



PROJECT DESCRIPTION

# Grassy Point LNG Executive Summary

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Woodside Energy Holdings Pty Ltd



# 1. General information and contacts

Woodside Energy Holdings Pty Ltd (Woodside) proposes to construct, commission and operate a liquefied natural gas (LNG) export facility on provincially administered Crown Land at Grassy Point, near Prince Rupert, on the British Columbia coast. The facility plans to convert processed natural gas, delivered by a third party pipeline, into LNG for export to global markets.

The ultimate facility plans to produce up to 20 million tonnes per annum (Mtpa) of LNG. Product is planned to be exported from the facility to global markets via ships.

The Grassy Point LNG facility (the Project) is planned to be constructed and operated in two distinct phases. Phase 1 of the Project involves the construction of LNG trains, with an LNG capacity of between 6 and 15 Mtpa of LNG, supporting infrastructure including jetties and a materials offloading facility, power generation, water supply, sanitary waste treatment, access roads and workforce accommodation. Phase 2 is expected to involve the installation of additional LNG Trains and associated supporting infrastructure at the site up to the nominal 20 Mtpa LNG. The capacity of each train is expected to be between 3 and 6.5 Mtpa.

Development options under consideration include an **onshore** LNG facility and a **nearshore** facility. Depending on the selected LNG processing option, construction of Phase 1 of the Project is expected to take approximately four years.

Woodside Energy Holdings Pty Ltd is a wholly owned subsidiary of Woodside Energy Ltd (WEL) based in Perth Western Australia. WEL is Australia's largest producer of liquefied natural gas (LNG). With 25 years experience as an LNG producer and operator, we pride ourselves as a safe and reliable supplier to customers in the Asia Pacific region.

## 1.1. Proponent Information

Name of designated project	Grassy Point LNG
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Address of proponent	240 St George's Terrace Perth Western Australia 6000
Chief Executive Officer	Peter Coleman Chief Executive Officer - Woodside 1-844-288-9888 grassypointlng@woodside.com.au
Project manager	Darren Flynn GM Onshore Developments - Woodside 1-844-288-9888 grassypointlng@woodside.com.au
Principal contact person	Cameron Sudintas Senior Environment Adviser - Woodside 1-844-288-9888 grassypointlng@woodside.com.au

## 1.2. Corporate Information

Woodside Energy Ltd (WEL) is Australia's largest independent oil and gas company with world-class facilities and a history of achievement.

Woodside has an extensive portfolio of facilities which we operate on behalf of some of the world's major oil and gas companies.

In 2014 Woodside is celebrating the company's 60<sup>th</sup> anniversary, 30 years of domestic gas production and 25 years of liquefied natural gas (LNG) exports.

Woodside has been operating the landmark Australian project, the North West Shelf, since 1984 and it remains one of the world's premier LNG facilities.

With the successful start up of the Pluto LNG Plant in 2012, Woodside now operates six of the seven LNG processing trains in Australia. Woodside strives for excellence in its safety and environmental performance and continues to strengthen its relationships to ensure it remains a partner of choice.

Woodside is seeking to expand our exploration portfolio, both within Australia and globally, to generate future growth opportunities for the company.

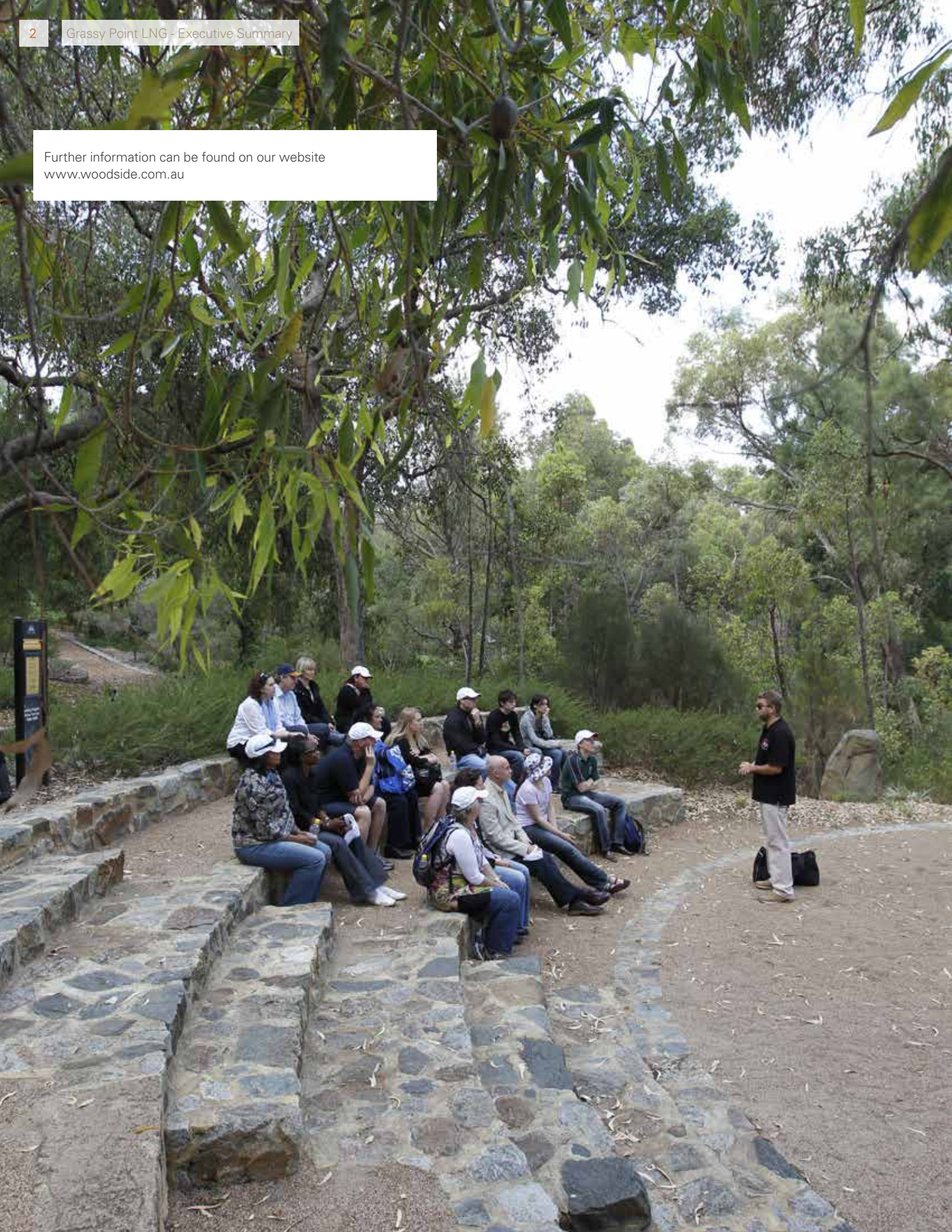
Internationally, Woodside's assets include exploration acreage in Peru, the Republic of Korea, Morocco, Tanzania, Myanmar, Ireland, New Zealand and Spain.

Driven by our world-class capabilities, we are committed to expanding our LNG portfolio through premium developments.

Canada has large, proven gas reserves and underdeveloped gas export infrastructure which would provide geographical diversity to our LNG business.



Further information can be found on our website  
[www.woodside.com.au](http://www.woodside.com.au)





## 2. Project information

### 2.1. Project Overview

Woodside proposes to construct commission and operate a liquefied natural gas (LNG) export facility on Provincial Crown Land at Grassy Point, near Prince Rupert, on the British Columbia coast. The facility plans to convert processed natural gas, delivered by a third party pipeline, into LNG for export to global markets.

The completed Grassy Point LNG Facility (Project) is proposed to be implemented in two phases. Phase 1 being the foundation project is planned to produce between 6 to 15 Mtpa of LNG and Phase 2 plans to increase overall capacity up to 20 million tonnes per annum (Mtpa) of LNG. The number of LNG trains (process systems) will be determined during the detailed engineering and screening studies to optimise construction cost and operating efficiency. The capacity of each train is expected to be between 3 to 6.5 Mtpa. Product is planned to be exported from the facility to global markets via ships.

Development options under consideration include an **onshore** LNG facility and a **nearshore** facility. These are discussed further in **Section 2.6**.

Emissions data and environmental effects detailed in this document reflect full build out capacity of 20 Mtpa.

### 2.2. Project Purpose

The purpose of the Project is to convert processed natural gas into LNG for export to global energy markets. The natural gas feedstock is expected to be transported to the facility via a third-party pipeline from reserves in the Western Canadian Sedimentary Basin.

LNG is natural gas that has been cooled to approximately  $-161^{\circ}\text{C}$ . At these temperatures the products are liquid and can be stored at atmospheric pressure.

In liquid form LNG, reduced approximately 600 times from its original volume, can be transported in specially designed LNG cargo ships. Once delivered to markets, these products are heated to turn the liquid into a gas and distributed through a network for residential, commercial, and industrial uses. The use of LNG in electricity generation provides a cleaner energy alternative to traditional coal fired power stations.

### 2.3. Project Location

The proposed Project is to be located on Provincial Crown Land in North Western British Columbia, Canada. It is approximately 30 km north of Prince Rupert on the Tsimpsean Peninsula at Grassy Point, within the Skeena - Queen Charlotte Regional District. Further details are provided in **Section 3**.

### 2.4. LNG Processing Options

Two main options are being considered for the LNG facility. One option is an **onshore** facility and the second option is a series of **nearshore** facilities, each incorporating LNG trains and associated services, close to the shoreline.

For illustration, indicative options are shown in **Figure 1** – Indicative Onshore Facility Option and **Figure 2** – Indicative Nearshore Facility Option. Each option is represented as 4 LNG trains (process systems) producing 20 Mtpa, however the number of trains will be determined during the detailed engineering stage.

The project components are similar for each option however the configuration and layout as well as the construction activities will differ. A summary follows, and further details are provided in **Section 2.6** and **2.7**.

Option 1 consists of an **onshore** facility which will convert natural gas, delivered to the facility by pipeline, into LNG. The **onshore** facility will consist of inlet and pre-treatment facilities, liquefaction trains (LNG trains), utilities, storage tanks, flares and other necessary infrastructure.

LNG will be delivered from the LNG tank area to the berth through pipelines supported on an elevated pile supported jetty. The loading of LNG tankers will be conducted from loading platforms located at the end of the jetty.

Option 2 consists of a series of **nearshore** floating facilities. Each of the facilities will incorporate pre-treatment, liquefaction train and utilities and will be moored to purpose built structures close to the shoreline. Each floating hull will incorporate LNG storage tanks and any other storage requirements.

LNG tankers will be moored alongside the floating facilities during loading operations. Under the floating arrangement, concurrent loading of tankers at adjacent berths will be achievable.

Additional infrastructure such as flare structures, administration, maintenance and logistics support may be located onshore.

### 2.5. Project Capital Cost Estimates and Employment Estimates

The early estimated capital cost for the Phase 1 of the Project is between CAD\$10 – 15 billion. This includes the construction and commissioning of LNG trains and associated infrastructure with a capacity of between 6 and 15 Mtpa.

Depending on the final concept selection, peak construction numbers for Phase 1 is forecast to require up to 1000 people for the **nearshore** option and up to 6000 for the **onshore** option (approximately 4,000 and 20,000 man years respectively).

The operational stage of the Project is anticipated to employ up to 300 people for 25 years (7,500 man years). In addition to the direct employment opportunities the Project is expected to create significant numbers of indirect job opportunities throughout British Columbia via the supply of goods and services.

Figure 1– Indicative Onshore Facility Option



Figure 2– Indicative Nearshore Facility Option



## 2.6. Project Components

The proposed Project will consist of the following major components which are detailed in **Table 1**. The components are similar for both the **onshore** and **nearshore** options.

