

KITIMAT LNG TERMINAL PROJECT

ASSESSMENT REPORT

With Respect to
Review of the Application for an Environmental Assessment Certificate
Pursuant to the *Environmental Assessment Act*, S.B.C. 2002, c. 43

and

COMPREHENSIVE STUDY REPORT

With Respect to
The Requirements of a Comprehensive Study
Pursuant to the *Canadian Environmental Assessment Act*, S.C 1992, c. 37

April 13, 2006

Prepared by

Environmental Assessment Office

And

**Transport Canada
Environment Canada
Indian and Northern Affairs Canada**

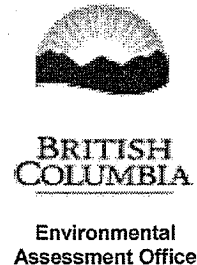


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PART A - GENERAL REVIEW BACKGROUND

1. INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This Report has been collaboratively prepared as a common basis for a provincial Assessment Report and a federal Comprehensive Study Report (CSR) on a proposal by Kitimat LNG Inc. (Proponent) to construct and operate facilities for liquefied natural gas receiving, storage, gasification and send-out, including a marine terminal facility and connecting road and pipelines, on a site along Douglas Channel, approximately 14 km south of Kitimat, BC (see Figure 1).

A preliminary project description was reviewed by the BC Environmental Assessment Office (EAO) in July 2004. On the basis of this information, the EAO identified reviewable project triggers under the BC *Environmental Assessment Act* (BCEAA) and confirmed that the proposed Project required a provincial environmental assessment.

A preliminary project description was reviewed by the Canadian Environmental Assessment Agency (CEA Agency) and interested federal agencies in September 2004. The *Canadian Environmental Assessment Act* (CEAA) triggers and potential federal Responsible Authorities (RAs) were identified as: a possible subsection 5(1) approval pursuant to the *Navigable Waters Protection Act* from Transport Canada; a possible subsection 35(2) authorization pursuant to the *Fisheries Act* from Fisheries and Oceans Canada (DFO); and a possible section 127(1) permit from Environment Canada under the *Canadian Environmental Protection Act, 1999*.

On August 18, 2004, the Proponent submitted an Application to EAO for an Environmental Assessment Certificate (Application) pursuant to the BCEAA, for the Kitimat LNG Terminal Project (Project), with a marine terminal and liquefied natural gas (LNG) facilities located at Emsley Cove. This Application also provided the basis of the information required under CEAA for the federal Comprehensive Study and report by the responsible authorities (RAs).

On December 19, 2005, the Proponent requested EAO, CEA Agency and RAs to undertake a more thorough assessment of an alternative site for the LNG terminal, specifically the Bish Cove (also referred to as Beese Cove) site, as a result of an agreement-in-principle signed with the Haisla First Nation that supports the location of the LNG facilities on Bees Indian Reserve No. 6 and the marine terminal in Bish Cove, should the EA confirm the acceptability of these sites. Additional information and assessment of the Bish Cove site is therefore provided in this joint provincial Assessment Report / federal CSR.

Should the LNG facilities be located on Bees Indian Reserve No. 6, the Proponent will require a lease from Indian and Northern Affairs Canada (INAC) under Section 53(1) (b) of the *Indian Act*, in order to use and occupy the upland. Consequently, INAC will have a CEAA Section 5(c) land trigger.

The purpose of a provincial Assessment Report is to:

- Briefly describe the Project;
- Report on the adequacy of the Proponent's public and First Nations consultations;
- Summarize the issues considered during the Application review;

- Report on whether the Application has considered and adequately addressed the Project's identified potential environmental, health, heritage, social and economic effects; and
- Identify the measures required to prevent or reduce to an acceptable level any adverse effects of the Project.

The purpose of a federal CSR is to:

- Identify the potential environmental effects of the Project, including the environmental effects of any accidents or malfunctions that may occur in connection with the Project and any cumulative effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
- Describe measures that are technically and economically feasible to mitigate any adverse environmental effects of the Project;
- Report on all public concerns raised in relation to the Project and how they have been addressed; and
- Based on the CSR and public comments, provide conclusions with respect to whether the Project is likely to result in significant adverse environmental effects.

A full listing of the factors to be considered in a comprehensive study is found in Section 2.4 of this Report.

1.2 PROVINCIAL AND FEDERAL ENVIRONMENTAL ASSESSMENT PROCESSES

1.2.1 Provincial Process and BCEAA Requirements

On September 14, 2004, EAO issued an order under section 10(1)(c) of BCEAA, designating the Project as reviewable and requiring the Proponent to obtain an environmental assessment certificate (Certificate) before proceeding with the Project. The Project was considered reviewable, pursuant to the BCEAA *Reviewable Project Regulation* (BC Reg. 370/02) because it includes:

- Proposed facilities with the capability to store energy that can yield by combustion ≥ 3 petajoules of energy; and
- A new natural gas processing plant facility that has the design capacity to process natural gas at a rate of ≥ 5.634 million m^3/day .

On March 30, 2005, EAO issued an order under section 11 of BCEAA outlining the scope, procedures and methods to be applied in the pre-Application and Application review stages of the assessment.

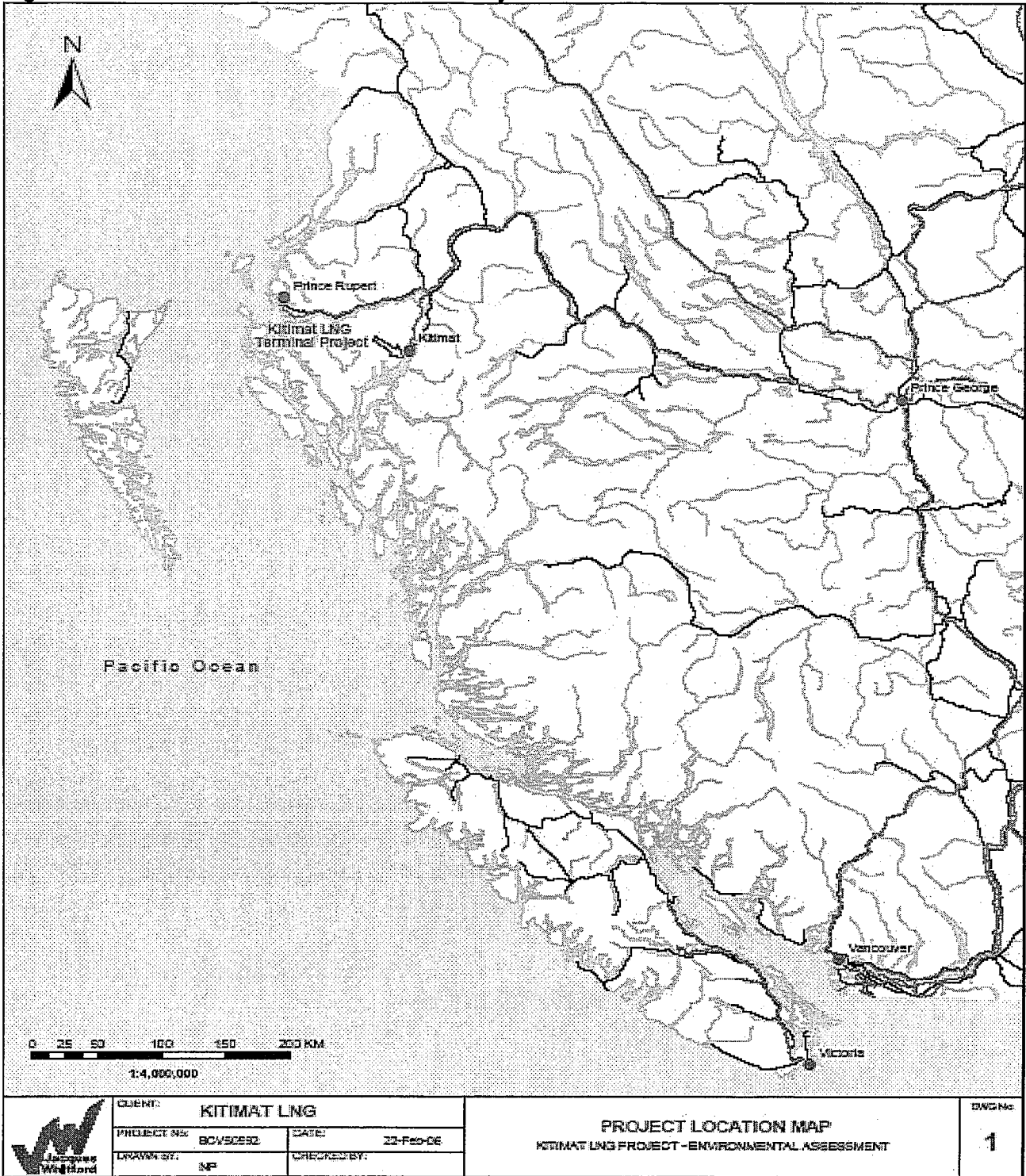
A Terms of Reference (TOR) for the Application was developed by the Proponent, with input from EAO, federal and provincial agencies, local governments and Haisla. The TOR was approved by EAO on April 13, 2005, as fulfilling the information requirements of EAO pursuant to section 16(2) of BCEAA. Federal agencies provided conditional support at that time, pending the outcome of a public review of the proposed scope of the review, as required under CEAA and final confirmation by the federal Minister of Environment of the appropriate level of review.

On April 15, 2005, the Proponent submitted an Application to EAO. The Application was screened against the Approved Terms of Reference (ATOR) for the Application, and accepted by EAO with minor revisions on June 6, 2005.

On June 14, 2005, EAO issued an order under section 13 of BCEAA amending the scope of the Project as described in the order under section 11. This amendment was necessary to accommodate

changes to some of the Project components that had been made during the development of the Application.

Figure 1. Location of Kitimat LNG Terminal Project Area



On December 30, 2005, EAO issued another section 13 order to accommodate a more detailed assessment of Bish Cove as part of the Project review, and to confirm that the shoreline modification associated with locating the marine terminal at Bish Cove constitutes an additional trigger under the *BCEAA Reviewable Project Regulation* (BC Reg. 370/02).

1.2.2 Federal Process and CEAA Requirements

Application of CEAA

Under subsection 5(1) of the *Canadian Environmental Assessment Act*, a federal environmental assessment (EA) will be required when, in respect of a project, a federal authority, for the purpose of enabling the project to be carried out in whole or part:

- Is the proponent;
- Makes or authorizes payment or any other form of financial assistance to the proponent;
- Sells, leases or otherwise disposes of lands; or
- Issues a permit, or license or other form of approval pursuant to a statutory or regulatory provision referred to in the *Law List Regulations*.

These planned actions of federal authorities are commonly called “triggers.” In the case of the Kitimat LNG Terminal Project, there are federal approvals required that are listed on the *Law List Regulations* which trigger a federal environmental assessment under CEAA.

A Comprehensive Study (CS) under CEAA is required when a proposed project meets at least one of the requirements in the *CEAA Comprehensive Study List Regulations*. The CS process requires preparation of a “project scoping document” that is distributed to the public for formal review and comment, in order to obtain input on the proposed scope of the project for the purpose of the EA, the factors proposed to be considered, the proposed scope of those factors, and the ability of the CS process to address the issues related to the project. A report is then made by the RAs to the federal Minister of Environment, who determines whether the assessment will continue as a comprehensive study, or whether the assessment will be referred to a mediator or a review panel.

After completion of the project review, a CSR is prepared and distributed for public comment. Upon completion of public review, public comments are forwarded to the federal Minister of Environment to be considered in a decision.

The Minister of Environment reviews the CSR and any public comments filed in relation to its contents. If the Minister is of the opinion that additional information is necessary or actions are needed to address public concerns, the Minister may request the RAs to address these concerns. Once these concerns are addressed, the Minister issues an environmental assessment decision statement that includes:

- The Minister’s opinion as to whether the Project is likely to cause significant adverse environmental effects; and
- Any additional mitigation measures or follow-up program that the Minister considers appropriate.

