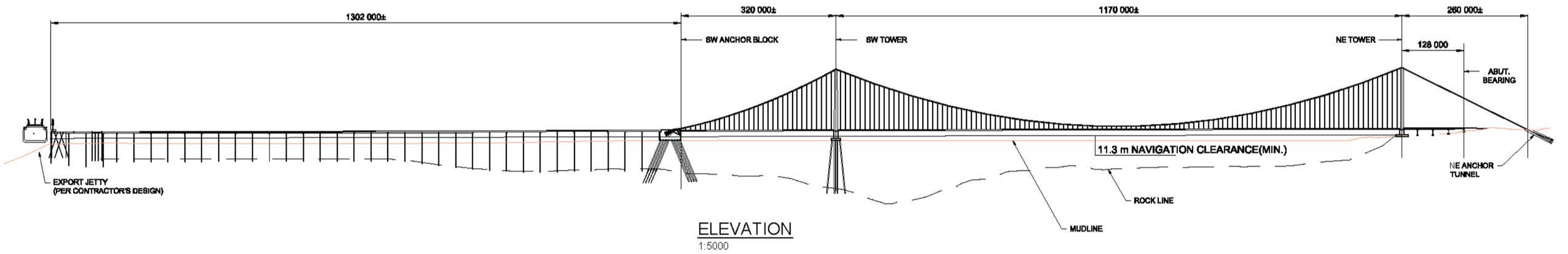
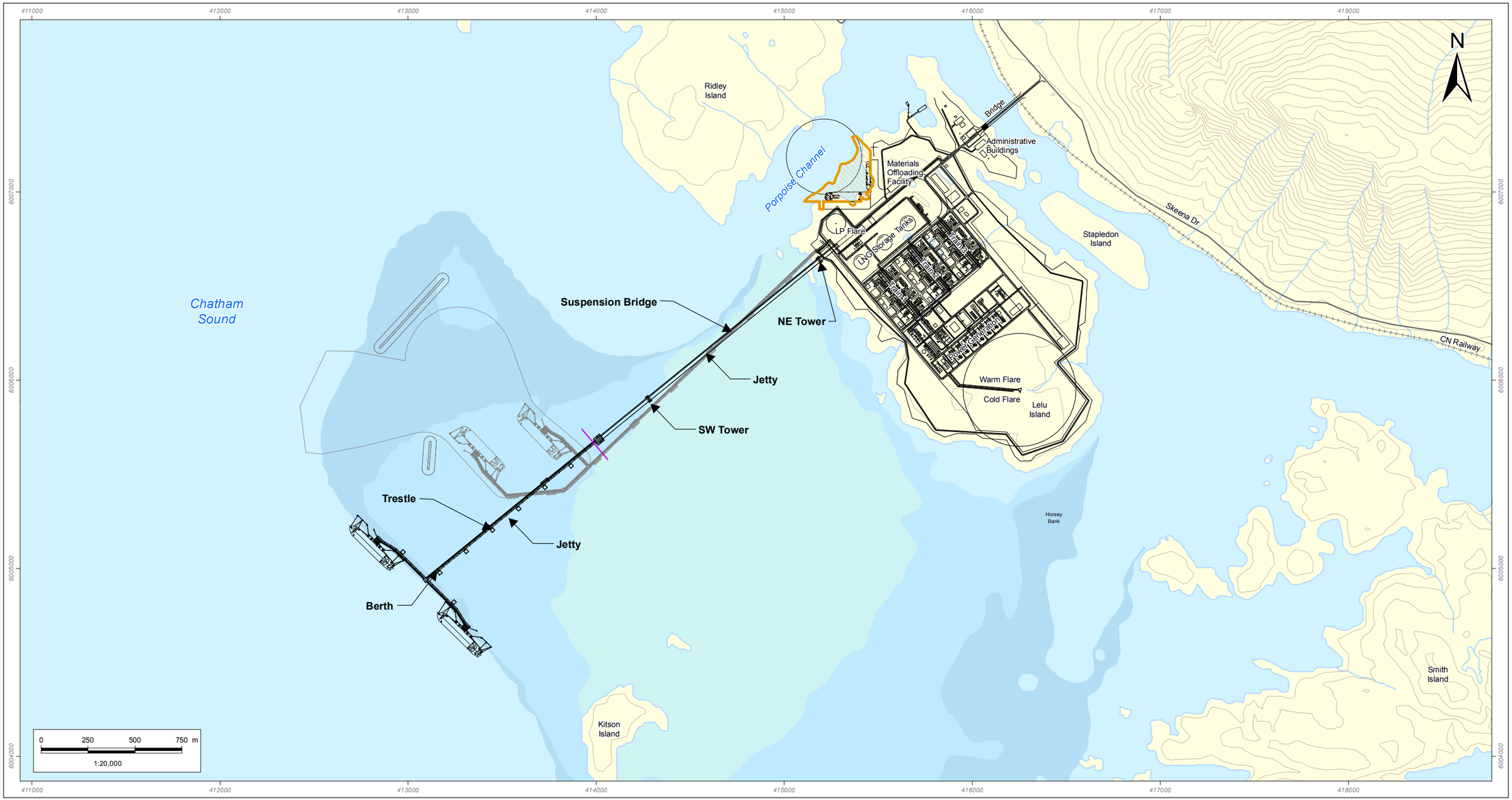


Figure 2-1 Marine Terminal (suspension bridge, trestle and berths)



Contour (m)
Marine Terminal Design Mitigation
Marine Terminal Design submitted in the EIS
Railway
Secondary Road
Watercourse
Dredge Boundary
Waterbody
Agnew Bank
Flora Bank
Horsey Bank

Pacific NorthWest LNG

Marine Terminal Design Submitted in the EIS Compared to the Design Mitigation

EIS ADDENDUM

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.