- An LNG facility that includes natural gas receiving and treatment facilities, natural gas liquefaction facilities, LNG storage tanks, refrigerant storage, flare systems, connecting piping (for natural gas, LNG, fuel gas and vapour return lines);
  - Supporting facilities and infrastructure including office and maintenance facilities, warehousing, process utilities (water, air and nitrogen), power generation, potable water supply, waste water treatment (sewage, process waste water and waste from potable water treatment), ocean waste water discharge, access roads within the site boundary;
  - Marine facilities consisting of LNG export carrier berths, materials offloading facility (MOF), mooring systems, supply wharves, storage and lay down areas, fuel storage, tug and pilot boat facilities and operation of LNG carriers;
  - Temporary facilities and infrastructure including lay down areas and construction work force accommodation;
- Project components outside the care and control of the proponent and therefore outside of the scope of this assessment include:
- Production and delivery (i.e. pipelines) of the upstream gas owned and operated by a different commercial entity. Environmental assessment of these components will be undertaken separately by the proponent for those activities.
  - Requirements for a regional road and transportation system connecting Prince Rupert, the Tsimpsean peninsula (Lax Kw'alaams, Metlakatla, and potentially Grassy Point), and Digby Island are being considered by the Province at this time. Woodside has attended an informational workshop with other LNG proponents hosted by the Ministry of Transportation, and expects to participate in further discussions to better understand how proposals might impact access to the Grassy Point site. As such, regional access roads are not part of the proposed Project at this time. It is expected that environmental assessment of any regional roads would be undertaken separately by the proponent for those activities.

**Table 1**– Detailed Project Components Common to Onshore and Nearshore Options

Component	Detailed Component
LNG facility	Pipeline gas reception facility Gas pre-treatment to remove contaminants from the gas prior to liquefaction Natural Gas Liquefaction trains producing up to 20 Mtpa 2 – 3 LNG storage tanks, approximately 180,000m <sup>3</sup> each depending on final concept Refrigerant storage (propane, ethane/ethylene) Heating and cooling medium systems
Supporting facilities and infrastructure	Roads and access to the site Surface water management Flare systems Fire protection systems Administration offices Central Control Room (CCR) Telecommunications (buried services and communication towers) Maintenance workshop Warehousing and lay down areas Medical centre with helipad Laboratory Waste management facilities Boundary security fencing and cleared perimeter safety/security areas Water supply and demineralised water equipment (treatment and distribution) Electrical power distribution systems Wastewater treatment and disposal systems including sewage Nitrogen and instrument air systems Fuel and chemical storage Sea water inlet and discharge AGRU waste gas incineration
Marine Facilities	Materials Offloading Facility 2 LNG export carrier berths (with refrigerant offloading capability) Mooring systems Supply wharves Storage and lay down areas Warehousing Fuel storage Tug and pilot boat facilities
Temporary facilities and infrastructure	Construction Water supply system (treatment and distribution) Construction power generation and supply Workforce accommodation Construction fuel and chemical storage Construction wastewater treatment and disposal systems including sewage Temporary waste management facilities Temporary lay down areas Construction offices On site concrete batching plant



## 2.6.1 LNG Facility

The major components of the Grassy Point LNG Project are listed below and in *Figure 3*.

### 2.6.1.1 Pipeline Gas Reception facility

The gas reception facility receives gas from the third party pipeline. Feed gas passes through filter coalescers to remove fine solid and liquid particles from the pipeline and then passes through feed gas heaters to prevent hydrate formation in the letdown valves and downstream piping. Other inlet facilities includes main gas pressure control valves, emergency shutdown valves (ESD), associated piping and relief system designed to maximum design pressure of the pipeline.

### 2.6.1.2 Natural Gas Pre-Treatment

Before natural gas is liquefied, the natural gas arriving at the facility is treated to remove contaminants such as mercury, carbon dioxide, water and heavier hydrocarbon components in the natural gas.

### 2.6.1.3 Ethane / Propane Separation

Hydrocarbon compounds such as ethane and propane may be recovered from the main feed gas stream to be used as refrigerant in the liquefaction process. These hydrocarbon compounds are separated from the main gas stream in a series of distillation (scrub) columns within the separation unit. The recovered propane and ethane are sent to the refrigerant circuits and storage as required.

### 2.6.1.4 Natural Gas Liquefaction Process

Liquefaction of natural gas to form LNG is carried out in liquefaction units (trains) which are the key components of an LNG processing facility. The natural gas passes through a series of heat exchangers to chill the natural gas to temperatures approaching  $-161^{\circ}\text{C}$  to form LNG. The heat exchanger is chilled via a refrigerant circuit, similar in principle to that found in a domestic refrigerator or air conditioner.

Storage of LNG will result in the production of hydrocarbon gas (boil off gas) within the LNG storage tanks caused by a combination of heat differential and the displacement of liquids as the tanks are filled. This gas is planned to be recovered by the boil-off compressors and returned to the liquefaction system or used in the facility fuel gas system.

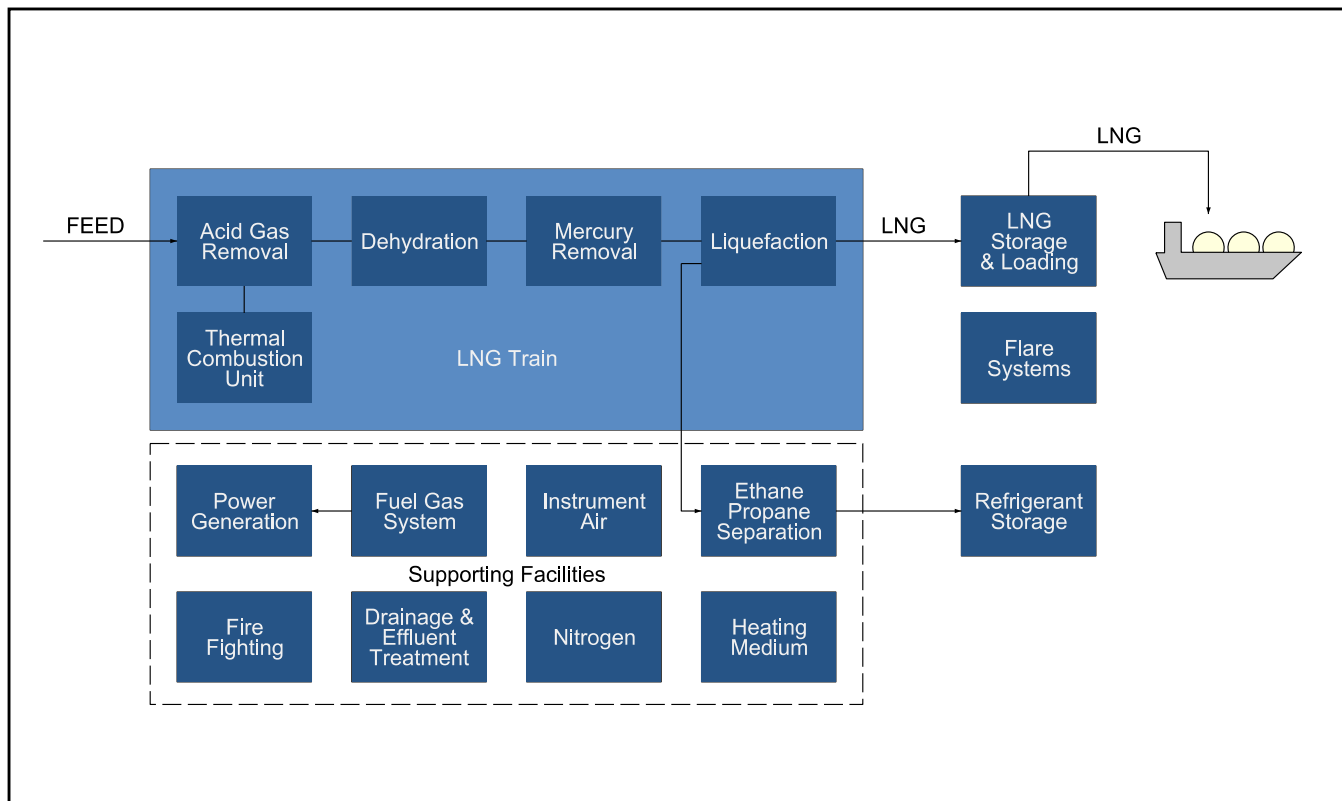
### 2.6.1.5 LNG Storage Tanks

Following processing the LNG is stored in tanks prior to offloading for export. The product is transferred from the LNG facilities to the designated storage tanks located within the LNG facility. Storage volumes will vary depending on the selected design and option but are expected to be approximately  $180,000\text{ m}^3$  per tank.

Transfer of product at the marine facilities is expected to consist of a system of pipelines and pumps to transfer product from the storage tanks to the ship loading facilities. Vapour is returned from the ship and used as fuel.

LNG storage for the onshore LNG option would require storage tanks to be constructed on land adjacent to the coast whereas the nearshore LNG option would have integrated storage incorporated within the floating structures.

Figure 3– LNG Process for Generic 3 Train Configuration





## 2.6.2 Supporting Facilities and Infrastructure

Supporting infrastructure will be required for the life of the LNG facility and will be common to both the **onshore** and **nearshore** facility options. This includes offices space, warehousing for spares and consumables, maintenance workshops, central control room for operations staff, telecommunications equipment and electrical and other service distribution systems. In addition a laboratory, for product testing and environmental monitoring and an onsite medical centre will be required.

### 2.6.2.1 Power Requirements

The Project requires a large consistent power supply to support the liquefaction process, associated utilities, and administration complex and workforce accommodation. The estimated power requirement is approximately 1000 MW. Typically worldwide LNG liquefaction plants produce their own energy utilising feed gas and waste gas streams from the facility as fuel gas, this is to ensure the reliability of energy supply for the facility.

### 2.6.2.2 Safety Flare Systems

Flare systems are predominantly used for the safe disposal of gas during emergency situations, LNG facility upsets or in preparation for maintenance activities. The LNG facility is designed such that no flaring is required for production purposes. Flaring events resulting from emergency or facility upsets would be of short duration.

The flare systems will be elevated flares. The flares will be designed (and operated) to include requirements to reduce dark smoke and ensure efficient burning.

### 2.6.2.3 Sewage Treatment

Waste water treatment facilities and associated marine outfalls will be constructed to treat, manage and dispose of sewage and grey water generated from the LNG facilities and supporting infrastructure. Tertiary treated sewage will be discharged to the marine environment via an outfall.

### 2.6.2.4 Waste Water Treatment

An effluent treatment system will be installed to treat process effluent and contaminated stormwater from the LNG facility. Treated wastewater will be discharged to the marine environment via an outfall. The treatment facilities will be designed to achieve long term no effect concentrations for pollutants of concern at the edge of an agreed mixing zone from an outfall diffuser.

Treatment units will be selected based on their ability to treat contaminants to the required level.

## 2.6.3 Water supply

Freshwater will be required for the LNG facilities and supporting operations. A number of alternatives are currently being considered, these include desalination of sea water, collection and use of surface water and ground water abstraction.

It is anticipated during initial site work, that a limited supply of fresh water will be required. This will be sourced either from Prince Rupert and shipped to site or supplied from surface water or a temporary seawater intake and treatment (desalination) systems.

Permanent infrastructure will be required to draw water, pump, filter, treat and dispose of brine. Construction of outfalls and intakes may require laying of pipes on the seafloor as well as

construction intake and outfall caissons. Where practicable this infrastructure will be constructed as part of the proposed marine structures such as the export jetty.

## 2.6.4 Marine Facilities

Common to both **nearshore** and **onshore** options the marine facilities are expected to comprise of a materials off loading facility for heavy equipment and materials (including modules), land backed wharves, an all-weather harbour facility (for tugs and support vessels), and the LNG export berths with refrigerant import capability.

As shown in **Figure 2 - Indicative Nearshore Facility Option**, an option exists to build a **nearshore** option with integrated storage and process equipment. The LNG processing facilities are placed on floating caissons which are expected to be moored in waters adjacent to the site. Utility connections and access from the land will be provided by wharves and jetties across the intertidal zone. Infrastructure to allow safe passage of vessels will also be constructed including navigation aids such as shipping lane markers, moorings and a designated anchorage.