The Minister then refers the project back to the RAs for a course of action or decision.

If it has been determined that the project is not likely to cause significant adverse environmental effects, an RA may exercise any power or perform any duty or function that would permit the project, or part of the project, to be carried out, such as issuing a permit or authorization.

Application of CEAA to the Kitimat LNG Terminal Project

For the EA of the Project, Transport Canada (TC), DFO, and Environment Canada (EC) were initially identified as RAs as they will be required to issue statutory or regulatory approvals noted on the *Law List Regulations* under CEAA for various aspects of the Project. As a result of the Proponent's December 19, 2005 request for a more thorough assessment of Bish Cove for the marine terminal and plant site, INAC was also identified as an RA. The specific powers, duties or functions of the RAs with respect to the Project are outlined in detail in section 3.1.

TC, EC and INAC determined that the scope of project meets the requirements of the paragraph 13(d) of the *Comprehensive Study List Regulations*, because it proposes to "construct a facility for the liquefaction, storage or regasification of liquid natural gas, with a liquefied natural gas processing facility of more than 3,000 tonnes /day or a liquefied natural gas storage capacity of more than 50,000 tonnes."

For the purposes of this CS, there are three RAs including: TC, EC and INAC. The conclusions of those three RAs are outlined in this Report. In reaching those conclusions, the RAs received specialist advice from the following expert federal authorities: DFO and Health Canada (HC).

For the Project, the RAs, in conjunction with the CEA Agency, prepared the Comprehensive Study Scoping Document for the Kitimat LNG Inc. Proposed Liquefied Natural Gas (LNG) Terminal at Kitimat, British Columbia, and advertised its availability for public review. The 30 day public review period ended on May 25, 2005. The ensuing report to the Minister of Environment led to confirmation, on November 2, 2005, that the environmental assessment under CEAA would continue as a comprehensive study.

1.2.3 Fisheries and Oceans Canada (DFO) Screening

DFO determined that they would likely be required to exercise regulatory decision making authority under s.35(2) of the *Fisheries Act* in regard to some components of the Kitimat LNG Terminal development proposal that could result in the harmful alteration, disruption, or destruction of fish habitat.

As an RA, DFO determined, based on its anticipated CEAA triggers, the issuance of authorizations under s.35(2) of the *Fisheries Act*, that the scope of project for the purposes of DFO's environmental assessment would be the construction and operation of the following:

- The shoreline LNG tanker berthing and uploading jetty;
- The separate tug boat berth; and
- Potential watercourse crossings associated with the following components:
 - the approximately 13-18 km send-out gas pipeline;
 - the 3 approximately 13-18 km NGL product pipelines; and
 - the upgrading and extension of the access road.

As none of these components were on the CEAA Comprehensive Study List Regulations, DFO is conducting a screening pursuant to the CEAA.

DFO supports the implementation of a single federal process allowing all RAs to fulfill their respective obligations pursuant to CEAA, and will therefore use the documentation generated for the comprehensive study and provincial EA process to inform its screening level environmental assessment.

DFO is an expert federal authority for the CS process and has been engaged in the review of the Application and the preparation of this joint provincial Assessment Report and federal Comprehensive Study Report.

1.2.4 Harmonized Review

The Canada - British Columbia Agreement for Environmental Assessment Cooperation (2004) provides for coordinated environmental assessment processes to avoid uncertainty and duplication between the provincial and federal environmental assessment processes and to facilitate a “one project – one review” approach when both processes are triggered.

The harmonized assessment of the Project was conducted in accordance with the Agreement, through a joint federal-provincial work plan. The provincial Environmental Assessment Office (EAO) and the federal Canadian Environmental Assessment Agency (CEA Agency) provided a coordination role for the EA process. The EAO role is to neutrally administer and manage environmental assessments, and the powers and responsibilities of that office. Likewise, the CEA Agency, as the Federal Environmental Assessment Coordinator, is the principal point of contact for federal authorities during the assessment process, consolidating information requirements for the assessment as well as coordinating the actions of federal authorities with those of the EAO.

This Report is a collaborative effort intended to provide a common basis for an Assessment Report under BCEAA and a CSR under CEAA. It captures the process followed; issues raised, potential effects and the Proponent’s proposed mitigation measures for the purposes of both federal and provincial review, and will be the common basis for federal and provincial environmental assessment decisions. The provincial Minister of Environment and the Minister of Energy, Mines and Petroleum Resources will use this Report and other accompanying materials as the basis for a decision on issuing an environmental assessment certificate under BCEAA.

The federal RAs and expert federal authorities (FAs) have participated in the development of this Report and are satisfied with its conclusions. However, a final federal determination and conclusion of whether the Project is likely to cause significant adverse environmental effects will be made by the Minister of the Environment in a federal environmental assessment decision statement.

2. PROJECT DESCRIPTION AND SCOPE OF REVIEW

2.1 PROPONENT INFORMATION

The Proponent, Kitimat LNG Inc. (Kitimat LNG) is a subsidiary of Galveston LNG Inc. of Calgary, Alberta. Galveston LNG is a private company established in 2004, and focused on the development of liquefied natural gas (LNG) and related facilities within North America.

Kitimat LNG Inc. is dedicated to the development and operation of the proposed Kitimat LNG Project. Galveston’s other subsidiary company, LNG Impel, is an LNG marketing and trading company with key responsibility to secure supply and markets for the Project.

2.2 PROJECT DESCRIPTION

The purpose of the LNG¹ import terminal is to receive and store LNG unloaded from tankers, regasify the LNG into natural gas and deliver natural gas via a 14 to 18 km send-out pipeline lateral to Kitimat. The Project facilities will consist of a berth for the LNG tankers, an LNG terminal containing a process area, storage tank/containment area and a natural gas send-out pipeline lateral. The Proponent proposes to construct and operate the facilities for LNG receiving, storage, gasification and send-out, with the associated marine docking facility and connecting roads and pipelines, on a site along Douglas Channel, approximately 14 km south of Kitimat, BC. The Project area is shown in **Figure 1** and the location of key Project components is shown in **Figure 2**. The Proponent has provided information for the assessment of the Project at both Emsley Cove and Bish Cove, which are approximately 3.1 km apart along the north shore of Kitimat Arm.

All Project components are located within the asserted traditional territory of the Haisla First Nation and within the District Municipality of Kitimat. Both Emsley Cove and Bish Cove are designated for industrial use in the Kalum Land and Resource Management Plan (May 2002). The Haisla have designated Bees IR No. 6 for commercial industrial use. This was done pursuant to the *Indian Act*, and Privy Council Order 1997-1052 accepts the designation by the Haisla and gives effect to terms and conditions that apply to the use of the reserve as set out in the designation. Use for an LNG facility would be consistent with the designated uses.

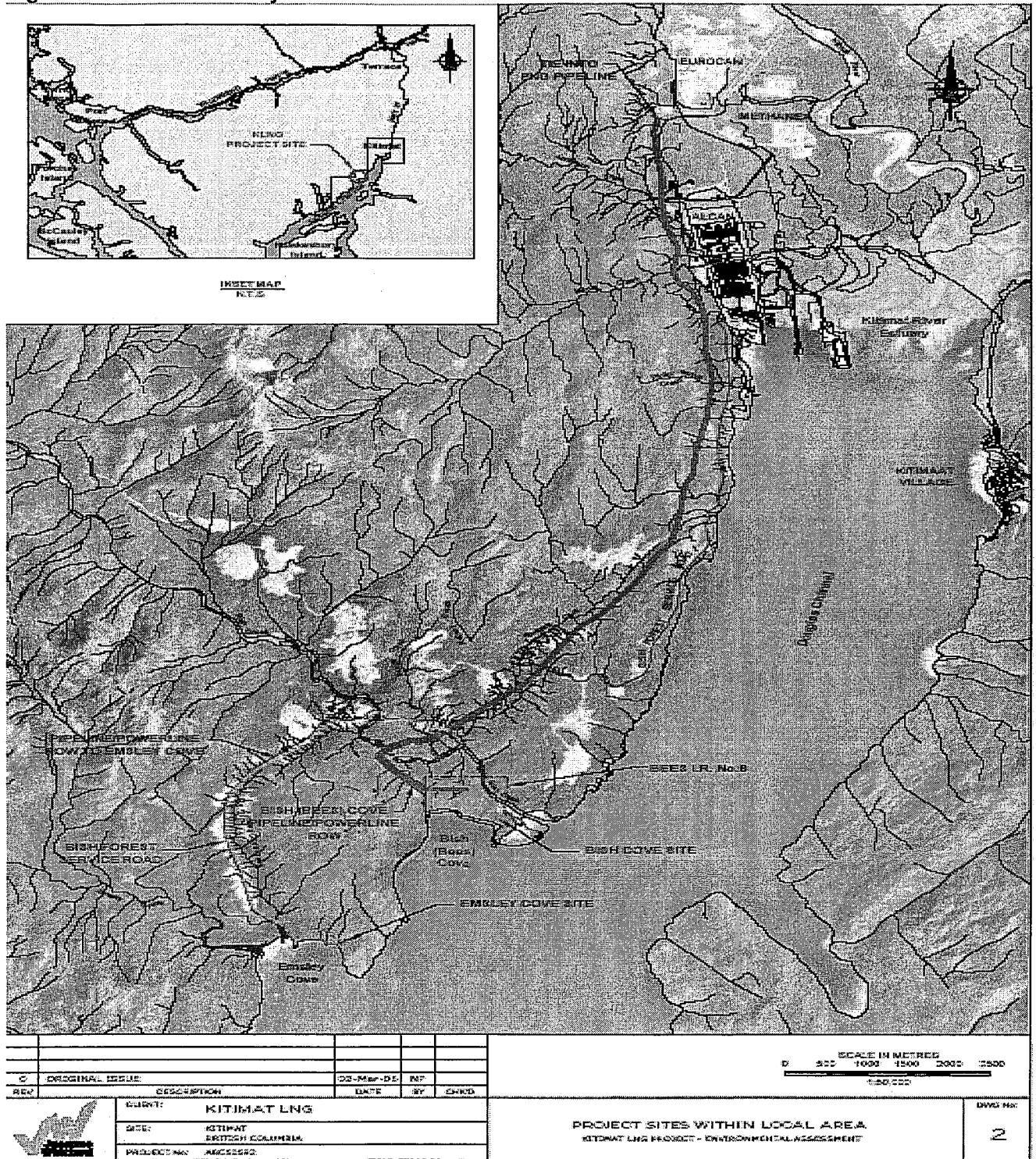
The marine and land-based facilities have been designed for a Project lifespan of approximately 25 years. There are no provisions for bunkering fuel for LNG tankers.

The major components of the Project are:

- The marine terminal facilities (including the construction and operation of the shoreline LNG tanker berthing and uploading jetty, the tug boat berth and barge jetty, and related LNG tanker operations in the vicinity of the terminal and at berth and dredging activities and potential disposal of dredged materials at sea if required);
- The upland facilities including the LNG storage tanks and natural gas liquids (NGL) separation unit;
- The lateral pipelines, access road, road upgrades, and aerial transmission line, extending between the LNG import terminal and the Pacific Northern Gas (PNG) pipeline, and;
- Ancillary facilities and activities.

¹ LNG is natural gas, consisting primarily of methane, cooled to minus 160° Celsius, which condenses the gas to a liquid at atmospheric pressure, and which reduces its volume by a factor of 600.

Figure 2. Kitimat LNG Project Sites within Local Area



2.2.1 Marine Facilities/Activities

LNG for the project will be transported by LNG carriers (tankers) from Pacific offshore countries to the Project site via Douglas Channel. The marine-based portion of the Project will include a construction barge loading and tug berth facility, as well as a terminal for the offloading of LNG tankers. The marine terminal has been designed to handle LNG carriers up to 250,000 m³ capacity, although existing carriers do not exceed 160,000m³. The marine terminal facilities would cover an area of approximately 0.75 ha of water and foreshore area at Emsley Cove and 2 ha at Bish Cove (see **Figures 3 and 4**). A minimum water depth of 14.5 m below chart datum at the LNG tanker berth will be maintained to provide safe underkeel clearances for the anticipated range of LNG tankers. The elevation of the berth platform takes into account tidal variations and waves, including locally induced or remote tsunamis. The marine facilities would require an estimated 9,000 m³ of dredging and excavation (mostly rock) for an Emsley Cove location, but none at Bish Cove due to the intended use of a vibro-densification process which strengthens and stabilizes marine sediments for foundation purposes through the piped injection of gravel columns at closely spaced intervals. Vibro-densification will disturb an estimated 2 ha of seabed in Bish Cove.