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

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FIGURE ID: 123110537-804	DATUM: NAD 83	CHECKED BY: A. POMEROY

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **2-2**

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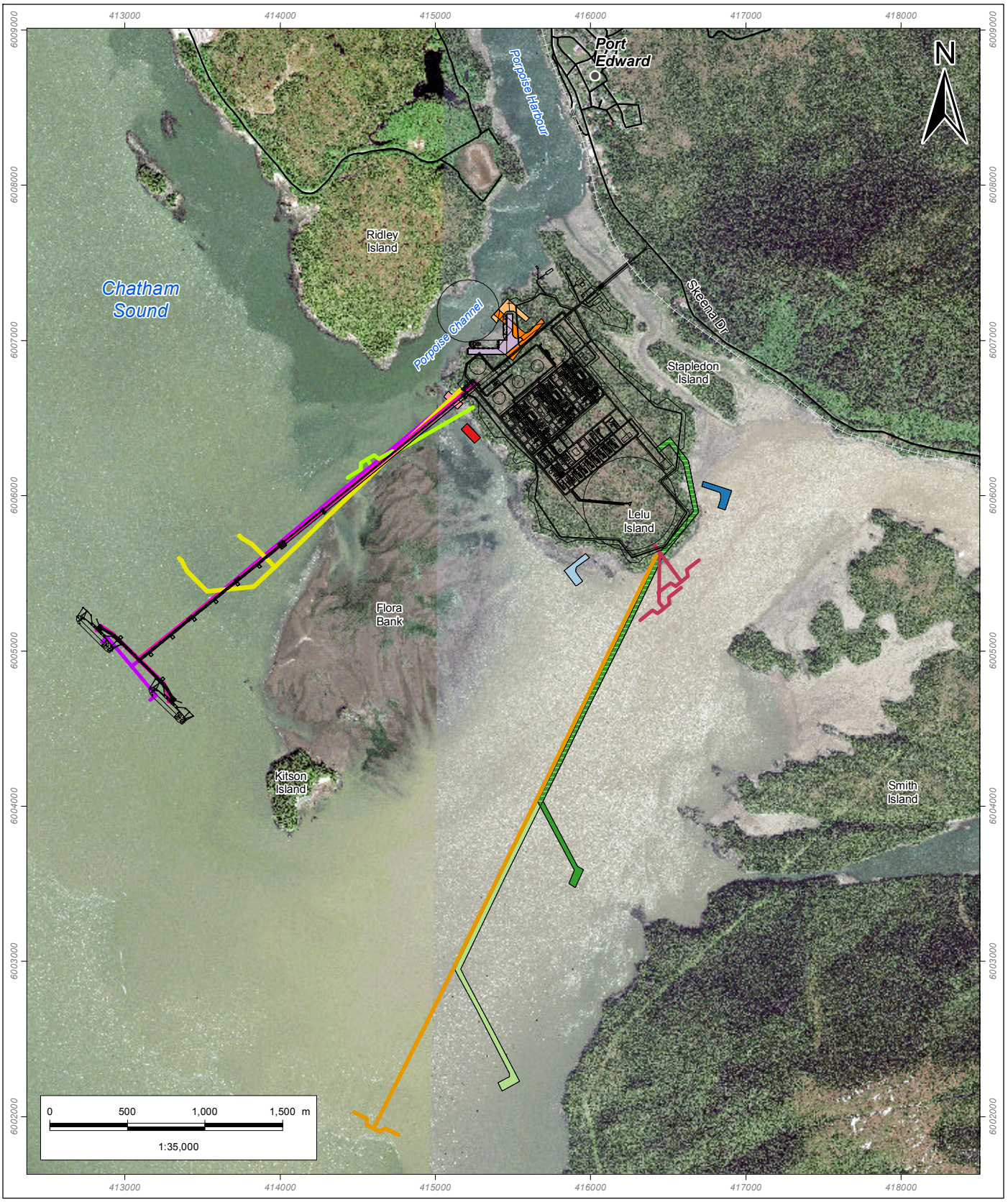

Materials Offloading Facility (MOF) Options

- 1
- 2
- 3
- 4
- 6
- 6a
- 8b
- 8b1
- 8c, F

Proposed Trestle and Berth Options

- 1
- 2, 3, 4, 6, 6a
- 8b, 8b1
- 8c
- Design Mitigation
- F

- City or Town
- Project Component
- Road

Pacific NorthWest LNG

Alternatives for Placement of Marine Infrastructure

EIS ADDENDUM

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.