### 2.6.4.1 Export Berths and Associated Shipping

For the **onshore** option up to 2 export berths are planned to be constructed with a conventional pile supported structure with concrete or steel decking. Each berth will be connected to the shore by a jetty that is approximately 200m long. The jetties will be capable of supporting vehicles, the LNG export pipelines, utilities and safety systems that service the berths.

For the **nearshore** option the loading berths are integrated in the **nearshore** LNG processing facility. Each **nearshore** berth is expected to be capable of mooring LNG carriers. The size of the carriers will be determined by technical and commercial considerations during the Front End Engineering Design stage.

Ship loading requires the use of three loading arms. Two arms are used for LNG load out and one is used for vapour, which returns gas that boils off during the loading process back to the facility.

The Project will require approximately 200 to 350 LNG carriers throughout the year, at full capacity, to export product from the facility to global markets. Ownership of the LNG carriers is expected to be a combination of ships owned by the Grassy Point Project and other commercial merchant carriers.

## 2.6.5 Temporary Facilities and Infrastructure

Temporary facilities will also be required for the construction phase of the project. This is expected to include temporary services such as water supply, diesel power generation, construction stage fuel and chemical storage, temporary lay down areas, construction offices and an onsite concrete batching plant. It is anticipated that all of these services will be removed at the end of the construction phase. Temporary facilities will be similar for both the **onshore** and **nearshore** options.

### 2.6.5.1 Construction Waste Water and Sewage Treatment

Temporary waste water treatment facilities and associated marine outfalls will be constructed to treat, manage and dispose of sewage and grey water generated during the construction stage. Tertiary treated sewage will be discharged to the marine environment via an outfall.

### 2.6.5.2 Construction Workforce Accommodation

The peak construction workforce could be up to 1000 workers for a **nearshore** option, and approximately 6000 workers for an **onshore** option. Consideration is being given to both temporary onshore accommodation and a temporary accommodation vessel for the construction phase. Onshore accommodation may include its own power, water supply and waste water treatment however scope exists to explore opportunities for shared power, water and wastewater infrastructure with other users if the accommodation is located close to the town of Lax Kw'alaams. The anticipated area required is estimated to be up to approximately 100 ha.

For the floating temporary accommodation option the vessel may be a converted cruise ship or a custom made vessel with self contained accommodation facilities and utilities. If this option was selected the vessel may be moored close to the Grassy Point LNG Facility.

The final siting of the accommodation will be determined in consultation with the Regional District of Skeena-Queen Charlotte and First Nation groups including Lax Kw'alaams. All considered sites will be studied as part of the EA process.

## 2.7. Project Schedule and Activities

### 2.7.1 Construction, Operation Decommissioning and Abandonment Stages and Scheduling

Subject to approvals the preliminary schedule aims for first LNG in 2021. The estimated duration of key Project stages are:

- Environmental assessment and engineering design – 2014 to 2017;
- Construction activities – 2017 to 2021
- Operations and maintenance – 2021 to 2047
- Decommissioning and abandonment – sometime after 2047

### 2.7.2 Construction Activities

Upon receipt of the necessary regulatory approvals and permits, construction will commence. Site preparation is planned for development areas within the land parcel for both the **onshore** and **nearshore** LNG options.

Construction of the first phase is expected to take approximately four years and summaries of site activities during this period are shown below for both the **onshore** and **nearshore** options in sequential order. It should be noted that while the site activities are presented sequentially the nature of the works require overlap of activities to enable efficient and timely construction.

#### Construction Sequence – Onshore Option

- Site Mobilisation (Initial Logistics) – Mobilisation of materials, plant, equipment, labour and management sufficient to undertake the Site Establishment and Preparation Phase. This activity includes initial site access via marine Early Offload facility (EOF) and/or road.
- Site Establishment and Site Preparation - Locate and clear site boundaries, undertake earthworks to prepare site to required levels and grades. Establish drainage system for construction phase. Completion of the Pioneer Construction accommodation, initial site offices and supporting temporary infrastructure.

- Construction Facilities – Commence construction of facilities to support ongoing site establishment activities including expansion of the pioneer camp, main construction accommodation, laydown, temporary facilities and utilities. This activity also includes the construction of a Materials Offloading Facility (MOF) capable of receiving modules, heavy plant and equipment.
- Site Mobilisation (Major Logistics) – Commencement of mobilisation of materials, plant, equipment, labour and management sufficient to undertake subsequent works. This activity sees a significant increase in numbers of personnel on site and the introduction of multiple discipline activities.
- Civils and Undergrounds – Installation of foundations, selected paving & road works, underground services & utilities and buildings for process plant, equipment and modules. This activity includes the commencement civil works for the construction on site erected LNG tanks and construction of the abutment of the product loadout jetty.
- Buildings – Construction of plant process buildings, warehouses, workshops, offices and the camp/ accommodation for operations personnel.
- Marine Works (Jetty Substructure) – Driving of piles for product loadout jetty, mooring & breasting dolphins and tug pens.
- Module Arrival – Arrival of Pre-Assembled Units (PAU's), Pre-Assembled Racks (PAR's), equipment skids etc
- Mechanical and Structural Erection – Commencement of process module placement and hook up, installation of stick built structural steel, columns vessels and piping. Erection of flare towers, setting of main equipment such as compressors, gas turbines and generators. Installation of LNG tank mechanical equipment
- Marine Works (Jetty Topsides) - Installation of jetty trusses, jetty head, product pipe work and associated ancillaries.
- Electrical and Instrumentation – Laying termination and connection of above ground power and instrument cables including those to substations, field auxiliary rooms, warehouses, workshops and offices.
- Pre-commissioning – Pre-commissioning of systems, units and areas as required to meet handover plan
- Painting and Insulation – Painting and insulation to weld margins on hook up and stick built piping, insulation of site erected vessels and columns where required
- Commissioning – Commissioning in process plant sequence
- Construction Demobilisation – Removal of construction facilities and infrastructure where not required for LNG facility expansion
- Site clean up and landscaping - Hard and soft landscaping of land based facilities, rehabilitation of construction areas, etc

### 2.7.3 Construction Sequence – Nearshore Option

- Site Mobilisation (Initial Logistics) – Mobilisation of materials, plant, equipment, labour and management sufficient to undertake the Site Establishment and Preparation Phase. This activity includes initial site access via marine Early Offload facility (EOF) and/or road.
- Site Establishment and Site Preparation - Locate and clear site boundaries, undertake earthworks to prepare site to required levels and grades. Establish drainage system for construction phase. Completion of the Pioneer Construction accommodation, initial site offices and supporting temporary infrastructure.
- Construction Facilities – Commence construction of facilities to support ongoing site establishment activities including

a small construction camp, laydown, temporary facilities and utilities. This activity also includes the construction of a Materials Offloading Facility (MOF) and Heavy Offloading Facility (HLO) capable of receiving materials for construction of the shore based facilities.

- Site Mobilisation (Major Logistics) – Commencement of mobilisation of materials, plant, equipment, labour and management sufficient to undertake subsequent works. This activity sees the number of personnel increase to cover the multi discipline nature of the activities.
- Civils and Undergrounds – Installation of foundations, selected paving & road works, underground services & utilities and buildings for shore based facilities. This activity includes the construction of the abutment of the nearshore facilities jetty.
- Buildings – Construction of shore based buildings such as warehouses, workshops, offices and the camp/ accommodation for operations personnel.
- Marine Works (Jetty Substructure) – Driving of piles for the nearshore floating facilities jetty, mooring & breasting dolphins and tug pens.
- Marine Works (Jetty Topsides) - Installation of jetty trusses, jetty head, service pipe work and associated ancillaries.
- Nearshore Facilities – Arrival and permanent mooring of the nearshore Facilities against the facilities jetty.
- Mechanical and Structural Erection – Removal of sea fastenings, erection of stick built facilities such as flare towers and gangways, hook up of facility to the feed gas line , hook up of services and utilities to shore based facilities
- Electrical and Instrumentation – Laying termination and connection of above ground power and instrument cables shore based facilities.
- Painting and Insulation – Painting and insulation to weld margins on hook up and stick built piping.
- Commissioning – Commissioning in process plant sequence
- Construction Demobilisation – Removal of construction facilities and infrastructure where not required for LNG facility expansion
- Site clean up and landscaping - Hard and soft landscaping of land based facilities, rehabilitation of construction areas, etc

## 2.7.4 Commissioning and Start Up

Commissioning and start-up activities will be undertaken at various stages following installation of the processing facilities and associated infrastructure. This is to ensure that the equipment and systems supporting the major components are functioning efficiently and safely. In addition, testing is required to ensure that any leaks detected within those systems are rectified prior to start-up of operations.

Prior to start-up of operations, a staged commissioning plan including detailed procedures will be in place to allow functional testing and verification of the following facilities:

- Plant utilities;
- Steam systems;
- Hydrocarbon storage and loading facilities (including gas and fire protection systems);
- Boil off gas system (including vapour return);
- Marine Port Facilities (including export jetty);
- Inlet facilities;

- Inert gas runs of compressors;
- Loading reagents and guard beds;
- Hydro-testing of piping and vessels; and
- Flare systems.

## 2.7.5 Operations

The operational phase of the proposed LNG facility, for both the **onshore** and **nearshore** options, is expected to be at least 25 years. The operations and maintenance of the LNG and marine facilities and the shipment of the LNG are the main features of this stage. The following list details the key activities that will occur during the operational stage of the project:

- Gas treatment to remove impurities from the feed gas;
- Production of LNG and LNG transfer between process, storage tanks and LNG carriers;
- Utilities operation, power, nitrogen, air, water treatment, waste water treatment;
- Associated safety related flaring of gas;
- Ongoing maintenance of LNG facility and marine equipment and infrastructure;
- Major maintenance shutdowns of LNG facilities approximately every 5 years;
- Solid and liquid waste management and disposal;
- Transportation of supplies and equipment by road or sea to the LNG facility;
- Operation of tugs and marine vessels; and
- Movement of LNG carriers;

The proposed shipping route utilises the existing Triple Islands pick-up point which is illustrated in **Figure 4**.

## 2.7.6 Decommissioning

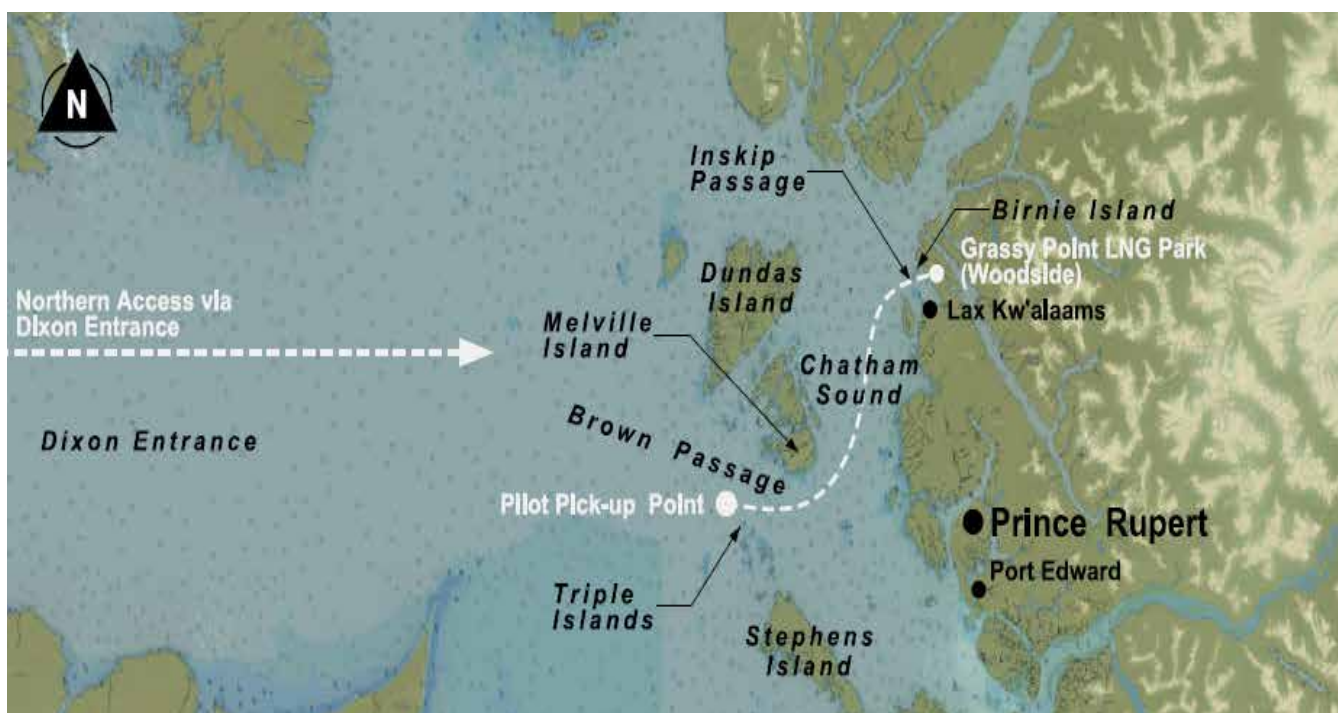
At the end of the operational life of the gas processing facility the facility will be decommissioned. Woodside expect the decommissioning plan to be developed in consultation with the BC Oil and Gas Commission, aboriginal groups and the local and provincial governments. Requirements may be defined during the EA and permitting process.