2.2.2 Land Facilities/Activities

The land terminal will contain facilities to move the LNG from ships to containment tanks via an elevated pipe rack. Two full containment tanks, each having an operating capacity of 160,000 m³ will be constructed at the terminal with provisions made for construction of the third tank in the future.

The LNG will be regasified using submerged combustion vapourizers (SCVs), and the plant will have a send-out capacity of up to one billion standard cubic feet per day (1Bscfd). Seven SCVs, operating in parallel, are required for the initial send-out capacity. One standby vapourizer is also provided in the event of an unexpected shutdown. The fuel gas for the vapourizers is drawn from the natural gas discharge of the vapourizers. When rich LNG is supplied to the terminal, ethane may be added to the natural gas to fuel the SCVs.

The LNG facility has been designed to receive LNG from different suppliers; therefore, some of the LNG batches received may have a higher heating value (Btu content) than the pipeline specification. In order to control the heating value of the send-out gas, a natural gas liquid separation plant has been included in the facility design. Natural gas liquid products will be separated out from the LNG for removal by three separate pipelines. Internal roads and infrastructure will be included in the terminal footprint. The land-based portion of the LNG terminal would have a larger overall footprint if located at Bish Cove due to soils and terrain (approximately 47 ha at Bish Cove and 30 ha at Emsley Cove).

2.2.3 Pipelines, Roads, and Transmission Lines

Natural gas will be transported from the terminal via a pipeline lateral to connect with the Pacific Northern Gas (PNG) pipeline located in Kitimat. The PNG line will send the natural gas to Duke Energy's existing Westcoast Energy Mainline gas transportation system. The pipelines associated with the Project are as follows: one 30 inch diameter natural gas send-out pipeline lateral, one 6 inch diameter ethane pipeline lateral, one 6 inch diameter propane pipeline lateral, and one 6 inch diameter butane pipeline lateral. All 4 pipelines will share the same 30 m ROW. The 3 NGL pipeline laterals will be constructed in a single trench while the natural gas pipeline lateral will be constructed in its own trench. The design discharge pressure from the vapourizers is 1,450 pounds per square inch gauge (psig). At this pressure, the 30 inch diameter pipeline lateral is adequate for delivering the send-out capacity to the Kitimat tie-in to the PNG pipeline. The pipeline lateral has been designed for continuous operation with an initial send-out capacity of 610 million standard cubic feet per day

(MMscfd). Provisions have been made for the possibility of 1 billion standard cubic feet per day (Bscfd) send-out capacity in the future.

For an Emsley Cove facility, the proposed lateral will be approximately 18 km in length and routed northeast from the LNG terminal, following the natural terrain and the existing Bish Creek Forest Service Road (FSR). There will also be three natural gas liquids (NGL) product lines in the pipeline lateral right-of-way. For a Bish Cove facility, the total length of pipelines is approximately 13.7 km, and also routed in parallel with an access road and the Bish FSR.

The LNG terminal will require an access road linking the terminal site to the existing Bish Forest Service Road (FSR). If the plant site is located at Emsley Cove, the length of this access road is anticipated to be approximately 800 m. The proposed access road from a plant site at Bish Cove to the Bish FSR is 2.3 km in length (see **Figure 2**). This access road will be a high grade gravel road and will require a 30 m wide ROW. This ROW of the existing forestry road will be 30 m wide as well.

The Bish FSR is within Tree Farm License (TFL) 41, owned by West Fraser Mills Ltd., and will require upgrading and maintenance to its crossing of Bish Creek through agreements between the Proponent and West Fraser Mills. An upgrading of the Bish FSR from its Bish Creek crossing to its western terminus would be required for an access road built to Emsley Cove (see **Figure 2**).

A 287 kV aerial transmission line will also be constructed by BC Hydro parallel to the Bish FSR, and plant access road to supply power to the LNG plant site. The transmission line will extend from Kitimat to Emsley or Bish Cove, with an anticipated width of 15 m. A step down transformer is required and will be located within the fence line of the terminal.

2.2.4 Ancillary Facilities and Activities

In addition to the process equipment the following will be required:

- Various supporting utilities and safety systems required for safe operation of the terminal;
- On-site infrastructure (roads, car park, fencing, and buildings), including:
 - control room;
 - maintenance/warehouse building;
 - compressor building;
 - generator building;
 - vapourizer building;
 - medium pressure pumps building;
 - high pressure pumps building;
 - motor control building;
 - utility building;
 - indoor parking building;
 - berth control room; and
 - gate house
- Emergency power generation facilities;
- Concrete batching plant during construction; and
- Hazard detection and control systems

The administration offices for Kitimat LNG will be located in rented premises in Kitimat.

Figure 3. Proposed Emsley Cove terminal layout.

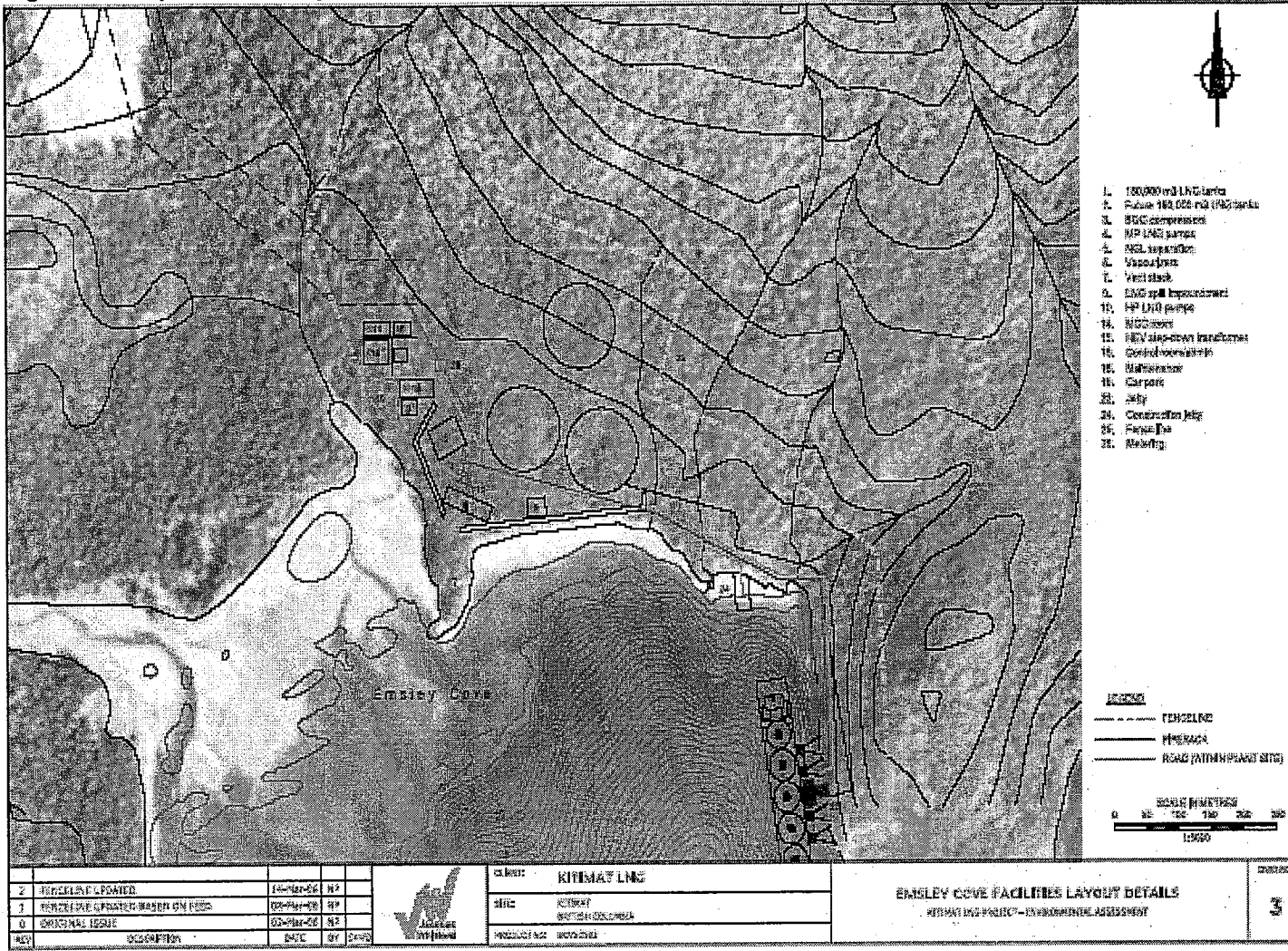
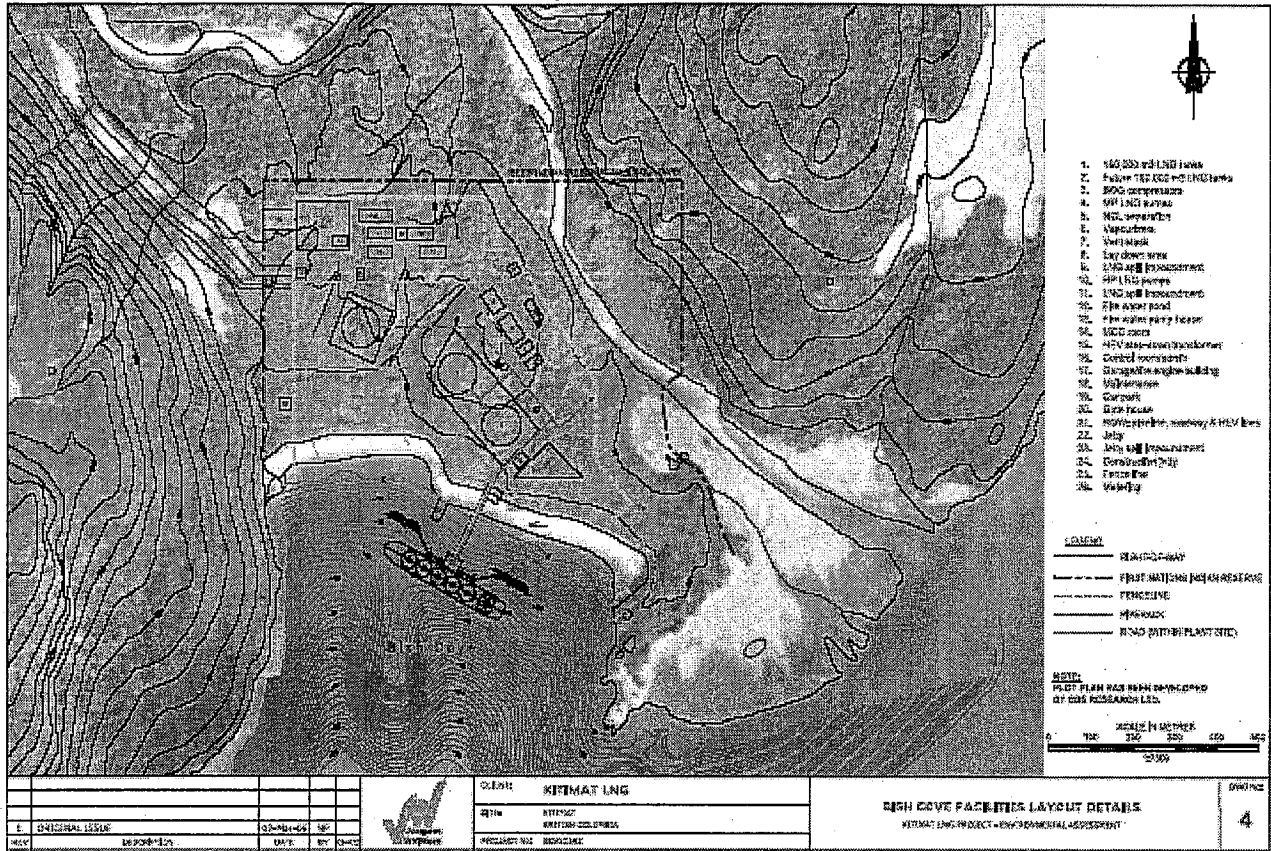


Figure 4. Proposed Bish Cove terminal layout.