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.

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DRAWN BY: K. POLL	CHECKED BY: B. BYRD

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **2-3**

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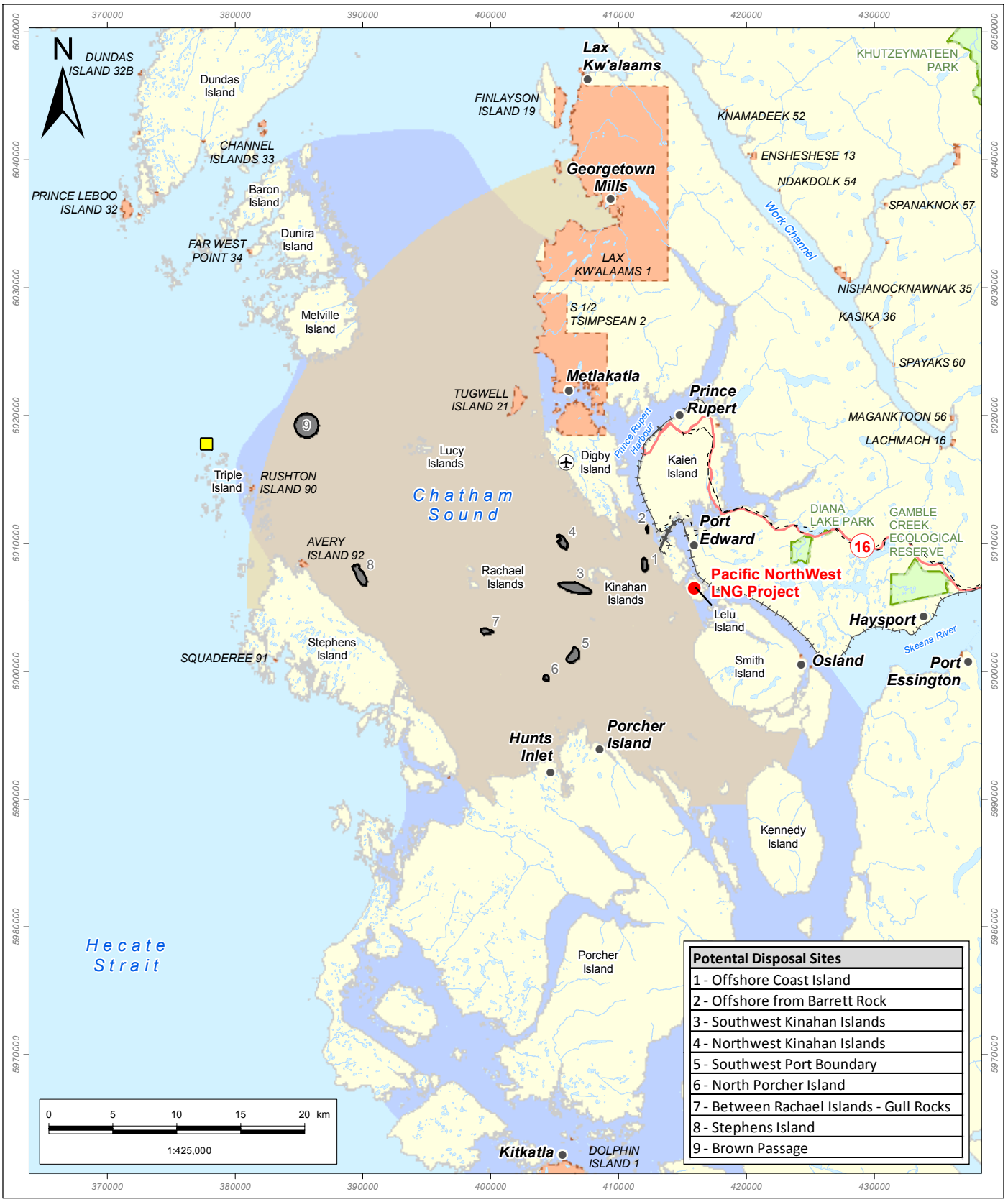

Potental Disposal Sites
1 - Offshore Coast Island
2 - Offshore from Barrett Rock
3 - Southwest Kinahan Islands
4 - Northwest Kinahan Islands
5 - Southwest Port Boundary
6 - North Porcher Island
7 - Between Rachael Islands - Gull Rocks
8 - Stephens Island
9 - Brown Passage

- Project Location
- Disposal at Sea Location
- Zone of Siting Feasibility
- Airport
- City or Town
- Pilotage Station
- Electrical Power Transmission Line
- Highway or Road
- Railway
- Watercourse
- Indian Reserve
- Protected Area
- Skeena Estuary
- Waterbody

Pacific NorthWest LNG

Zone of Siting Feasibility for Disposal at Sea

EIS ADDENDUM

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

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: 24-NOV-14	PROJECTION: UTM - ZONE 9
FIGURE ID: 123110537-383	DATUM: NAD 83
DRAWN BY: A. BOONE	CHECKED BY: B. BYRD

PREPARED BY: Stantec

PREPARED FOR: Pacific NorthWest LNG

FIGURE NO: **2-4**

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