If a decision is made to decommission the facility at the end of life, typical decommissioning activities are described below:

- Decontamination - The site will be tested for potential contamination, although not anticipated. Contaminated materials will be removed and disposed at an appropriate facility;
- Dismantling - facilities will be dismantled and removed from site. Buried objects that contain no potentially harmful materials may be left in place or deep buried to facilitate rehabilitation;
- Recycling of recyclable materials such as steel;
- Site grading - Depending on the site closure plan the LNG site could be levelled so that final site levels blend with the existing terrain as far as practicable; and
- Rehabilitation - Overburden and topsoil material is planned to be used throughout to promote regrowth. All areas could be deep ripped to remove compaction.



Figure 4– Proposed LNG shipping route



## 2.8. Emissions Discharges and Waste

Woodside will apply a risk management approach that assesses the potential impact of each emission, discharge and waste stream. This approach focuses during the design phase on application of a hierarchy of controls, where we will seek to eliminate potential impacts, and where this cannot be reasonably achieved, reduce the potential impact. Should discharge of liquids/solid wastes be required, it is anticipated that detailed consultation with the Environmental Assessment Working Group will define acceptable discharge limits.

Estimates of emissions, discharges and waste streams are defined based on the expected Project design. Discharge rates and total volumes of each stream are subject to refinement based on decisions made in FEED and detailed design on the design, construction and operation of the facility. In light of this, the following tables provided in this section are indicative based on Woodside's previous LNG experience.

### 2.8.1 Emissions to Atmosphere

Emissions to air will be generated from a number of sources including site preparation works, fuel combustion for power generation, the processing, storage and loading of product hydrocarbons, shipping vessel movements and fugitive emissions from plant and equipment.

#### Construction

Atmospheric emissions generated during construction include emissions from combustion of fossil fuels from mobile equipment, vehicle use and construction stage power generation. Due to the relatively high levels of rainfall in the Price Rupert region, dust generated by site clearing and earth works is anticipated to be minor.

#### Operations

During routine operating conditions, emissions to air will be generated from the combustion of fuel gas for energy generation including for the liquefaction processes, process heating

requirements and electricity generation. Atmospheric emissions as a result of combustion equipment will include quantities of volatile organic compounds (VOCs) including BTEX, oxides of sulphur ( $\text{SO}_2$ ), particulate matter (PM); and greenhouse gases (GHG) such as carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ) and nitrous oxide ( $\text{N}_2\text{O}$ ). The main (non-greenhouse gas) products of combustion, in terms of quantities produced, are carbon monoxide (CO) and oxides of nitrogen ( $\text{NO}_x$ ).

Primary sources of emissions to air during operations include, but are not limited to:

- Generation of mechanical power (to power refrigerant/liquefaction compressors and to provide electricity);
- Thermal oxidation of gases from the  $\text{CO}_2$  removal unit;
- Generation of heat (boilers);
- Flaring of pressurised hydrocarbons;
- Fugitive emissions (from connections and valves); and
- Shipping movements (LNG carriers, supply vessels and tugs).

Power generation is the largest process source of  $\text{CO}_2$ ,  $\text{NO}_x$  and  $\text{SO}_x$  associated with the combustion of fuel gas for electric and process load demands throughout the LNG plant. Smaller quantities of these species will also be emitted from flares and thermal oxidation equipment.

Fugitive emissions take into account VOCs released during storage and loading of condensate to tankers and losses via equipment (e.g. valves) throughout the LNG plant. Estimates of fugitive emissions are dependent upon the type and number of equipment which are subject to detailed design.

Approximate atmospheric emissions from a nominal 20 MtPa LNG facility on an annual basis are provided below in **Table 4**. These emissions have been calculated based on the design of a previous Project and have been scaled to reflect the full 20 MtPa LNG throughput of the Grassy Point facility. These calculations are likely to be refined throughout FEED and detailed design of the Project.

Currently Canada and BC are developing numerous policies, legislation and initiatives to address GHG emissions. It is anticipated that Canada's draft GHG regulations for the oil and

gas industry will be issued by the end of 2014 and is expected to include a performance or intensity based emission baseline and reduction standard and a carbon price ceiling. The BC Oil and Gas Commission has identified actions aimed at reducing GHG emissions from LNG facilities including reducing natural gas flaring, implementing best practices and emission reduction technologies and promoting the use of carbon capture and storage. Additionally the OGC released the flaring and venting reduction guidelines under the Oil and Gas Activities Act which provides regulatory requirements and guidance for flaring, incinerating and venting in BC.

Mitigation measures for air quality and greenhouse gas production are expected to include low NO<sub>x</sub> technology in power generation, thermal oxidation of waste acid gas removal unit gases, waste heat recovery and energy efficiency measures. Detailed mitigation measures will be prepared in line with good international practice within the Environmental Assessment application.

There are national and provincial guidelines for turbines. The national emission guidelines issued by the Canadian Council of Minister of the Environment (CCME) National Emissions Guidelines for Stationary Combustion Turbines (Canadian Ambient Air Quality Standards for PM<sub>2.5</sub> and ozone). The BC emission criteria for gas turbines are 48mg/m<sup>3</sup> and 58mg/m<sup>3</sup> of NO<sub>x</sub> and CO, respectively for turbines greater than 25MW (these criteria are currently under review). As a minimum Woodside will meet the more stringent of Provincial or Federal discharge limits for emissions to atmosphere, however it is anticipated that in some instances more stringent criteria may be applied to the Project as a result of the EA process.

### Decommissioning

Atmospheric emissions generated during decommissioning are anticipated to be similar to the construction stage. This will mainly be emissions from the combustion of fossil fuels from mobile equipment such as cranes and heavy earth moving equipment, vehicle use and diesel power generation once the main turbines are decommissioned.

**Table 2– Construction Sources of Criteria Pollutants**

	CO <sub>2</sub>	CO	SO <sub>x</sub>	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CH <sub>4</sub>	VOC	H <sub>2</sub> S
Mobile combustion sources e.g. cranes, vehicles, ships	✓	✓	✓	✓	✓	✓			
Construction stage power generation and commissioning flaring	✓	✓	✓	✓	✓	✓	✓	✓	
Fugitive Emissions from fuel loading							✓	✓	

**Table 3– LNG Facility Sources of Criteria Pollutants**

	CO <sub>2</sub>	CO	SO <sub>x</sub>	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CH <sub>4</sub>	VOC	H <sub>2</sub> S
Mobile combustion sources e.g. cranes, vehicles, ships	✓	✓	✓	✓	✓	✓			
Process combustion sources e.g. flares, power generation, thermal oxidiser	✓	✓	✓	✓	✓	✓	✓	✓	
CO <sub>2</sub> Removal (AGRU) and Thermal Oxidation	✓	✓	✓	✓			✓	✓	✓
Fugitive Emissions							✓	✓	

**Table 4– Approximate annual atmospheric pollutant emissions from a 20 MtPa LNG facility**

Atmospheric Pollutant	CO <sub>2</sub>	CH <sub>4</sub>	SO <sub>x</sub>	NO <sub>x</sub>	VOC	PM <sub>10</sub> , PM <sub>2.5</sub>	CO	Total CO <sub>2</sub> e
Approximate Totals (t/yr)	6,900,000	4,600	180	24,000	1,400	370	10,000	7,250,000

## 2.8.2 Liquid Waste and Marine Discharges

Discharges of waste that are likely to be discharged to the offshore or nearshore environment during each of the Project stages are described in this section.

### Construction and Commissioning

Waste water from construction activities include site dewatering, hydrostatic test water, discharges from concrete batch plants, water from maintenance shops, and water treatment reject.

Waste water will be collected and reused where possible. Regional capability to treat waste waters is currently limited however consideration will be given to offsite disposal should regional treatment facilities be constructed to support future major projects.

Storm water management during construction will be required to minimise erosion of soils from surface runoff during high rainfall events and to protect the site from flooding during construction works. Holding basins and diversion drains are likely to be created to contain surface runoff and allow suspended solids to settle out. Water from the holding basins may be used during construction for dust control measures and other purposes.

### Operations

During the operational stage it is proposed to treat effluent on site to an agreed specification and dispose clean treated water to the ocean via an outfall.

An effluent treatment system is expected to be installed to treat process effluent and contaminated storm water from the LNG facility. Treated wastewater will be discharged to the marine environment via an outfall, see **section 2.6.2.4**. Other streams such as water treatment reject and sewage may be co-mingled for treatment, however this will be determined in detailed design.

Storm water management is expected to be based on the segregation of runoff by water quality. This allows a different degree of treatment options to be selectively applied to the segregated drainage runoff, ranging from total capture and treatment for contaminated runoff to freely discharge into natural environment for uncontaminated runoff.

### Decommissioning

Liquid wastes generated during decommissioning are anticipated to be similar to the construction stage. Wastes will be generated during the decontamination of process pipe work and vessels, sanitary waste from decommissioning crews and accidental hydrocarbon and chemical spills.