The proposed LNG terminal will require a potable water source during construction and its operational lifetime. During operation, this requirement will be met with an in-plant well. During construction, potable water may need to be trucked from Kitimat, prior to establishment of the well. The largest fresh water requirement will occur prior to commissioning during hydrostatic testing of the LNG tanks and pipeline laterals. Approximately 100,000 m³ of water will be required for this task. This water will not be taken directly from the local fresh water environment.

2.3 CAPITAL COSTS AND EMPLOYMENT

Capital cost of the Project, including the pipeline lateral and infrastructure, is estimated at approximately \$700 million CAD (2005\$). The Project is expected to create approximately 700 jobs during construction and 50 jobs during normal operations. Project construction is expected to take 30-36 months and to be completed by April 2009.

2.4 PROJECT SCOPE

The joint provincial-federal Application TOR, the provincial section 11 order², the provincial section 13 orders³, the federal-provincial work plan, and the Canadian Environmental Assessment Registry (CEAR) all set out the scope of the Project, for BCEAA and CEAA purposes.

The scope of the Project for the joint provincial Assessment Report / federal Comprehensive Study Report is the construction, operation, and decommissioning of the following on-site and off-site components and activities potentially associated with an LNG terminal at either Emsley Cove or Bish Cove:

Marine terminal facilities including:

- A shoreline LNG tanker berthing and unloading jetty and a separate tug boat berth;
- Related LNG tanker operations in the vicinity of the terminal and at berth;
- Berth for receiving materials and equipment during construction; and
- Dredging activities and potential disposal of dredged materials at sea if required.

Lateral pipelines, access road, road upgrades, and aerial transmission line, extending between the LNG import terminal and the Pacific Northern Gas (PNG) pipeline, including:

- A send-out gas pipeline (30 inch diameter, underground);
- Three NGL product pipelines (6 inch diameter, underground);
- Off-site facility access road and upgrades to the existing access road; and
- Aerial transmission line (287 kV supply from BC Hydro) and associated right-of-way.

Upland facilities including:

- LNG storage in three 160,000 m³ (operating volume) full containment LNG tanks;
- Pipe rack;

² On March 30, 2005, the provincial EAO issued an order under section 11 of BCEAA outlining the scope, procedures and methods to be applied in the pre-Application and Application review stages of the assessment.

³ On June 14, 2005 and December 30, 2005, the provincial EAO issued an order under section 13 of BCEAA amending the scope of the Project as described in the order under section 11 to accommodate changes to the Project.

- Natural gas liquids (NGL) separation unit;
- Vent stacks and re-condenser;
- Low pressure, medium pressure and high pressure LNG pumps;
- Submerged burner type LNG vaporizers;
- Vapour handling system, including boil-off gas compressors;
- Send-out impoundment; and
- Water supply piping (i.e. closed loop or intake/discharge, potable water).

Ancillary facilities and activities including:

- Various supporting utilities and safety systems required for safe operation of the terminal;
- On-site infrastructure (roads, car park, fencing, and buildings);
- Emergency power generation facilities;
- Concrete batching plant during construction; and
- Hazard detection and control systems.

Spatially, the environmental assessment applies to both Emsley and Bish Coves and includes the send-out pipeline, access road, road upgrades, and aerial transmission line, extending northwards from the LNG facilities and infrastructure to Kitimat. The geographic scope of the LNG shipping activities for the purpose of the assessment includes the waters encompassed within the Coves and extends out to the existing shipping lane.

The temporal boundaries will encompass the entire lifespan of the Project (expected to be approximately 25 years). The environmental assessment will discuss the effects of the Project in all phases, beginning with the construction phase and throughout the operations phase (including any maintenance and/or modifications) and where appropriate, through to the completion of the decommissioning phase.

2.5 SCOPE OF ASSESSMENT

The Application's Approved Terms of Reference (ATOR), the provincial section 11 order and the federal-provincial work plan all confirm the scope of assessment, for the purposes of BCEAA, as the consideration of the potential effects of the Project, including environmental, social, economic, health and heritage effects and potential effects on aboriginal interests, taking into account practical means of preventing or reducing to an acceptable level any potential adverse effects of the Project. Specifically, the assessment has considered air quality, visual quality, noise levels, freshwater and marine ecosystems, terrestrial ecosystems, wildlife, fisheries, vegetation, navigation, social, economic, cultural and heritage values.

For the purposes of CEAA, the scope of assessment defines the factors proposed to be considered in the environmental assessment and the proposed scope of those factors. The RAs are required to consider the factors specified in section 16 of the CEAA, taking into consideration the definitions of the environment, environmental effect and the project, prior to making a decision regarding whether to take action (e.g. grant funding, dispose of land, or issue a permit or authorization) that would permit the Project to proceed.

The factors considered in the environmental assessment, pursuant to section 16 of the CEEA, include the following:

- *the environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;*
- *the significance of the environmental effects referred to above;*
- *comments from the public that are received in accordance with the Act and the regulations; and*
- *measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project.*

Additional factors to be considered as part of the CSR include:

- *the purpose of the Project;*
- *alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means;*
- *the need for, and the requirements of, any follow-up program in respect of the Project; and*
- *the capacity of renewable resources that is likely to be significantly affected by the Project to meet the needs of the present and those of the future.*

As defined under CEEA, "environmental effect" means, in respect of a project:

- any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act*
- any effect of any change referred to in paragraph (a) on*
 - health and socio-economic conditions*
 - physical and cultural heritage*
 - the current use of lands and resources for traditional purposes by aboriginal persons, or*
 - any structure, site or thing that is of historical, archaeological, palaeontological or architectural significance, or*
- any change to the project that may be caused by the environment.*

In order to focus the environmental effects analysis, the Proponent identified components of the environment that are valued for traditional or contemporary use, economic reasons, and/or cultural/social reasons. The following Valued Components (VCs) were selected for this Project, based on consultations with First Nations, resource users, local communities, and government agencies (federal and provincial).

- Atmospheric Environment;
- Marine Environment;
- Freshwater Fish and Fish Habitat;
- Wildlife and Wildlife Habitat;
- Avifauna;
- Vegetation Resources;
- Archaeological and Heritage Resources;
- First Nations Communities and Land Use;
- Land and Resource Use (including commercial and recreational fisheries);
- Employment and Business;
- Community and Regional Infrastructure and Services; and
- Public Health and Safety.

The scope of the factors to be considered under CEAA is similar though not identical to that under BCEAA. Specifically, the federal environmental assessment did not consider Employment and Business and Community and Regional Infrastructure and Services. Both these VCs have been considered in this report under Communities and Economy.

In order to effectively assess the potential environmental effects of the Project, the spatial boundaries for VCs varied based on the spatial characteristics of the Project and various VCs. Part B of this Report provides details on the proposed scope of the factors to be considered under CEAA, including the spatial boundaries or areas applicable to each VC. These boundaries may extend beyond physical project limits, and even beyond the limits of potential direct interactions between the Project and the VCs, particularly in the case of migratory species, or regional or national socio-cultural and economic systems.

3. REQUIRED STATUTORY APPROVALS

3.1 FEDERAL APPROVALS

The following federal approvals, authorizations, permits and lease will be required for the proposed Project. As noted in section 1.2.2, at the conclusion of this environmental assessment the federal Minister of Environment will issue an environmental assessment decision statement. The federal departments will be able to proceed with their regulatory decisions if the Minister's environmental assessment decision statement indicates that, in the opinion of the Minister, the Project is not likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures:

- Construction of the proposed marine terminal will require an approval issued by Transport Canada under section 5(1) of the *Navigable Waters Protection Act*;
- Construction of the pipeline in a navigable stream may require an approval issued by Transport Canada under section 5(1) of the *Navigable Waters Protection Act*;
- Construction of a bridge across a navigable stream will require an approval issued by Transport Canada under section 5(1) of the *Navigable Waters Protection Act*;
- Any harmful alteration, disruption or destruction of fish habitat would require formal authorization from Fisheries and Oceans Canada (DFO) under Section 35 of the *Fisheries Act*;
- Disposal of any dredged material at sea will require a permit from Environment Canada (EC) under section 127(1) of the *Canadian Environmental Protection Act 1999* and
- Construction and operation of proposed LNG facilities and associated infrastructure on Bees IR No. 6 will require a lease granted by Indian and Northern Affairs Canada (INAC) under Section 53(1)(b) of the *Indian Act*.

With the exception of the lease requirement above, the above list relates to those federal statutory and regulatory approvals in the *CEAA Law List Regulations* under CEAA that require environmental assessments under CEAA if they enable a project to be carried out. There may be additional federal permit requirements for the Project that are not listed above.

3.2 PROVINCIAL APPROVALS AND CONCURRENT REVIEW OF PERMITS

In accordance with the September 14, 2005 section 10 order⁴ issued for the Project, no provincial authorizations, permits, tenures or licenses may be issued under any provincial statutes until the Project has received a Certificate from provincial ministers. In addition, the issuance of a Certificate does not guarantee that the necessary permits and authorizations will be granted, as the Project must comply with the requirements of the appropriate provincial regulatory agencies.

The “permitting stage” refers to the stage following an EA certificate decision in which approvals may be issued by regulatory agencies. Key provincial regulatory agency approvals required by the Project in the permitting stage are shown in **Table 1**.

Table 1. Key Provincial Agency Permitting Required for Kitimat LNG Terminal Project

Statute	Authorizing Agency	Purpose	Authorization Type
Land Act, Section 14	Oil and Gas Commission (OGC)	Gas processing facilities (at Emsley Cove)	2 year temporary occupation Permit
Forest Act and Forest Practices Code Act			Cutting Permit
Land Act, Section 39	OGC	Gas processing facilities (at Emsley Cove)	2 year Licence of Occupation
Land Act, Section 38	OGC	Gas processing facilities (at Emsley Cove)	30 year Lease of Crown land
Land Act, Section 14	Ministry of Agriculture and Lands (MAL)	Marine terminal facilities	2 year temporary occupation Permit
Land Act, Section 39			2 year Licence of Occupation
Land Act, Section 38	MAL	Marine terminal facilities	30 year Lease of Crown land
Land Act, Section 14	OGC	Hydro line	2 year temporary occupation Permit
Forest Act and Forest Practices Code Act			Cutting Permit
Land Act, Section 39	OGC	Hydro line	3 year Licence of Occupation
Land Act, Section 40	OGC	Hydro line	30 year Statutory Right-of-Way
Land Act, Section 14	OGC	Pipeline	2 year temporary occupation Permit
Forest Act and Forest Practices Code Act			Cutting Permit
Land Act, Section 39	OGC	Pipeline	3 year Licence
Land Act, Section 40	OGC	Pipeline	30 year Statutory Right-of-Way
Petroleum and Natural Gas Act	OGC	Road, new construction	Initial Approval under PNG Act

⁴ On September 14, 2004, EAO issued an order under section 10(1)(c) of BCEAA, designating the Project as reviewable and requiring the Proponent to obtain an environmental assessment certificate (Certificate) before proceeding with the Project.

Land Act, Section 39	OGC		20 year License of Occupation
Water Act, Section 8	OGC	Temporary withdrawal of fresh water for storage tank flushing; hydrostatic testing of the pipeline	Approval for Short Term Use of Water
Water Act, Section 7	Ministry of Environment (MOE)	Withdrawal of freshwater for plant use	Water licence
Water Act, Section 9	OGC	Stream crossings for road and pipeline upgrade and construction	Approval of Changes In and About a Stream
Environmental Management Act	OGC	Any emissions or other waste discharges from the facility	Waste Discharge Permit
Heritage Conservation Act	Ministry of Tourism, Sport & the Arts (AB)	Inspection and survey of Project area for heritage sites	Heritage Inspection Permits
		Systematic data recovery	Heritage Investigation Permits
		Heritage site alteration or disturbance	Site Alteration Permits

Under section 23 of BCEAA and British Columbia Regulation 371/2002, a proponent may apply to EAO for concurrent review of applications submitted to provincial regulatory agencies, at the same time their environmental assessment application is being reviewed.

On June 2, 2005, the Proponent made an Application to EAO for the concurrent review of three applications made to the OGC for a gas processing facility at Emsley Cove, a pipeline lateral and NGL lines, and a transmission line. The EAO accepted these applications for concurrent review as part of its letter of formal acceptance of the Project Application, also dated June 6, 2005. However, on December 21, 2005, the Proponent requested that EAO acceptance of the concurrent review application be withdrawn, as a result of the uncertainty created by the assessment of the Bish Cove site for the LNG terminal. The EAO accepted this request on December 22, 2005, and the three applications made to the OGC were withdrawn from active review by the OGC, pending new and more definitive applications.

4. INFORMATION DISTRIBUTION AND CONSULTATION

4.1 PROJECT WORKING GROUP

Project working groups are used by the EAO as the primary source of policy and technical expertise for considering issues identified during project assessments. In addition to conducting the EA review, the working group identifies information and consultation requirements for provincial statutory permit approvals. It also identifies federal information needs where a review is conducted as a harmonized federal/provincial review.

The Project Assessment Director established a Kitimat LNG Terminal Project Working Group (WG) in November 2004, comprised of representatives of federal, provincial and local government agencies and the Haisla First Nation. The CEA Agency agreed to participate as a co-chair of the WG, to enhance and underline the harmonized nature of the federal and provincial EA review. The WG members are identified in **Appendix B**.

WG members undertook the following activities, based on the mandate of the organizations they represent:

- reviewing and commenting on drafts of the Application Terms of Reference;
- reviewing and commenting on the Application;
- providing advice on issues raised during the course of the assessment of the Project; and
- providing advice on the assessment findings to be reported to provincial ministers and the federal Minister of Environment at the conclusion of the EA.

WG meetings and conference calls were held in December 2004, in June, July, August and September 2005 and in February 2006 to identify specific issues and concerns with information, and to resolve issues. Notes from Working Group meetings in both the pre-Application and Application review stages of review are available on the EAO website as identified in **Appendix A**.

4.2 MEASURES UNDERTAKEN WITH THE PUBLIC

The EAO, CEA Agency and federal RAs are responsible for ensuring Project information is adequately distributed and that the public is consulted at key stages of a project EA. The section 11 and section 13 orders issued to the Proponent by the EAO required specific public consultation procedures to be followed both during pre-Application and Application review stages. The public participation for the federal environmental assessment process followed the provincial process while including additional participation steps required for a comprehensive study. The additional steps under CEAA are outlined in Section 4.3.

The Proponent initiated a consultation program in April 2004 with the general public, as well as community organizations, the District of Kitimat (DOK), and the Regional District of Kitimat-Stikine (RDKS). The purpose of this program was to determine interest in, and issues associated with the proposed Project.

Public consultations during pre-Application included a community workshop in Kitimat (November 2004) that was attended by approximately 120 people. Section 2 of the Project Application describes the Proponent's pre-Application consultation activities, and includes a summary of issues and concerns regarding the Project raised during this period. The EAO confirmed in its May 4, 2005 letter

to the Proponent that the Proponent's pre-Application public consultation measures were considered to be adequate.

For the Application review period, the EAO required the Proponent to advertise the availability of the certificate Application and commencement of a 45 day public review and comment period, extending from June 15, 2005 until July 30, 2005. The EAO also required open houses in Terrace (June 21, 2005) and Kitimat (June 22 and 23, 2005), and participated in and monitored these events. These open houses were attended by approximately 150 people. During the Application review period, the Proponent also held an open meeting with the Kitimat Chamber of Commerce that was attended by approximately 18 people.

The section 13 order issued by the EAO on December 30, 2005 also established a requirement to advertise an additional public review period to allow public comments on the supplementary information being generated by the Proponent for a more thorough assessment of the Bish Cove location for the LNG plant site and marine terminal. This public comment period was set as January 18 to January 31, 2006 and was subsequently extended by the EAO to February 22. A public meeting was held by EAO on the Bish Cove plans and assessment work on February 15, 2006 in Kitimat, at the request of the District of Kitimat Council. The public meeting attracted approximately 76-100 participants.

Throughout the process, the EAO utilized its electronic Project Information Centre (ePIC) to post relevant information, meeting records and correspondence related to the Project. The Proponent also utilized a web site (<http://www.kitimatlng.com/>) and other means of public distribution throughout the process, in accordance with EAO requirements. Both EAO and the Proponent notified the public of the availability of information and opportunity to comment on the Application.

In the formal June 15 to July 30, 2005 public comment period for the Application review, 44 written comments were received from members of the public, in addition to a number of comments provided during the three open house meetings. Most public comments expressed support for the Project, although the public did express some concerns about the potential effects of the Project on: air quality; noise levels; fishing in, and public recreational access to Emsley Cove; recreational boating effects in Douglas Channel; the marine environment at Emsley Cove, particularly on eelgrass beds; marbled murrelet effects; and terminal-related emissions on plants, birds and wildlife. Some concerns were also expressed about the potential for accidents and explosions.

During the 30 day review period and associated public meeting on supplementary information related to Bish Cove, 3 written responses and 11 questions/comments were received (the latter made verbally at the public meeting). They included comments on the potential effects of the marine facility on eelgrass beds, public access to the Cove, health and safety hazards associated with the terminal, and the number and size of LNG tankers.

Appendix C of this joint Assessment Report / Comprehensive Study Report provides a summary of public issues raised in the two public comment periods on the Application as well as comments received during the public review of the CEAA scoping document.

4.3 PUBLIC PARTICIPATION UNDER CEAA

4.3.1 CEAA Section 21 – Public Participation Regarding Proposed Scope of Project

Under subsection 21(1) of the CEAA, for a comprehensive study, RAs must ensure public consultation on the proposed scope of the project, the proposed factors to be considered in the environmental assessment, the proposed scope of those factors, and the ability of a comprehensive study to address issues relating to the Project. An invitation for members of the public to review and comment on a scoping document was advertised in community newspapers during the weeks of April 25th to May 9th 2005 and also placed on the Canadian Environmental Assessment Registry (CEAR). Around the same time, the public was made aware, by way of advertising in community newspapers, of the availability of participant funding for public participation in the comprehensive study process and review of the CSR.⁵

Public notices were placed in newspapers. The notice requested that the public provide comment to Environment Canada by May 25, 2005. The notices also provided details concerning how to access the scoping document, and how to provide feedback. Copies of the scoping document were made available at four viewing locations in the area and also mailed directly to the Haisla. A meeting on June 10, 2005 between the Haisla and representatives of the Crown provided additional clarification on issues raised as part of the scoping document review.

The scoping document was posted on the Proponent's website. The Proponent also sent an e-mail to the stakeholders on the Proponent's project database notifying stakeholders of the availability of the scoping document for review and comment. There were a total of 479 people on the stakeholder distribution list from government agencies, First Nations, local industry, community service groups, community recreation groups, environmental groups, human resource/development/training organizations, online inquires, and public event attendees.

Two submissions from the District of Kitimat were in support of the Project and did not raise environmental concerns. Two CEAR comments from the public discussed potential effects and access to Emsley Cove, and the proximity of the terminal to populated areas. Two issues raised by the Haisla and their representatives are being dealt with collaboratively through a consultation process with the Haisla. These concerns were evaluated as part of the comprehensive study review and are specifically noted in the issues section in Part B of this Report.

In their Environmental Assessment Track Report submitted to the Minister of the Environment, the RAs, in consultation with the expert federal authorities, indicated that the comprehensive study could fully address issues related to the Project. The Minister of the Environment confirmed, on November 2, 2005, that the environmental assessment under CEAA would continue as a comprehensive study.

Participant Funding Program recipients were also confirmed November 2nd, 2005. The CEA Agency has provided \$40,000 to three applicants to support their participation in the environmental assessment of the proposed Kitimat Liquefied Natural Gas (LNG) Project. The recipients were the Kitimat Valley Naturalists, Kitamaat Village Council (Haisla), and Kitimat Chamber of Commerce.

⁵ The CEA Agency administers a Participant Funding Program which supports individuals and non-profit organizations interested in participating in environmental assessments (i.e. comprehensive studies and review panels).

4.3.2 CEEA Section 21.2 - Public Participation in the Comprehensive Study

As a part of the cooperative provincial/federal review of the Project, the RAs shared the formal comment period on the Application as prescribed in the BCEAA. This process is further discussed in Section 4.2 of this Report.

4.3.3 CEEA Section 22 - Public Access to the Comprehensive Study Report

A third opportunity for public input on the Project and the associated environmental assessment is through commentary on this Report. Pursuant to section 22(1) of the *Canadian Environmental Assessment Act*, the CEA Agency will facilitate public access to the CSR, including administering a formal public comment period. All comments submitted will be provided to the RAs and will become part of the public registry for the Project. The RAs will be asked by the Agency to advise whether their conclusions have been altered as a result of the public comments received.

4.4 MEASURES UNDERTAKEN WITH GOVERNMENT AGENCIES

The section 11 order issued to the Proponent by the EAO required specific consultation procedures with federal, provincial and local government agencies to be followed both during pre-Application and Application review stages, using individual consultation as well as the Project Working Group.

The Proponent's government agency consultation program began with the District of Kitimat and the Regional District of Kitimat-Stikine, to determine interest in, and identify issues associated with the proposed Project. The Proponent also contacted the Ministry of Economic Development to gain a better understanding of provincial government agencies and requirements, and held a number of exploratory meetings with the EAO and provincial agencies in Victoria. This led to consultations with federal agencies to discuss process and information requirements. After November 2004, the Proponent was able to use the newly established Project Working Group as the primary vehicle for agency consultation respecting development of its Application and meeting the requirements of both CEEA and BCEAA.

During Application review, the primary vehicle for resolving issues was through the Working Group and its sub-groups. The WG and sub-groups were used to identify, document and resolve Project-related issues. Much of the work done in this EA was conducted by an Issues Sub-Group and Alternative Sites Sub-Group comprised of federal agencies, the EAO and the Haisla.

Appendix D of this joint Assessment Report / Comprehensive Study Report provides a summary of government agency issues raised during the Application Review stage.

4.5 MEASURES UNDERTAKEN WITH FIRST NATIONS

The Project lies within the asserted traditional territory of the Haisla. On the basis of information submitted to the BC Treaty Commission and the Haisla TUS documents, there is no indication of another First Nation asserting traditional territory in the Project area.

The EAO initially contacted the Haisla to discuss their involvement in the EA for the Project and invited the Haisla to participate in the Project Working Group. The EAO also provided the Haisla with opportunities for formal review and comment on the draft section 11 order. Through the Project WG,

the federal RAs and EAO also engaged the Haisla in review of the draft Terms of Reference, and review of the Application. EAO and the RAs offered to meet at any time with the Haisla on the Project, and capacity funding assistance was provided by the EAO. The Haisla also received participant funding from the CEA Agency to support their participation in the environmental assessment of the proposed Project. Haisla representatives participated in all phases of the Project assessment and provided two technical representatives to the Project Working Group.

Staff from the EAO as well as provincial ministries and federal departments consulted with the Haisla in addition to the Project Working Group meetings on four separate occasions to discuss issues raised by the Haisla with respect to potential effects of the Project on asserted Haisla aboriginal rights.

The Proponent made early efforts to consult the Haisla and secure their support for the Project. This included the funding of independent studies and professional advisors for the Haisla and efforts to obtain agreements and business arrangements to address any potential infringement of asserted aboriginal rights.