**Table 5– Construction Waste Water Sources and Possible Treatment**

Source of Construction Waste	Potential Treatment and Disposal Options
Hydrostatic test water (vessel and pipe work testing)	Holding basins followed by ocean discharge via marine outfall
Site de-watering	Holding basins followed by ocean discharge via marine outfall
Treated sanitary wastewater	Tertiary treatment and discharge to ocean via marine outfall
Water Treatment (reverse osmosis reject or cation/anion water treatment reject)	Ocean discharge via marine outfall. Possible routing to process water treatment system depending on technology selected
Wastewater treatment plant	Onsite effluent treatment plant and discharge to ocean via marine outfall
Storm water (clean & contaminated)	Collected in holding basin and discharged to ocean
Potential for accidental hydrocarbon and chemical spills	Collection and specialist offsite disposal

**Table 6– Operations Waste Water Sources and Possible Treatment**

Source	Potential Treatment and Disposal Options
Wash waters	Possible treatment and ocean discharge via marine outfall
Site de-watering	Ocean discharge via marine outfall
Treated sanitary wastewater	Ocean discharge via marine outfall
Water Treatment (reverse osmosis reject or )	Ocean discharge via marine outfall
Wastewater treatment plant	Onsite effluent treatment plant and discharge to ocean via marine outfall
Clean storm water	Holding basins followed by ocean discharge via marine outfall
Boiler blowdown	Onsite effluent treatment plant and discharge to ocean via marine outfall
LNG Carriers	Adoption and implementation of MARPPOL
Potential for accidental hydrocarbon and chemical spills	Collection and specialist offsite disposal



**Table 7– Decommissioning Waste Water Sources and Possible Treatment**

Source	Potential Treatment and Disposal Options
Wash waters	Possible treatment and ocean discharge via marine outfall
Sanitary waste	Collection and specialist offsite disposal
Decommissioning sewage	Onsite effluent treatment plant and discharge to ocean via marine outfall
Potential for accidental hydrocarbon and chemical spills	Collection and specialist offsite disposal

**Table 8– Potential Solid wastes to be recycled or disposed**

Source	Potential Treatment and Disposal Options
Trees/ Green waste	Stockpile usable/commercial grade timber for sale. Dispose of unsuitable material by chipping/mulching or carting to regional landfill.
Topsoil, subsoils, rock and organic matter	Strip and stockpile topsoil onsite.
Dredged material	Ocean disposal or onsite long term storage
Waste concrete	Crushed and used as road base
Insulation material	Collection and disposal offsite at regional land fill
Putrescibles (food and wastewater treatment plant biomass)	Collection and disposal offsite at regional landfill
Packaging Materials – Wood, cardboard and paper	Recycled or disposed offsite at regional landfill
Metals (aluminium, copper, copper and steel)	Segregated, collected and transported for recycling
Accidentally contaminated soils	Collection and specialist offsite disposal

### 2.8.3 Solid Waste

A range of solid wastes will be generated through the lifecycle of the LNG facility from early site preparation through to project decommissioning. Options for solid waste disposal include recycling or disposal at an approved land fill. Preliminary discussions with the City of Prince Rupert have highlighted limited capacity to deal with large volumes of construction waste from proposed LNG facilities in the region. Further discussions are anticipated to be held with the City and other municipal authorities in the region regarding waste disposal options.

### Construction and Commissioning

Solid waste will be generated as soon as site preparations commence in the clearing of the site and the establishment of the workforce accommodation. Packaging materials make up a considerable proportion of construction based waste and efforts will be made in supply chain to reduce unnecessary packing materials. Recyclable materials, such as steel and copper, will be segregated, collected and sent for recycling.

### Operations

During the operations stage solid wastes will be generated during mainly through maintenance activities, including major shutdowns, and biomass from the operation of the sewage treatment plant. Other solid wastes are expected to include process materials such as spent filters and spent contaminant removal agents such as molecular sieves (water removal). Details of solid wastes are detailed in **Table 9**.

### Decommissioning

Facilities are expected to be dismantled and removed from site. Buried objects that contain no potentially harmful materials may be left in place or deep buried. The site will be ripped to facilitate rehabilitation. Opportunities for recycling of materials, such as steel, will be investigated.

### 2.8.4 Hazardous Waste

#### Construction and Commissioning

Hazardous waste will be limited to waste paints solvents and thinners used in the construction and preparation of the facilities. Where possible the cleaning of lines and vessels will be undertaken at the place of manufacture however there may be occasion where corrosion inhibitors and other cleaning materials may be used. Accidental releases of amine, from the acid gas removal unit, or hydrocarbon may occur. These will be cleaned up and waste materials disposed appropriately.

#### Operations

Operation stage hazardous waste is expected to include spent mercury removal media, solvents and paints and potentially contaminated water/ soil from accidental releases of amine or hydrocarbons such as fuel or lube oil. Refer to **Table 10**.

Mercury guard bed is a reagent used to remove mercury from the gas stream. Commonly amongst LNG facilities around the globe this material is sent for specialist treatment and recovery in Switzerland or the Netherlands in accordance with the requirements of the Basel Convention. As the LNG industry expands in BC this technology may become available in the future within Canada.

#### Decommissioning

Waste will be generated through the washing of contaminated plant and equipment and the subsequent capture and disposal of these wastes. Whilst not expected any contaminated soils would be collected and disposed by specialist contractor.

**Table 9**– Potential Solid wastes to be recycled or for disposal

Source	Potential Treatment and Disposal Options
Putrescibles (food and wastewater treatment plant biomass)	Collection and disposal at offsite regional landfill
Packaging Materials – Wood, cardboard and paper	Recycled or disposed at offsite regional landfill
Metals (aluminium, copper, copper and steel)	Segregated, collected and transported for recycling
Molecular sieve (water removing agent)	Collection and disposal offsite at regional land fill
Accidentally contaminated soils	Collection and specialist offsite disposal

**Table 10**– Hazardous Waste Generation Construction, Operations and Decommissioning

Source	Construction	Operations	Decom	Potential Treatment and Disposal Options
Paints, solvents, thinners and hazardous liquid waste	✓	✓	✓	Collection and specialist offsite disposal
Corrosion inhibitors, vessel and line cleaning materials	✓			Onsite treatment or collection and specialist offsite disposal
Spent mercury removal media		✓		Review of North American treatment options to be undertaken during FEED. Base case is for transportation and recycling in Europe.
Contaminated waters and soils (amine and/or hydrocarbon)	✓	✓	✓	Collection and specialist offsite disposal
Misc. treated sewage and sludge, batteries, filters, aMDEA	✓	✓	✓	Collection and specialist offsite disposal

## 2.8.5 Other Discharges and Emissions

### 2.8.5.1 Noise and Vibration

Noise and vibration are planned to be generated in both the terrestrial and marine environment during construction, commissioning, operations and decommissioning stages of the LNG Project. Sound power levels will be determined by the particular activity and nature of the source e.g. vessel propellers, rotating equipment, piling and blasting (if required).

Noise and vibration will be managed to meet occupational limits inside the facility boundary and relevant noise limits outside the plant boundaries. These limits will be determined in conjunction with the BC Oil and Gas Commission, through the EA process and in consultation with Lax Kw'alaams. Sources of noise emissions are noted in **Table 11**.

### 2.8.5.2 Light

The generation of artificial light during construction, commissioning, operations and decommissioning of the LNG Project will result in light spill to the environment. Potential effects from light spill are detailed in **Section 5.6.1**. The main sources of light are characterised in **Table 12**.

Table 11– Noise and Vibration Emission Sources

Emissions Source	Construction	Operations
<b>Terrestrial</b>		
Vehicle movements / road transports	✓	✓
Site clearing and earthworks	✓	
Piling, blasting	✓	
Power generation	✓	✓
Construction of LNG Processing facilities	✓	
Operation of LNG processing facilities		✓
Flare system (especially during Commissioning)	✓	✓
Line blowing	✓	
<b>Marine</b>		
Dredging vessels and dredging works	✓	
Construction of marine port and export jetty facilities	✓	
Supply vessels (for import of materials and modularised units)	✓	✓
Shipping vessels and support vessels		✓
Pile driving	✓	
Drilling and blasting if necessary, depending on soil structure/geotechnical	✓	
Barges and tugboats to support construction activities	✓	
Operation of process equipment located on caissons		✓

Table 12– Sources of Light

Emissions Source	Construction	Operations
<b>Terrestrial</b>		
Vehicles	✓	✓
Office lighting	✓	✓
Facility lighting		✓
Road lighting	✓	✓
Start up and Emergency flaring	✓	✓
Temporary lighting	✓	
<b>Marine</b>		
Dredging vessels and dredging works	✓	
Marine facilities lighting	✓	✓
Supply vessels (for import of materials and modularised units)	✓	✓
Shipping vessels		✓
Barges and tugboats to support construction activities	✓	



## 3. Project location

The Project is to be located on Provincial Crown Land in North Western British Columbia, Canada. It is approximately 30 km north of Prince Rupert on the Tsimpsean Peninsula at Grassy Point, within the Skeena - Queen Charlotte Regional District (see **Figure 5**).

The land parcel for the Grassy Point LNG Facility is on Provincial Crown Land that consist of approximately 693.6 Ha of Upland and 243.9 Ha of Submerged land adjacent to the Port Simpson natural harbour.

The approximate geographical coordinates of the Grassy Point LNG Facility are:

- Decimal Degrees Latitude 54.5861/ Longitude -130.4040
- Degrees-Minutes-Seconds Latitude 54°35'9.96"/ Longitude 130°24'14.40"
- Universal Transverse Mercator (UTM NAD83) E 409269.01 / N 6049640.68 Zone 9
- BC Albers (NAD83) E716239.83, N 1073857.84

The approximate distances from the proposed Grassy Point site to various receptors are included in the **Table 13**. Indian reserves in the vicinity of the Grassy Point site are shown in **Figure 13** on page 43.

### Site Layout

Preliminary layout for the **onshore** option is represented in **Figure 6**. Further studies are in progress to determine the most optimal configuration of the facilities and equipment.

Berths are located in water depths such that dredging appears not to be required, while maintaining suitable exclusion zones while loading. Individual berths / jetties have been identified as the preferred option as this optimises both jetty and piping lengths and presents as the most likely favourable berth operability scenario.

The location of the feed gas pipeline is assumed to enter from the northern portion of the plot and has been positioned here so as to retain a clear distance away from shipping traffic, including LNG carriers and construction support delivery vessels to the Materials Offloading Facility (MOF).

The MOF has been shown to the north of the plant at this time, however further studies may indicate a more optimum location to the south depending on plant final configurations including the location of administration and lay down areas. The MOF and associated haul road shown provides for module and equipment delivery and facilitates potential future expansion activities by separating construction and operations activities. The gradient limitations of the interconnecting haul roads dictate the height of the level platforms for the development areas and this influences the overall volume of earthworks required to develop the site.

Administration and support facilities have been located to the south as this is perceived as the more favourable topography and is in close proximity to the potential location of a plant access road from the south.

Preliminary layout for the **nearshore** option is represented in **Figure 7**. Further studies are in progress to determine the most optimal configuration of the facilities and equipment.

The **nearshore** option may consist of either floating or grounded structures and units may be a combination of trains, utilities, power generation and LNG storage. In addition unit structures might be combined. Depending on the outcome of further studies onshore storage for LNG may be required. Should the **nearshore** structures be designed as floating facilities they will be anchored to fixed jetty structures that will provide access to the onshore facilities. Both pipe rack jetty and road access and separate pedestrian access ways will most likely be required to each unit.

Onshore facilities to support the **nearshore** option will consist of pipe rack, service corridor and road access along the coast connecting the **nearshore** units to onshore plant facilities including inlet facilities, potential LNG storage and flare. The configuration assumes that the feed gas pipeline will enter from the north and as per the **onshore** layout and has been positioned here to separate it from all shipping traffic.

The administration and support facilities area has been located to the north in close proximity to the MOF. Also adjoining this is the potential lay down area. It is anticipated that road access, if require, will be provided from an access road located to the east of the SPA area.