The EAO obligated the Proponent, through its section 11 order, to undertake consultations with the Haisla on the effects of the Project, and to report the outcome of these consultations to the EAO.

The Proponent met with Haisla representatives approximately 22 times between April 2004 and November 2005 to attempt to address Haisla concerns regarding the Project. During the Application review, the Proponent was also required to hold a community open house in Kitimaat Village (August 11, 2005) that was attended by approximately 57 people. Issues raised included concerns about the location of the Project at Emsley Cove, effects on traditional and contemporary uses, and questions related to employment, training and business opportunities.

On December 15, 2005, the Proponent issued a media release announcing that KLNG Inc. had signed an agreement-in-principle with the Haisla on the Project. A December 15, 2005 letter from the Haisla to the EAO and federal agencies confirmed this agreement and indicated support for the Proponent's request for a more thorough assessment of the Bish Cove site. The letter states the Haisla's support for any recommendation from the EA to locate the Project at Bish Cove on Bees IR No. 6.

The Proponent continued meeting with the Haisla to negotiate a specific impacts and benefits agreement during the months of January to April 2006, and on April 13, 2006 advised the EAO and the RAs that an impacts and benefits agreement had been reached for Bish Cove.

Appendix D of this joint Assessment Report / Comprehensive Study Report provides a summary of issues raised by the Haisla First Nation as members of the government agency Working Group. **Appendix E** provides a provincial summary of issues raised by the Haisla on potential aboriginal rights impacts of the Project.

4.6 CONSULTATION SUMMARY

As noted, **Appendices C, D and E** of this Joint Assessment Report / Comprehensive Study Report contain a complete list of issues identified by the public, government agencies and the Haisla during the review of the Proponent's Application, as well as the Proponent's response to these issues.

The public, Haisla and government agency notification and consultation process has complied with the procedures outlined in the section 11 and section 13 procedural orders issued to the Proponent for the Project. All issues raised by the public, Haisla and federal, provincial and local government agencies during the review of the Project, that are deemed to be within the scope of the review, have been considered in the Application review process and the documents generated as part of the review.

As required under CEAA, this Report considered comments from the public that have been received in accordance with the CEAA and its regulations. In addition, public comment received on the conclusions and recommendations and any other aspect of this Report will be taken into consideration by the federal Minister of the Environment in the environmental assessment decision statement.

5. ASSESSMENT OF ALTERNATIVES

5.1 GENERAL

As outlined in the Terms of Reference and specifically as required under CEAA, the joint provincial Assessment Report and federal Comprehensive Study Report is to examine the need for the Project, the purpose of the Project, the alternatives to the Project; and the technically and economically feasible alternate means of carrying out the Project and the environmental effects of any such alternative means.

The "need for" and "purpose of" the Project are established from the perspective of the Project Proponent and provide the context in which any alternatives were considered. A clear statement of the need for the project is used to establish the scope of the alternatives to be considered (i.e. those within the control or interest of the Proponent).

"Alternative means" of carrying out the Project are defined as the various technically and economically feasible ways that the Project can be implemented. As required under Section 16(2)(b) of CEAA, project alternatives must be considered for a Comprehensive Study level of assessment. The alternative means of carrying out the project include facilities siting, pipeline lateral routing, LNG storage options, LNG regasification options, NGL product separation options and electrical energy supply options. The alternative means of carrying out the Project were evaluated on the basis of normal selection criteria including commercial, engineering, safety and environmental considerations, as applicable. The assessment of alternatives for the Kitimat LNG Terminal consisted of two parts; Alternate Locations and Alternate Facility Design.

5.2 NEED FOR THE PROJECT

As per the CEA Agency Operational Policy Statement regarding the assessment of project need and alternatives, the need for the project is defined as *the problem or opportunity the project is intending to solve or satisfy*, therefore establishing the fundamental rationale for the project.

Natural gas demand in North America is projected to increase by an average of 1.8 percent annually from 2001 to 2025, while production is expected to increase by only 0.7 percent annually over the same period. This trend is also expected for the Canadian natural gas market, with consumption increasing by 2.2 percent per year. The downward reassessment by the National Energy Board (NEB) of natural gas production in Canada, and an increase in demand from projects such as the oil sands in Alberta, are potential drivers of this trend. Conventional natural gas reserves are declining in Canada, and Canadian gas producers are finding it increasingly difficult to tap new reserves sufficient to offset declines in existing production.

The Proponent indicated that in other jurisdictions around the world such as Japan, Korea and parts of Europe, the natural gas shortage has been partially addressed by the import of Liquefied Natural Gas (LNG). A key advantage of LNG is that it provides a new supply option for the use of this clean burning fuel.

5.3 PURPOSE OF THE PROJECT

As per the CEA Agency Operational Policy Statement regarding the assessment of project need and alternatives, the purpose of the project is defined as *what is to be achieved by carrying out the project*.

The Proponent outlined that this Project is designed to meet the growing demand for natural gas by responding to the projected supply shortage within the North American market. Over the long term, consumer demand for natural gas in North America is expected to significantly outpace supply. Domestic supplies cannot keep up with the growing demand for natural gas. Both government and industry recognize that this gap will continue to grow, and are looking towards LNG to temper the imbalance.

According to the Proponent, historically, there have been high costs associated with the LNG value chain. In recent years, advances in technology have reduced the costs associated with exploration, liquefaction and shipping, making LNG regasification facilities commercially viable. As the demand for natural gas is expected to increase, prices are estimated to range from US\$4.00 to US\$6.00 per Million British Thermal Units until the end of the decade. These prices make the import of LNG commercially feasible.

The Proponent noted that the proposed Kitimat LNG terminal is located near large industrial users and an existing pipeline distribution system, making it well positioned to supply local, provincial, national and North American gas markets.

5.4 ALTERNATIVES TO THE PROJECT

The analysis of "alternatives to" is intended to validate that the preferred alternative is a reasonable approach to meeting need and purpose. This analysis should identify the alternatives to the project, and identify the preferred alternative to the project based on the relative consideration of the environmental, economic and technical benefits and costs.

Alternatives to a project are defined as functionally different ways to meet the project need and achieve the project purpose. Examples of alternatives to the KLNG Project include: expanding existing LNG import facilities; reducing consumption or encouraging more efficient use of natural gas in Canada and in North America; proposing a project that employs alternate methods of energy generation (coal, wind, etc.); or awaiting the completion of the northern pipeline projects.

Although the alternatives noted above could fulfill the need and purpose of the Project, it is essential to acknowledge that "alternatives to" need to be established from the perspective of the Proponent. None of the above options are in the control of, the ability of, or the interests of the Proponent. In this circumstance, the only way to meet the need and purpose is to create a new LNG import facility. As a result, the only viable "alternatives to" the Project is the null or "do nothing" option.

5.5 ALTERNATIVE LOCATIONS

To assess alternative locations, the Proponent applied economic/commercial, technical and community criteria prior to any environmental criterion. If a location was found to be unfeasible for economic or technical reasons (e.g. due to lack of take-away pipeline capacity), no assessment of environmental criteria was conducted. After economically/commercially and technically viable locations were identified, comprehensive environmental, technical, social and economic criteria were applied to the final site selection.

The Proponent developed criteria for three phases of alternative assessment: preliminary site selection; secondary site selection; and final site selection.

Preliminary site selection was based primarily on high-level economic/commercial considerations. The secondary site selection was based on commercial viability and general operational constraints, as well as a relative estimate of environmental concerns. The final site selection was conducted using a comparative analysis of comprehensive environmental, technical, social and economic criteria. A preferred location was selected from the final site selection process.

5.5.1 Alternative Site Evaluation

In an effort to determine a preferred location for an LNG import and regasification terminal, the Proponent developed a preliminary site selection process that evaluated six locations across a wide area including; the Pacific Northwest in the United States, southwest BC close to Vancouver, Prince Rupert, and the Kitimat region.

The following initial criteria were used in selecting the preferred location of the LNG terminal among the above mentioned areas:

- Location on the west coast of North America;
- Access to existing natural gas take-away pipeline;
- Deep water all-season port;
- Supportive government, community and First Nations; and
- Commercial feasibility for entire Project.

Based on the above criteria, the Proponent discounted potential locations in the United States Pacific Northwest and Vancouver due to either lack of public support and/or the lack of take-away pipeline capacity. The Prince Rupert location was discounted due to issues surrounding the take-away pipeline capacity. As a result of the preliminary site selection process, potential sites were narrowed down to those in the Kitimat Area (**Table 2**).

Table 2. Preliminary Site Selection Summary for Kitimat LNG Terminal Project

Criterion	Cherry Point, Washington	Columbia River, Washington	Vancouver	Vancouver Island	Prince Rupert	Kitimat Area
West Coast of North America	YES	YES	YES	YES	YES	YES
Pipeline capacity	NO - no pipeline	NO - no pipeline	NO - no capacity	NO - peak shaving facility	NO - no capacity (confirmed by PNG)	YES -possible capacity upgrade to accommodate
Deep Water All-Season Port	YES	YES	YES	YES	YES	YES
Supportive Government, Community and First Nations	NO	NO	NO	NO	YES	YES
Commercial Feasibility for Entire Project	NO	NO	NO	NO	NO	YES

The secondary site selection process developed by the Proponent examined several potential sites in the Kitimat area that were identified as potentially suitable through the preliminary site selection process. Secondary site selection criteria included commercial viability, general operational constraints and a preliminary estimation of environmental concerns. Specifically, criteria included:

- Commercial concerns;
- Availability of suitable industrial lots;
- Available take-away pipeline capacity;
- Tanker manoeuvrability;
- Proximity to nearest community; and
- Comparatively high-level environmental considerations.

The Proponent indicated that the Kitimat area had several characteristics that made it an attractive location for an LNG terminal, including:

- The Port of Kitimat is a major deepwater port with existing major industrial development that includes methanol, ammonia, aluminium and pulp and paper;
- A developed shipping channel (Douglas Channel) provides convenient access;
- The area is in close proximity to the existing Pacific Northern Gas Ltd. (PNG) gas pipeline system;
- The communities have had some exposure to the concept of an LNG facility due to a previously proposed LNG liquefaction and export terminal proposal;
- The communities of Kitimat and Kitimaat Village had previously been supportive of an LNG facility;
- Available locations existed that were identified for industrial uses;
- Proximity to trained labour pool;
- Proximity to an accredited industrial education institution;
- Access to market/industrial demand;
- Availability of industrial land with technically acceptable attributes; and
- Safe site removed from a populated centre.

The Proponent dismissed locations in the Kitimat industrial area because the land parcels were deemed to be too small for an LNG regasification facility. Clio Bay was also dismissed as the preferred site due to its remote location on the eastern side of the Kitimat Arm, a longer pipeline lateral requirement, and increased disruption of land near the Kitimaat Village, Minette Bay and within Kitimat itself. Based on the secondary site selection criteria, the Proponent narrowed down potential sites to two in the Kitimat area: Bish Cove and Emsley Cove.

5.5.2 Summary and Justification of Preferred Location

The two sites deemed most suitable were Emsley Cove and Bish Cove. The Proponent initially deemed the Emsley Cove location to be more commercially viable than Bish Cove, and based its initial evaluation and environmental assessment application on the Emsley Cove location.

The agreement-in-principle reached between the Proponent and the Haisla in December 2005, however, resulted in the Proponent requesting that the EA provide a more thorough assessment of Bish Cove, and providing supplementary information on Project requirements, layout and potential effects at a Bish Cove location.

The comparative analysis conducted for these two sites is provided in **Table 3** and includes technical, social, and environmental criteria to gauge their relative suitability. The comparative analysis indicates that both sites have positive and negative attributes, with some of the compared criteria similar between the two sites. After review of the comparative analysis presented in **Table 3**, the Bish Cove location was confirmed by the Proponent as the preferred location.

Table 3. Comparative Analysis of Emsley Cove and Bish Cove Project Locations

CRITERIA	EMSLEY COVE	BISH COVE	COMMENT AND ASSUMPTIONS
PROJECT FOOTPRINT			
Length of Bish FSR to be upgraded (km)	16.8	10.6	The shorter road upgrade, pipeline and transmission line required for the Bish location would result in less environmental impact while reducing construction and maintenance costs. However the length of new access road is longer for the Bish cove location which would result in additional costs. The facility site area is greater at the Bish Cove location which will result in greater habitat loss than found at the Emsley Cove.
Length of New Access Road Construction (km)	0.8	2.3	
Pipeline distance (km) – Plant fence line to PNG interconnect	18.2	13.8	
Length of Pipeline (km) – from the common ROW divergence	5.9	2.3	
Transmission line distance (km) – from sub-station to fence line	12.4	7.9	
Total Facility Site Area (ha)	30.0	47.2	
VEGETATION RESOURCES AND CLEARED AREAS			
Total Area of Project Footprint Requiring Clearing (ha)	158.4	134.8	Bish Cove will result in clearing less total area, and specifically less mature and old growth forest, than Emsley Cove. However, there will be a greater area of rare plant communities that will be cleared from the Bish Cove location. No wetlands will be affected at either terminal location.
Total Area of Mature and Old Growth Forest Clearing (ha)	82.5	46.0	
Total Area of Cleared Wetland (ha)	0	0	
Total Area of Plant Communities of Conservation Concern in Cleared Area (ha) – Red Listed Salmonberry and Blue Listed Devil's Club plant communities.	16.8	22.1	The area cleared for the Bish Cove location is predominantly early seral (pole/sapling) plant communities. Overall, potential direct effects on vegetation are considered minimal at both locations.

CRITERIA	EMSLEY COVE	BISH COVE	COMMENT AND ASSUMPTIONS
TERRESTRIAL HABITAT			
Total Area of High and Moderately High Suitability Wildlife Habitat Cleared (ha)			<p>Bish Cove has a larger area of high and moderately high suitable wildlife habitat primarily due to proximity to Bish Creek and its estuary. These areas provide high and moderately high suitable habitat for black bear, grizzly habitat, black-tailed deer, moose and marten. Bish Cove has high suitability habitat for deer. At Emsley Cove, more high and moderately high suitable habitat for Marbled Murrelet and coast tailed frog will be affected; however presence for these two species hasn't been confirmed.</p> <p>Overall, potential direct effects on wildlife are considered minimal at both locations.</p>
Black Bear (fall)	0.9	9.2	
Black Bear (spring)	1.2	8.0	
Black Bear (summer)	0.9	8.0	
Grizzly Bear (fall)	0	4.6	
Grizzly Bear (spring)	0.3	3.8	
Grizzly Bear (summer)	0	3.8	
Black-Tailed Deer	1.0	0.4	
Moose	0	0.9	
Marten	1.0	8.8	
Mountain Goat	0	0	
Marbled Murrelet	5.6	4.0	
Tailed Frog	4.5	2.4	
AQUATIC AND MARINE HABITAT			
Total Number of Streams Affected (pipeline crossings + total road crossings)	127	125	Road crossings include Bish FSR road and new access road only.
New Stream Crossings (fish bearing) for Pipeline and Powerline	8 new crossings of fish bearing streams. Of these streams, two of them are less than 1.5 metres in width, two of them are 1.5-5 metres in width, three are between 5-20 metres in width and one is greater than 20 m wide. Riparian areas are currently disturbed for six of the eight streams.	22 new crossings of fish bearing streams. These new crossings will be over predominantly S4 (<1.5 m) streams but also includes Bish Creek (> 20 m wide) and Skoda Creek (between 5 m to 20 m wide). Both are important fisheries streams and these crossings would constitute the second crossing on each stream. Riparian areas are currently undisturbed at potential crossing locations.	Emsley and Bish locations will require a similar number of stream crossings (fish bearing and non-fish bearing) in total when comparing existing and new crossings for both locations. However, larger streams are crossed at the Bish location. Stream crossings at either location will require permitting through DFO.
New Stream Crossings (fish bearing) for Access Road	2 new crossings of fish-bearing streams associated with the road to Emsley Cove from the Bish FSR divergence point; one S1 (5-20 m) and one S4 (<1.5 m).	22 new crossings of fish-bearing streams associated with the new road to Bish Cove from the common road divergence point. These are the same crossings as described above for the powerline and pipeline ROW.	There are a similar number of total stream crossings at either location and more new crossings / upgraded crossings at Bish vs. Emsley.
New Stream Crossings (fish bearing) for Facility	The Emsley Cove site will affect three streams that are fish bearing at their mouths.	The Bish Cove site would affect ten fish bearing streams.	Bish site requires sections of creeks to be in-filled or lost due to grading.
Total Fish Escapements (1980 to 1998)	Coho Salmon 25 Pink Salmon 1,283 Chum Salmon 133	Coho Salmon 715 Pink Salmon 16,994 Chum Salmon 3,535	The Bish Creek Watershed has significantly higher fisheries production than Emsley – however the following comment addresses estuary habitat that is essential to fisheries

CRITERIA	EMSLEY COVE	BISH COVE	COMMENT AND ASSUMPTIONS
			production.
Distance to Centre of Estuary (km)	0.41	3.16	Emsley Cove has an estuary located within the Cove itself.
Total Eelgrass Area in Cove (ha)	4.7	1.9	Eelgrass coverage shows the presence of sensitive habitats, and there is considerably less eelgrass found in Bish Cove compared to Emsley.
Estimated area of Eelgrass to be Directly Affected	6.4%	None	A more accurate measure of habitat compensation would be required by DFO as a result of habitat loss incurred by construction and infrastructure of the Barge and Tug jetties. However, there is a greater amount of eelgrass habitat that would be directly affected by jetties and their associated traffic at Emsley Cove. Eelgrass habitat would not be directly affected by jetties and their associated traffic at the Bish Cove location.
SITE SUITABILITY CRITERIA			
Land Use Zoning	Designated as industrial site in the Kalum Land and Resource Management Plan (LRMP). The District of Kitimat has jurisdiction over planning and development in the area. Emsley Cove is currently zoned in the OCP as forestry (G5) with recognition of the site as a potential future industrial site. The District of Kitimat is in the process of changing the official zoning from forestry to industrial.	Designated as an industrial site in the Kalum LRMP. The Haisla have approved use of Bees IR No. 6 for heavy commercial industrial use as set out in Privy Council Order 1997-1052, and use for an LNG facility is consistent with the designated uses.	Industrial Zone designation has been completed at Bish.
Area available for Development (ha)	120	100	Both sites have acceptable areas available for development.
MARINE DEPTH PROFILE			
Water Depth Required for LNG Vessel Mooring Location (m)	+15	+15	Similar
Depth at Mooring Location (m)	40	25	Both the Emsley Cove and Bish Cove sites provide adequate water depth.
Tanker Manoeuvrability (700 m) Achieved?	Yes	Yes	Similar
Maximum Depth at Centre of Cove (m)	75	75	Similar
Amount of Dredging Required (m ³)	9,000 m ³	0	Dredging required at Emsley but not for Bish.
Marine Surficial Geology	Sandy silt overlying bedrock to loose sandy silt in the centre of the Cove.	Very soft organic silt, and very loose to loose sandy silt.	More difficult and costly construction for the marine terminal at Bish Cove.
Terrestrial Surficial Geology	Limited topsoil with bedrock – providing good foundation for storage tanks and	Existence of alluvial clays results in a more defined location where the storage tanks and	Both locations allow for adequate foundation to site the storage tanks and ancillary facilities. Considerable geotechnical work completed for Bees IR No. 6, while layout at Emsley Cove is

CRITERIA	EMSLEY COVE	BISH COVE	COMMENT AND ASSUMPTIONS
	other infrastructure but space for site layout due to topography	other infrastructure can be located.	preliminary and would be subject to further geotechnical investigations for hazards and constraints.
Exposure to Wind	The eastern profile of Emsley Cove and the position of the LNG Berth next to the Emsley Point rock outcrop provides adequate protection from outflow winds.	The eastern profile of Bish Cove and the position of the LNG Berth next to Bish Point rock outcrop provide adequate protection from outflow winds.	Both locations provide adequate protection from outflow winds.
HEALTH AND SOCIO-ECONOMIC CRITERIA			
Proximity to Population Centre (km)	Kitimat city centre 18.0 Kitamaat Village 11.6	Kitimat city centre 15.0 Kitamaat Village 8.6	Emsley Cove is slightly farther away from local population centres. Both sites are well removed in case of emergency.
Recreational Usage	There are no official recreational trails or sites in the Emsley Cove area; however there is direct access to the cove via Bish FSR and ATV trail. Local residents may occasionally access Emsley Cove by boat but community consultation indicates that use is infrequent.	There is an established Recreation Site and trail north of Bish Cove/Creek (North Cove Trail, North Cove Recreation Site). However no direct use of land as it is an IR. Frequency of boat access in Bish Cove is unknown.	Neither of these areas attracts significant numbers of recreational users.
Vessel Usage	Recreational boating is somewhat less than Bish Cove due to its increased distance from Kitimat. Salmon trolling in the area occurs farther out in the water rather than near the shore. Commercial fishing occurs well outside of Cove area.	More recreational boating exists at Bish Cove since it is closer to Kitimat and salmon congregate in the area from mid May to September. Salmon trolling occurs close to shore. No commercial fishing allowed close to Bish Creek. Occurs closer to shore than at Emsley	Slightly more recreational fishing occurs near Bish Cove. Commercial fisheries at both sites are out into open water, but closer to the shore at Bish.
Aesthetics	Emsley Point provides a visual and sound barrier from Kitimat. A line of sight analysis has been completed. A facility at Emsley Cove will not be visible from Kitimat or Kitamaat Village.	Bish Point provides a visual and sound barrier from Kitimat. A line of sight analysis has been completed. A facility at Bish Cove will not be visible from Kitimat or Kitamaat Village.	Similar. Neither location can be seen from Kitimat or Kitamaat Village.
HERITAGE AND ARCHAEOLOGICAL CRITERIA			
Archaeological Resources	Three of 4 CMT sites have been removed by timber harvesting. Newly recorded sites were one isolated lithic find, one lithic	Bees IR No. 6, has 6 previously recorded archaeological sites. Five are within the vicinity of the terminal and three consist of culturally modified tree	At Emsley Cove, the proposed terminal facilities are currently undisturbed whereas the proposed rights-of-way coincide with existing clear cut in many segments. Recorded heritage resource sites in the vicinity of the development consist of culturally modified trees recorded in association with past timber harvesting activities.

CRITERIA	EMSLEY COVE	BISH COVE	COMMENT AND ASSUMPTIONS
	<p>scatter , and a shell midden.</p> <p>One additional potentially pre-1846 culturally modified tree site was recorded.</p>	<p>(CMT) sites. Just outside the facility footprint, 6 CMTs were recorded. Another site has historic building remains (cabin?) and lithic precontact materials. Once site contains only disturbed surface precontact lithic materials identified during a monitoring program.</p> <p>Of historic significance is the reported presence of a village site described as extending eastward for some 300 metres from the southwest corner of the IR.</p> <p>Two of the previously recorded sites, are at the mouth of Bish Creek.</p>	<p>Archaeological heritage issues at Bish Cove have been largely addressed through designation of Haisla reserve for industrial use and would result in less scrutiny and costs than at Emsley Cove.</p> <p>Both Emsley and Bish Cove have been and are being used for traditional uses (hunting, fishing, plant gathering). Heritage and archaeological resources would be handled comparably at either location, in accordance with the BC Heritage Branch and the Haisla Nation.</p> <p>Development at either site would require Proponent to mitigate any significant effects to archaeological and heritage resources through appropriate mitigation measures as identified through consultation with the Haisla and the BC AB for provincially administered land and Parks Canada for federally administered land.</p>
FIRST NATIONS CRITERIA			
Acceptability for the Haisla	Emsley Cove has not yet been considered for industrial purposes by the Haisla.	Bish Cove has previously been accepted by the Haisla as an industrial site. An Impacts and Benefits agreement with the Haisla provides long-term contract-based certainty over the IR land use.	Bish Cove offers a substantially superior location in terms of business and legal certainty. Also a competitive advantage re: timing of post EA approvals and construction.