**Table 13**– Distance to Receptors

Receptor	Approximate Distance from South Site Boundary	Indian Reserve	Approx Shortest Distance Between Boundaries
Nearest permanent residence	2km	Lax Kw'alaams	1.2 Km
Nearest temporary residence	2km	S1/2 Tsimpsean	18.0 Km
Wildlife Habitat area	80m	Tymgowzan	2.7 Km
Zumtela Bay Conservancy	240m	Birnie Island	1.4 Km
Federal Lands	1.4km	Finlayson Island	4.4 Km
BC Provincial Boundary	600km	Cliff Islands	8.6 Km
International Boundary	16.4km	Ktamgaodzen	2.9 Km

Figure 5– Provincial and International Boundaries



## GRASSY POINT PROVINCIAL AND INTERNATIONAL BOUNDARIES

**LEGEND:**

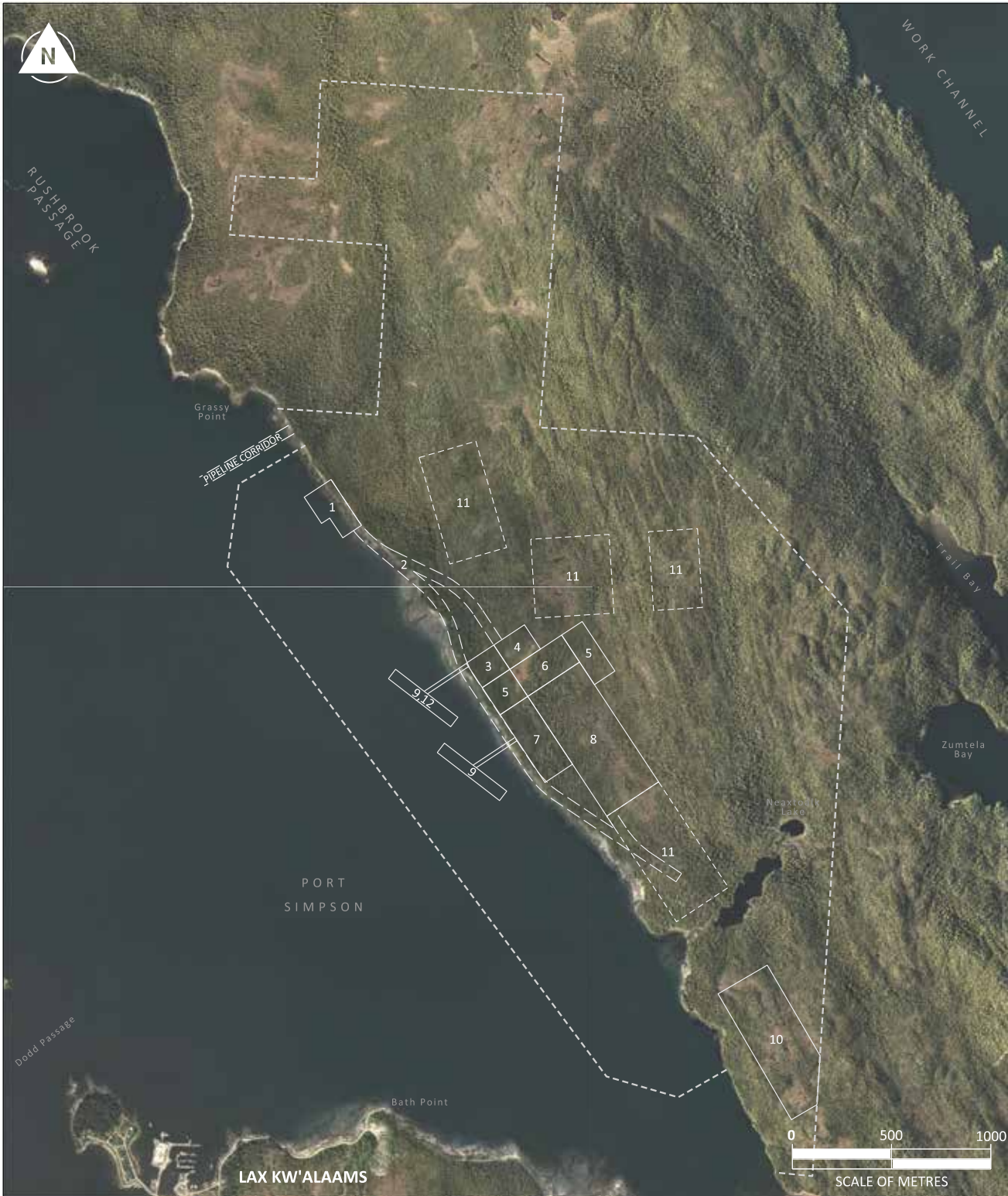
- PROVINCE OF BRITISH COLUMBIA
- PROJECT LOCATION

Datum: *NAD83*  
 Projection: *NAD 1983 BC Environment Albers*  
 Source: *Government of British Columbia  
 British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))*

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*



Figure 6- Indicative Onshore Facility Option



### GRASSY POINT SITE PLAN - ONSHORE OPTION

**LEGEND:**

-----	PROJECT BOUNDARY	6	POWER GENERATION
1	MARINE FACILITY	7	LNG STORAGE
2	HAUL ROAD	8	LIQUEFACTION
3	INLET FACILITIES	9	LOADING
4	FLARE	10	ADMINISTRATION & SUPPORT FACILITIES
5	UTILITIES	11	POTENTIAL LAYDOWN AREAS
		12	TREATED WATER OUTFALL

Datum: *NAD83*  
 Projection: *NAD 1983 BC Environment Albers*  
 Source: *Woodside Energy Holdings Pty Ltd*



Figure 7- Indicative Nearshore Facility Option



## GRASSY POINT SITE PLAN - NEARSHORE OPTION

<p><b>LEGEND:</b></p> <ul style="list-style-type: none"> <li>----- PROJECT BOUNDARY</li> <li>- - - - - PEDESTRIAN ACCESS</li> <li>1 MARINE FACILITY</li> <li>2 ROAD</li> <li>3 INLET FACILITIES</li> <li>4 FLARE</li> <li>5 UTILITIES</li> </ul>	<ul style="list-style-type: none"> <li>6 POWER GENERATION</li> <li>7 LNG STORAGE</li> <li>8 LIQUEFACTION</li> <li>9 LOADING</li> <li>10 ADMINISTRATION AND WORKSHOPS</li> <li>11 POTENTIAL STORAGE</li> <li>12 PIPE TRACK, ACCESS ROAD, SERVICE CORRIDOR</li> <li>13 LAYDOWN AREA</li> <li>14 TREATED WATER OUTFALL</li> </ul>	<p>Datum: <i>NAD83</i>                  Projection: <i>NAD 1983 BC Environment Albers</i>                  Source: <i>Woodside Energy Holdings Pty Ltd</i></p>
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## 3.1. Land and Water Use

### 3.1.1 Zoning Designation

The Grassy Point LNG Facility land parcel is located within the Electoral Area A - Dodge Cove, of the Skeena-Queen Charlotte Regional District (SQCRD). The SQCRD is granted its powers by the provincial government and is directed primarily by two provincial pieces of legislation – the *Local Government Act* and the Community Charter.

The Regional District administers services ranging from solid waste management and recycling to land use planning, water supply and public safety. The SQCRD administers planning and development in this area and at this time the Grassy Point LNG Facility land parcel is not listed under their current planning and development zoning bylaws.

The Grassy Point LNG facility land parcel is also located within the Land Use Zones of the North Coast/ Central Coast Land and Resource Management Plan (LRMP).

The LRMP recommends three different land use designations:

- Protected areas
- Biodiversity, Mining and Tourism areas
- Ecosystem Based Management (EBM) Operating Areas.

Land within the EBM Operating Areas, accounting for the majority of the land base, is available for the full range of economic uses, provided that such uses are consistent with the application of EBM principles.

The lands within the South Site land parcel are categorised as EBM. The site is adjacent to private lands and the existing protected area of Zumtela Bay conservancy (see **Section 3.2.3.1**).

### 3.1.2 Current Land Ownership

Woodside Energy Holdings Pty Ltd (Woodside) proposes to construct, commission and operate a liquefied natural gas (LNG) export facility on provincially administered Crown Land at Grassy Point, near Prince Rupert, on the British Columbia coast. In January 2014, Woodside secured the exclusive right to negotiate a long-term tenure for an LNG facility at the south site of Grassy Point after reaching an agreement with the Government of British Columbia. The Sole Proponent Agreement (“SPA”) was executed on the 15th of January 2014. This includes both the onshore and marine foreshore as depicted in **Figure 8**. Specified existing interests identified by the Province, and included in Schedule D of the SPA, include four mineral tenures and one trapline. Land access will be resolved with the Province as part of the SPA.

A block of private land lies immediately west of the northern part of the Grassy Point site see **Figure 8**. Near the Lax Kw’alaams community, there are private lands, temporary permits, and licenses of occupation.

There are no known national historic sites in the Project boundary however adjacent sites are shown in **Figure 8**.

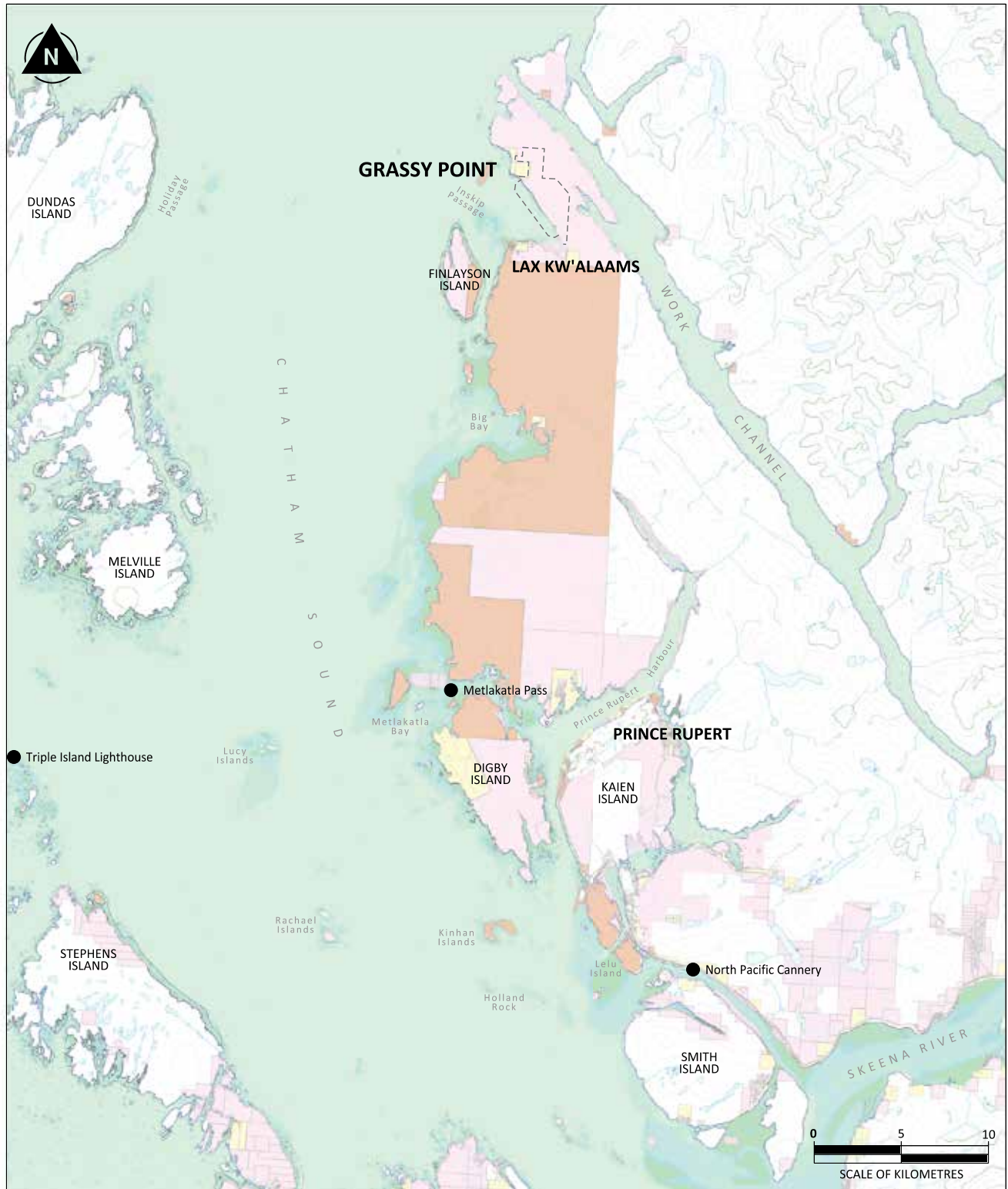
Land tenure over the Grassy Point site is illustrated in the following table.

**Table 14– Land Tenure**

Agency File Number	Type of Interest
1022211	Mineral Tenure
1022210	Mineral Tenure
1022212	Mineral Tenure
1022208	Mineral Tenure
TR0614T037	Trapline

The potential land parcel locations for the accommodation are also likely to be on provincial administered Crown Land. Grassy Point land tenure is shown on **Figure 8**.

Figure 8– Land Tenure



### GRASSY POINT LAND TENURE

**LEGEND:**

- CROWN FEDERAL LAND
- CROWN PROVINCIAL LAND
- PRIVATELY OWNED LAND
- PROJECT BOUNDARY

- NATIONAL HISTORIC SITES OF CANADA  
*(location is indicative only)*

Datum: NAD83  
 Projection: NAD 1983 BC Environment Albers  
 Source: Government of British Columbia  
 British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*



### 3.1.3 Water Use, Resource Management and Conservation Plans

Stumaun Creek, 3 km to the south of the Grassy Point site, provides the community of Lax Kw'alaams water under permit from the designated 856 Hectare Stumaun Community Watershed. No water lots have been identified on the Grassy Point site.

#### 3.1.3.1 Zumtela Bay Conservancy

Zumtela Bay (refer to **Figure 11**) is located near the northwest end of Work Channel on the northwest coast of British Columbia and is within the territory of the Coast Tsimshian. It is approximately 5 km northeast of Lax Kw'alaams, 25 km northwest of Metlakatla and 30 km north of Prince Rupert and is located immediately east of the Grassy Point site.

Zumtela Bay Conservancy encompasses a bay and surrounding upland and intertidal area where the Coast Tsimshian have strong cultural interests, including the desire to pursue their traditional activities, in a manner that sustains the biological diversity and natural values of the bay. Land use is shown in **Figure 12**. The conservancy is within the traditional territories of the Coast Tsimshian.

Woodside will work with Aboriginal Groups to minimise impacts to environmental and heritage values in the Conservancy area.

#### 3.1.3.2 Marbled Murrelet Wildlife Habitat Area

The area immediately east of the Grassy Point site has been established as a wildlife habitat area for the Marbled Murrelet through an order given by the Deputy Minister of Environment under section 9(2) and 10(1) of the *Government Actions Regulations* (B.C.Reg. 582/2004).

### 3.1.4 Marine Terminal

Regulatory input associated with the development in adjacent and surrounding waters is anticipated from the Department of Fisheries and Oceans, and is likely to require the establishment of a Port Authority or Harbour Master under the Canada *Marine Act*. Currently the adjacent and surrounding waters are beyond the jurisdiction of the Prince Rupert Port Authority that is the nearest established Port Authority in this region.



## 4. Federal & Provincial involvement

### 4.1. Federal Financial Support

Federal financial support is not expected during this Project.

### 4.2. Federal Lands

Federal lands are not anticipated to be affected by the Project.

### 4.3. Federal and Provincial Legislative Requirements

Woodside is seeking both federal and provincial environment approval in accordance with the *Canadian Environmental Assessment Act, 2012 (CEAA 2012)* and the *BC Environmental Assessment Act (BCEAA)* respectively for the construction, commissioning and operation of an LNG facility and its supporting infrastructure. In addition to the environmental assessment (EA) process a number of federal and provincial permits and authorisations are expected to be required for each of the investigation, construction and operational stages of the Project.

The scope of this Project description, and subsequent EA, is limited to the LNG facility, the associated marine terminal and supporting infrastructure and services. Production and delivery (i.e. pipelines) of the upstream gas is outside the scope of this assessment.

### 4.4. Environmental Assessment

The Project is expected to require an environmental assessment (EA) under both the *Canadian Environmental Assessment Act, 2012 (CEAA 2012)* and the *British Columbia Environmental Assessment Act (BCEAA)* for the construction, commissioning and operation of an LNG facility and its supporting infrastructure. Details of pertinent assessment thresholds for an EA are detailed in **Table 15**.

### 4.5. Assessment Thresholds

The Project meets several threshold criteria listed under both federal and provincial environmental legislation. These are detailed in **Table 15**.

### 4.6. Regional Environmental Studies

There are no regional federal studies covering the Grassy Point area. This was confirmed in a meeting with CEAA, Lisa Walls - Regional Director Pacific and Yukon, on 12 March 2014.

In 1981, Dome Petroleum conducted an environmental assessment for a proposed LNG facility within the Grassy Point area. The facility was never constructed.

Numerous LNG and pipeline projects within the Prince Rupert region are currently engaged in the environmental assessment process and, as such, many environmental studies will likely occur in the near future to support these applications.

### 4.7. Permits

Woodside has identified federal and provincial permits, licences and approvals that may be required for the Project to commence and these are listed in the following tables in this section.

To conduct feasibility and environmental/heritage baseline studies additional permits will include an Investigative Use Licence. This is required to access land for the purpose of preliminary studies. These permits are granted by the Provincial BC government and have a two year term to five year term. Department of Fisheries and Oceans authorisation is needed to cover marine studies adjacent the shoreline.

#### 4.7.1 Federal Permits

**Table 16** outlines key federal permits, licences approvals and authorisations that may be required for the Project including the name of the approval, the activity it covers, applicable legislation and the granting agency.





**Table 15– Summary of Federal and Provincial Environmental Assessment Thresholds**

Grassy Point LNG Facility	CEAA 2012 Regulations Designating Physical Activities	BCEAA 2012 Reviewable Project Regulation
Construction and operation of new electrical power generation capacity of approximately 1000 MW to supply power for site operations including the natural gas liquefaction process.	2. The construction, operation, decommissioning and abandonment of  (a) a new fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more;	Part 4; Table 7 Electricity Projects;  1 Power Plants  (1) a new facility with a rated nameplate capacity of > 50 MW of electricity that is: (b) a thermal electric power plant
Construction and operation of a natural gas liquefaction and storage facility with a processing capacity, at full build out, of approximately 55,000 t/day (79 million m <sup>3</sup> /day of natural gas) and a storage capacity of approximately 540,000m <sup>3</sup> (~14 PJ).	14. The construction, operation, decommissioning and abandonment of a new  (d) facility for the liquefaction, storage or regasification of liquefied natural gas, with a liquefied natural gas processing capacity of 3 000 t/day or more or a liquefied natural gas storage capacity of 55 000 t or more;	Part 4; Table 8; Petroleum and Natural Gas Projects;  1 Energy Storage Facilities  (1) Subject to subsection (2), a new energy storage facility with the capability to store an energy resource in a quantity that can yield by combustion > 3 PJ of energy.
Construction of a marine facility consisting of a material offloading facility (MOF), LNG loading jetties, tugs pens and a wharf.  Construction of the marine facility is planned to disturb an area greater than 2 hectares of foreshore or submerged land.  Marine terminal designed to accept LNG tankers up to approximately 108,000 DWT	24. The construction, operation, decommissioning and abandonment of a new  (c) marine terminal designed to handle ships larger than 25,000 DWT unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation.	Part 8; Table 14; Transportation Projects  4 Marine Port Facilities (other than Ferry Terminals)  (1) Subject to subsection (2), a new marine port facility, other than a ferry terminal, if construction of the facility entails dredging, filling or other direct physical disturbance of  (b) > 2 hectares of foreshore or submerged land, or a combination of foreshore and submerged land, below the natural boundary of a marine coastline or marine estuary.

**Table 16– Federal Permits, Licences, Approvals and Agencies**

Activity	Permit/Auth'n	Legislation	Responsible Agency
Disposal of marine sediments at an off shore disposal site. Dredging may be required around the MOF and LNG jetty to achieve a safe navigation depth.	Disposal at Sea Permits. 125(1) (b)	Canadian Environmental Protection Act  Disposal at Sea Regulations	Environment Canada (EC)
Exporting LNG outside of Canada to international markets.	Export Licence National Energy Board Act s. 117	National Energy Board Act	National Energy Board (NEB)
Construction of temporary and permanent off-loading docks and the LNG berth.  Operation of the Facility, port and carrier.	Approval Navigation Protection Act  Certificates of Compliance	Navigation Protection Act  Marine Transport Security Act  Marine Transportation Security Regulations	Transport Canada (TC)
Activities that may result in serious harm to fish may include: <ul style="list-style-type: none"> <li>▪ Dredging</li> <li>▪ Temporary and permanent foreshore docks and berths</li> <li>▪ Onshore infrastructure around streams or lakes.</li> </ul>	The <i>Fisheries Act</i> requires that Projects avoid causing <i>serious harm to fish</i> unless authorised by the Minister of Fisheries and Oceans Canada.	Fisheries Act s. 35.2	Fisheries and Oceans Canada (DFO)
Transportation, storage and manufacture of explosives that will be used for blasting during site preparation.	Explosives Permit/License	Explosives Act s. 7(1) Explosives Regulations	Natural Resources Canada



## 4.7.2 British Columbia Permits

**Table 17** outlines key Provincial permits, licences and approvals that may be required through the lifecycle of the Project, including the name of the approval, the activity it covers, applicable legislation and the granting agency. A list of permits and authorisations is available from the BC Oil and Gas Commission.

**Table 17– Additional Provincial Permits for Construction and Operation of the LNG Facility**

Activity	Permit / Authorisation	Legislation	Agency
<b>Construction</b>			
Construction of LNG facility	LNG Facility Permit	Oil & Gas Activities Act	OGC
Land tenure for construction of Project, facilities, structures, construction camps, roads, etc.	Interim Licence of Occupation or Temp Works Permit, License of Occupation, Right of Way or Lease for final installation Section 11, 14, 38, 39 or 40.	Oil & Gas Activities Act  Land Act,	OGC
Damage of, or damage to, a heritage site.	Site alteration Permit (Section 12)	Heritage Conservation Act	OGC
Cut and or remove Crown timber during construction & land clearing	Cutting Permit under a Master Licence to Cut	Oil & Gas Activities Act Forest Act	OGC
Temporary Water Use (hydrostatic testing, dust control, construction water)	Short Term Water Use Permit (Section 8)	Oil & Gas Activities Act Water Act and regulations	OGC
Changes in or about a stream	Section 9 Approval	Oil & Gas Activities Act Water Act, Section 9	OGC
Temporary Use Permits, e.g. Workforce accommodation, helipads, workspaces and storage areas	Temporary Permit or Licence of Occupation, Master Licence to Cut, Health Permit	OGAA Land Act Forest Act Northern Health Authority	OGC Local Health Authority
<b>Operations</b>			
Operation of LNG facility	LNG Facility Permit	Oil & Gas Activities Act	OGC
Air and water discharges	Waste Discharge Permit	Environmental Management Act	OGC Ministry of Environment
Water supply	Water use permit	Oil & Gas Activities Act Water Act and regulations	OGC

## 5. Project Setting and potential effects

Woodside is adopting a structured approach to obtaining baseline information in order to gain understanding of the valued components associated with the Grassy Point location, and the scope of the required surveys and studies to support the environment assessment.

For the purpose of this Project Description, Woodside has retrieved older vintage baseline data (from the proposed Dome Petroleum Ltd LNG Terminal, 1981), public domain data from other current LNG developments in the Prince Rupert region (such as the Prince Rupert LNG and Pacific North West LNG Projects) and anecdotal evidence presented over the course of stakeholder and aboriginal engagement to date.

A number of work scopes will be undertaken in Q4 2014 that will commence field based baseline data collection and inform environmental impact assessment. These include geophysical surveys that will provide seabed mapping to guide focus areas for subsequent marine ecosystem and habitat mapping, onshore and intertidal geotechnical coring that will provide an understanding of a number of physical and chemical parameters and an onshore based evaluation of surface features. Additionally, commencement of metocean and oceanographic data collection is scheduled for Q1 2015.

It is envisaged that subsequent to submission of the Project Description, field based surveys and studies will be scoped and undertaken to verify and validate data presented in environment assessment documentation. These surveys and studies will meet as a minimum the requirements of the Application Information Requirements (AIR) approved by the Province and guided by the Working Group. It is anticipated they will span multiple seasons to allow for determination of seasonal and annual variation. Woodside will look to engage with proponents of other regional developments to facilitate sharing of information, with an objective of minimising the replication of data collection and expansion of existing datasets to obtain a fuller or broader understanding of potential environmental impacts.