5.6 ALTERNATIVE FACILITY LAYOUT

5.6.1 Onshore Facilities

The proposed layout of the LNG terminal onshore facilities was directed by three primary considerations: locating the LNG tanks on bedrock or another highly competent soil such that the tanks would not be at risk in an earthquake; protection of the aquatic resources within the facility footprint by utilizing environmental setbacks from the creeks and marine foreshore; and incorporation of separation distances between facility buildings in accordance with Canadian and international design standards (CSA Z276- 01 and NFPA 59A, 2006). The preferred terminal layout for both Emsley Cove and Bish Coves has been determined and is presented in **Figures 3 and 4**. The on shore facility site area is greater at the Bish Cove location which will result in greater habitat loss than found at the Emsley Cove. The specifics of the vegetation clearing are outlined in Table 3 above. Both locations allow for adequate foundation to site the storage tanks and ancillary facilities.

The site configurations as shown meet the requirements of current (2001) and anticipated (2006) North American standards (Canadian Standards Association, CSA Z276-01, Liquefied Natural Gas (LNG) – Production, Storage, and Handling and NFPA 59A, Standard for the Production, Storage, and Handling of Liquefied Natural Gas, 2006, not yet published). The final layout, especially the location of the LNG storage tanks, will be based on a full geotechnical evaluation of the site. The Bish site layout is more definitive than for Emsley, and is based on significant geotechnical work done when Bees IR No. 6 was being assessed for development and designation. Other considerations in the final layout of the onshore terminal will include efficiency of piping arrangements and supporting equipment, site topography, hazard assessment, earthquake scenarios and other environmental considerations. The primary goal is to optimize efficiency and meet design requirements while minimizing environmental effects.

5.6.2 Marine Facilities

The marine facilities that are required for receiving LNG tankers at the proposed facility include those structures to safely berth and moor the vessel, and those structures that provide the interface between the vessel and the shore to safely and efficiently offload cargo. The marine structures will include four berthing/breasting dolphins, six mooring points and one unloading platform.

Two locations were considered in siting the marine facility at Emsley Cove, including the delta front in the middle of the cove and the eastern Emsley Point shoreline. The former was dismissed as a feasible location as it required construction of a long access and piping trestle extending from the shoreline to the proposed LNG tanker berth. The trestle would add significant cost to the Project, and result in more substantial effect on the existing bottom vegetation than the eastern shore. In addition, the deltaic sediment was not considered suitably stable as a foundation material for the marine structures.

The eastern shoreline at Emsley Cove is considered to be well suited for siting the berth facility based on preliminary site observations and geophysical and bathymetric surveys. The eastern shoreline provides good sheltering from northern wind and waves, appears to provide suitable rock foundation material, and provides a deep water berth at the least distance from the shoreline (essentially eliminating the need for an access trestle). Dredging, blasting and excavation of some 9,000 m³ is anticipated for the site.

In Bish Cove, the Proponent proposed three alternative locations for the marine facilities, including alternatives for ship berth and a combined construction jetty/ tug berth facility. In determining the preferred location for the marine facilities, the following factors were considered: ease of vessel navigation approach and departure; exposure to wind, waves, current; water depth, blasting and dredging requirements; sea bed geotechnical conditions; geo-hazards; proximity to plant site; cost; risk/safety; and environmental sensitivity.

Originally, the Proponent proposed a location in the eastern portion of Bish Cove, necessitating elimination of a known eelgrass bed and the dredging of approximately 500,000 m³ of bottom sediments. This was the preferred location since it offered better navigation access, minimized vessel exposure to crosswinds, offered access to a stable rock slope to locate the jetty foundations, pipe-rack areas and access road, had lower risk with respect to geo hazards, and reduced costs.

The rationale for not locating the marine facilities on the west side of the Cove was further documented, and included the susceptibility of this portion of the Cove to terrain instability that would create major engineering, cost and safety concerns.

Concerns raised by DFO on the habitat impact of this site led the Proponent to a re-evaluation and a new proposal to locate these facilities in the centre of Bish Cove in 20-25 m of water, thereby avoiding loss of eelgrass beds. The new proposal also included use of vibro-densification over a 2.0 ha area to provide support for pilings, thereby eliminating the likelihood of dredging and blasting in water. Specifically, the final proposed location in the centre of Bish Cove is the preferred location due to the following: smaller footprint; little or no direct impact to eelgrass; no anticipated dredging; no maintenance dredging; little or no propeller wash concerns; with additional costs being offset by operational advantages such as being closer to the on shore facilities. Geo-hazards, safety and navigational issues can be adequately addressed at the preferred location. Provided the vibro densification process addresses the sediment stability issue, the centre location is considered to be the best location for the marine facilities.

The preferred marine facility layout for both Emsley Cove and Bish Cove has been determined and is also shown presented in **Figures 3 and 4**.

5.6.3 Natural Gas and Natural Gas Liquids Pipeline Laterals

Emsley Cove and Bish Cove were both evaluated as the point of origin for the send-out pipeline lateral. The existing PNG pipeline is the known terminus for the send-out pipeline lateral. The preferred route considered these previously established end points. The pipeline lateral route was selected to follow previously cleared forestry lands wherever possible, to minimize the number of stream crossings, and to minimize the potential for erosion.

The route selection criteria considered many factors, including the existing topography, locations of previously disturbed areas (e.g. previously clear-cut forestry operations), feasibility of paralleling the existing road, minimizing environmental effects, and minimizing interaction with resources and future development. The factors considered within the routing analysis have led to an evolving preferred route as opposed to distinctive route options. Properly considering all of these factors ultimately leads to a more economically feasible route option.

The Emsley Cove location will require approximately 18 km of pipeline to the PNG connection, and will entail 5.9 km of new pipeline ROW from the common ROW divergence along the Bish FSR. The Bish Cove location will involve 13.75 km of pipeline to the PNG connector, and only 2.3 km of new pipeline ROW.

The natural gas liquids pipeline laterals will be contained within a 30 m right-of-way (ROW) and will be below ground. Where possible, and where required by DFO, horizontal directional drilling (HDD) will be used on significant stream crossings. Crossing methods for all streams will be decided upon in consultation with DFO.

5.6.4 LNG Storage Tank Options

The evaluation of the LNG storage tank options refers to both the Emsley Cove and Bish Cove sites.

In LNG terminology, "containment" refers to the safe storage and isolation of LNG. Safe use of LNG, or any cryogenic substance, requires an understanding of how materials behave at cryogenic temperatures. At extremely low temperatures, carbon steel loses its ductility and becomes brittle.

Therefore, the material selected for tanks, piping, and other equipment that comes in contact with LNG is critical. The use of high nickel content steels, aluminum, and stainless steels is costly but necessary to prevent embrittlement and material failures. High alloy steels composed of nine percent nickel and stainless steel will be used for the inner tank of LNG storage tanks and for other LNG applications.

There are three tank options for storing LNG (single, double, or full containment storage tanks). Single and full containment tanks are the most widely used. Three 160,000 m³ (operating volume) LNG storage tanks are being considered for the terminal. Two of the tanks would be constructed initially with provisions to construct the third tank in the future. For the purposes of the Application, the environmental effects were assessed for three LNG storage tanks.

A single containment tank for LNG is a tank system comprised of an inner tank and an outer container. For this type of tank, only the inner tank is designed to contain LNG. The outer container serves primarily to contain insulation and vapor and to provide a weather shield. Single containment tanks are generally less expensive and rely on a separate impoundment to contain the design spill. The low earthen type of impoundment system required for these tanks have a large footprint, resulting in large heat flux exclusion zones.

A double containment tank is designed and constructed so that both the inner tank and the outer containment are capable of independently containing the LNG. The independent primary (inner) tank contains the LNG and vapour under normal operating conditions. The outer containment (impoundment) is intended to contain any LNG leakage from the inner tank.

Similar to a double containment tank, a full containment tank is designed and constructed so that both the inner tank and the outer containment are capable of independently containing the stored LNG. The inner tank contains the LNG under standard operating conditions. The outer shell and bottom are made out of pre-stressed concrete. The tank roof is constructed of reinforced concrete. The outer tank supports the outer roof and is also intended to contain the LNG. The tanks are designed in accordance with international LNG standards (CSA Z276 and US NFPA 59A). A full containment tank with concrete roof is less susceptible to damage from external events. Full containment tanks offer the highest level of safety and have been chosen as the preferred option for this Project.

5.6.5 Regasification and NGL Separation Technologies

The evaluation of the regasification and NGL separation technologies refers to both the Emsley Cove and Bish Cove sites.

Regasification involves changing LNG from a liquid state back into natural gas. The industry uses three technologies for this process; open rack vapourizer (ORV), submerged combustion vapourizer (SCV), and intermediate fluid vapourizer (IFV). The most commonly used vapourizers are SCV and ORV.

An Open Rack Vapourizer (ORV) uses sea water as its heat source. Sea water flows down on the outside surface of either aluminum or stainless steel heat exchanger panels and vaporizes LNG inside the panel. Baseload operations commonly use ORVs as the operating cost is quite low; however capital costs can be high, depending on the complexity of the sea water intake structure and intake distances. The seawater temperature at the Project site is not compatible with this type of vapourizer (which is typically used in temperate regions); therefore, the ORV is not considered to be a viable option for this Project.

Intermediate Fluid Vapourizers (IFV) use either seawater or waste heat. As is the case for the ORV, Kitimat LNG does not have access to warm seawater or waste heat (such as condensate from a power plant); therefore, the IFV is not considered to be a viable option for this Project.

A Submerged Combustion Vapourizer (SCV) is a self contained unit that uses heated water to vaporize LNG. The vapourizer consists of an enclosed water bath into which exhaust from a natural gas fired burner is allowed to percolate through and heat the water. Submerged stainless steel tubing

in the water bath allows LNG to flow through the vapourizer where it is regasified by the heated water bath. The advantages of this system include: no water requirement except for initial fill; quick start up ability and tolerance for load fluctuation; and high thermal efficiency.

Of the three options that were evaluated, the SCV is viewed as the most cost effective and environmentally sound type of vapourizer and is therefore the preferred option for this Project.

In North America, pipeline gas must comply with specific requirements for composition and heating value. In reviewing viable options for controlling composition and heating value, natural gas liquids (NGL) separation using a conventional fractionation process has been retained because it allows receiving LNG from various sources.

5.6.6 Electrical Energy Supply

Provisionally, the terminal whether located at Emsley Cove or Bish Cove will require approximately 16 mega watts (mW) of electrical energy supply. Two alternatives for the primary electrical energy supply were evaluated for the Project: on-site natural gas-fired electrical generators; and an aerial transmission line connecting into the existing BC Hydro power grid.

Environmental issues that were considered include additional emissions for the on-site electrical generators, and disturbance and potential effects on freshwater fish habitat for the transmission line.

Given the ROWs required for the road and pipeline laterals, the additional ROW required for the transmission line was considered nominal.

An aerial transmission line supplying electrical energy from BC Hydro has been determined to be the preferred option. This preference is based on environmental considerations to limit the amount of air emissions from Project activities. Natural gas-fired generators would add an additional source of air emissions at the terminal, whereas the use of electrical energy supplied from BC Hydro provides cleaner, "green" energy source for the terminal. The transmission line will be sited adjacent to the existing ROW for the road.

Back-up electrical energy generation will also be required for the terminal. Alternatives for a back-up energy supply were not considered. An on-site stand-by turbo-generator rated for 8 mW will be used to maintain a nominal send-out in the event of temporary loss of the main power supply. Given the need to allow at least 30 minutes for bringing the turbo-generator online, a 500 kW emergency diesel generator has also been included, primarily to provide electrical power supply for the LNG tanks foundation heating, lighting and critical controls. The diesel generator and ancillaries will be designed to remain in operation after the Safe Shutdown Earthquake scenario.