It is also envisaged that longer term data collection and monitoring programs will be established in order to validate predicted effects.

Without certainty that measured field data can be provided, Woodside has adopted a precautionary approach in an assessment of potential effects on the receiving environment.

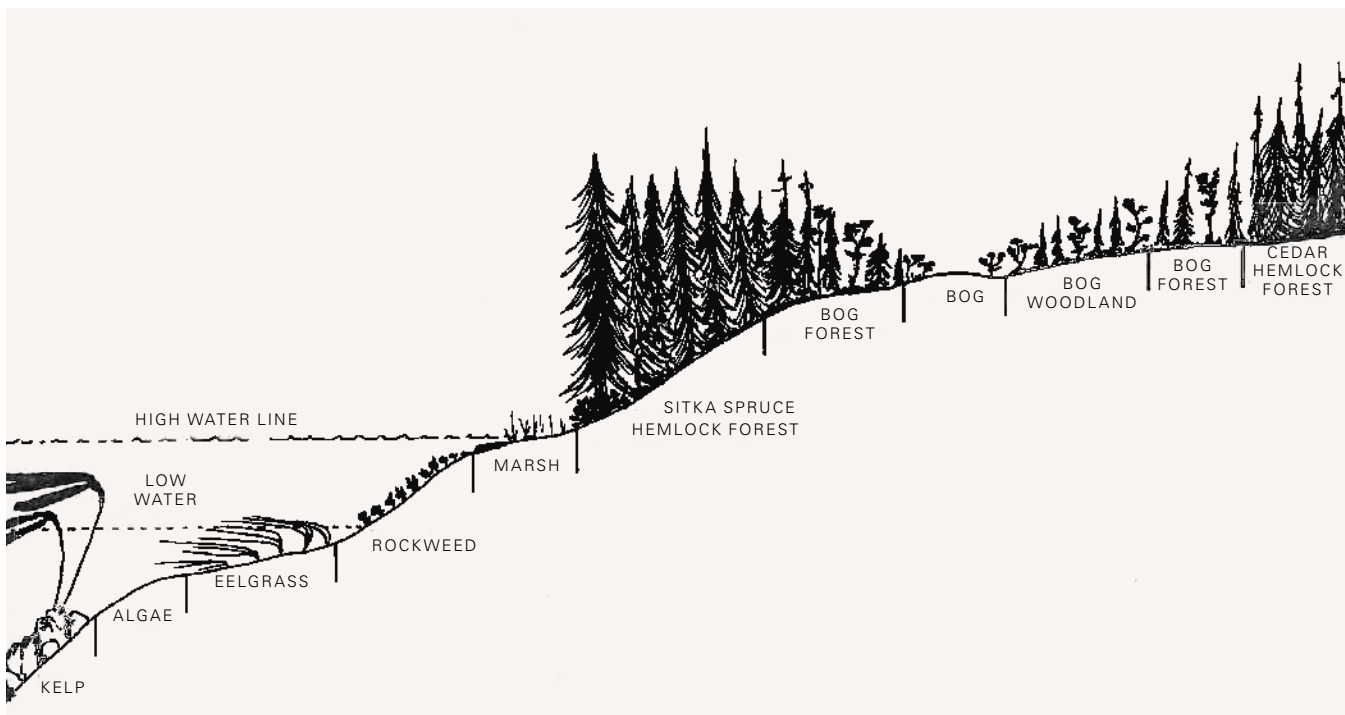
### 5.1. Existing Environment

The Project is to be located on Provincial Crown Land in North Western British Columbia, Canada. It is approximately 30 km north of Prince Rupert on the Tsimpsean Peninsula at Grassy Point, within the Skeena - Queen Charlotte Regional District. The site has been anticipated to be developed for industrial purposes since the proposed Dome Petroleum LNG terminal in 1981.

Grassy Point sits within the Coastal Western Hemlock Zone which stretches in a broad band along the Province's entire coast. The zone covers the majority of lower elevations west of the Coast Mountains, from the very wet and exposed outer coast to drier and more sheltered areas of the inner coast.

A conceptual model of the Grassy Point site, developed by Dome Petroleum (1981) and verified by site visits, showed the inland reaches of the Tsimpsean Peninsula as coniferous forests, of cedar/ hemlock. This transitions to bog forest, bog woodland and bog moving west towards the ocean. Continuing west the bog transitions for a second time into sitka spruce/hemlock in a narrow fringe which stretches along the coast line. Small patches of marsh exist at the mouth of Neaxtoalk Creek and a number of other streams along the peninsula. In the intertidal zone rockweed and eelgrass inhabit the shallows giving way to algal species and kelp in the deeper water. These habitats provide food and shelter for a large number of resident and migratory species. Details of marine and terrestrial species are included in the following chapters.

Figure 9– Conceptual Schematic of Plant Communities at the Grassy Point Location (Dome Petroleum 1981)



## 5.1.1 Atmospheric Environment and Climate

### 5.1.1.1 Climate and Air Quality

Prince Rupert is the wettest city in Canada receiving approximately 2,500 mm of rainfall throughout the year. The wind direction is predominantly from the south to south east all year with highest wind speeds occurring in the winter months. In summer, mild winds from a west to northwest direction occur.

Local topography greatly affects wind conditions, with shielding and funnelling effects possible from the surrounding Coast Mountains. In the winter months strong outflow winds come from the Portland Inlet at the top of Chatham Sound.

Climatic conditions at Grassy Point are expected to be similar to those characterised by the data collected from the Prince Rupert Airport. The prevailing winds are from the south-east with average wind speeds from 2 – 4 m/s (Environment Canada, 2012).

Data reviewed in the Prince Rupert region of northwest British Columbia have stated that existing air quality is generally good (Prince Rupert LNG, AECOM 2013), and this is as expected given the lack of major industry emitters within the Grassy Point area. A number of air quality stations exist within the Prince Rupert region and these are planned to be reviewed alongside site specific data within the context of the Environmental Assessment application. Monitoring sites are expected to be chosen based on the sensitive receptors in the vicinity including the community at Lax Kw'alaams.

### Potential Effects

The addition of Green House Gases (GHGs) from human sources is enhancing the amount of solar energy trapped by the earth's atmosphere – leading to warming of the global climate system.

Project activities leading to the emission of GHGs are likely to occur during construction and operation and may include vehicle and vessel movements, construction equipment, power generation, fugitive emissions, flaring and process operations and include CO, CO<sub>2</sub> and CH<sub>4</sub> (see **Section 2.8.1**).

Currently Canada and BC are developing numerous policies, legislation and initiatives to address GHG emissions. It is anticipated that Canada's draft GHG regulations for the oil and gas industry will be issued by the end of 2014 and is expected

to include a performance or intensity based emission baseline and reduction standard and a carbon price ceiling. The BC Oil and Gas Commission has identified actions aimed at reducing GHG emissions from LNG facilities including reducing natural gas flaring, implementing best practices and emission reduction technologies and promoting the use of carbon capture and storage. Additionally the OGC released the flaring and venting reduction guidelines under the Oil and Gas Activities Act which provides regulatory requirements and guidance for flaring, incinerating and venting in BC.

During the construction and operation stages of the Project contaminants are expected to be emitted from road and vessel traffic, power generation, LNG process, flaring and fugitive emissions.

Mitigation measures for air quality and greenhouse gas production are expected to include low NOx technology in power generation, thermal oxidation of waste acid gas removal unit gases, waste heat recovery and energy efficiency measures. Detailed mitigation measures will be prepared in line with good international practice within the Environmental Assessment application. As a minimum Woodside will meet Provincial and Federal discharge limits for emissions to atmosphere, however it is anticipated that in some instances more stringent criteria may be applied to the Project as a result of the EA process.

A summary of the potential impacts is shown in **Table 18**.

### Baseline Data Collection

Existing baseline data will be supplemented during the next stages of the environment assessment. The scope of the studies is expected to be formalised through the preparation and acceptance of the Application Information Requirements (or EIS guidelines). Woodside anticipates that the following types of studies will be undertaken prior to lodgement of an EA application:

- Regional ambient air monitoring including grassy point, neighbouring communities and the wider region;
- Monitoring will include a suite of parameters to be guided by existing monitoring data to allow direct comparison. This may be supplemented with additional parameters as identified through the AIR development and working group; and
- Desktop studies and modelling predictions of ambient ground level concentrations of key pollutants.

**Table 18– Potential Effects Air Quality and GHG**

Project Activity	Stage	Potential Effects
Vehicle and vessels movements, power generation, fugitive emissions and flaring	Construction	Increased local emissions of GHG leading to changes in the baseline level of GHG in the local and regional study area
Site preparation including clearing, earthworks and blasting	Construction	Long term storage of carbon (sequestering) from bog forests, bog woodlands and blanket bogs lost in Project construction.
Facility emissions including power generation, flaring, shipping, combustion of acid gas removal gases and ancillary operations	Construction Operation Decommissioning	Increased local emissions of GHG leading to changes in the baseline level of GHG in the local and regional study area
Vehicle and vessels movements, staging and storage areas, power generation, fugitive emissions, flaring, combustion of acid gas removal unit gases and process operations	Construction Operation Decommissioning	Increases in the local baseline of CO, NOx, SOx, PM <sub>10</sub> , PM <sub>2.5</sub> , unburnt hydrocarbons and volatile organic compounds (VOC) leading to potential localised human health concerns and possible damage to vegetation.



## 5.1.2 Terrestrial Environment

### 5.1.2.1 Geology, Soils and Terrain

The Grassy Point LNG Facility is located in the Hecate Lowlands on the western extremity of the Coast Mountains (Kitimat Range) in British Columbia. The region has been glaciated, and this has shaped the current landform, but there is little evidence of glacial deposition onshore. The dominant topographic lineaments are aligned in the northwest-southeast direction, reflecting the underlying bedrock structure. The region has been subjected to major sea level and isostatic changes throughout and following several periods of glaciation. Regionally, marine clay deposits have been documented up to 200 m above the present sea level, but there is little evidence of significant onshore marine clay deposits at the Grassy Point LNG Facility location.

The site is underlain by metamorphic rocks, predominately schists, believed to be some 230 million years old, into which younger intrusive rocks (less than 100 million years old) have been intruded.

The western area of this portion of the Tsimpsean Peninsula consists predominantly of dark greenish grey hornblende schist, with some biotite and garnet schist and impure quartzite. To the east, including Lizzie Hill, biotite hornblende gneiss is indicated and it is possible that a geological fault delineates these differing rock types.

The foliation of the schist trends at a strike in the range of 130 to 175 degrees (clockwise from true north) and dips steeply at angles ranging from 55 to 70 degrees towards the northeast. The strike of the bedrock is generally parallel to the shoreline, reflecting the bedrock control on the topography, with localised, but significant, variations.

A relatively flat wave-cut platform exists along much of the beach, where mica schist bedrock is predominately exposed. There are a number of small sandy beaches, along the shoreline which represent in filled depressions within the bedrock. There are also a number of well-defined swampy areas in the flatter portion of the site. The Grassy Point LNG Facility is located in an area of moderate seismicity, with known regional historical earthquake activity since 1627. The largest recorded earthquake in the region was the magnitude 8.1 event on the Queen Charlotte Fault to the west of Haida Gwaii in 1949, some 220 km west of the site area. The second largest earthquake with a magnitude of 7.8 occurred on 28 October 2012 with an epicentre located on the western side of Haida Gwaii.

### Potential Effects

During the construction of the Project the landscape can reasonably be expected to be physically altered by a number of activities including site preparation and clearing, earthworks and blasting (if required). Temporary and permanent storage of top soils and other excavated materials may be required within the Project boundary. Detailed mitigation measures will be prepared within the Environmental Assessment application.

A summary of the potential impacts is shown in **Table 19**.

## Baseline Data Collection

Existing baseline data will be supplemented during the next stages of the environment assessment. The scope of the studies is expected to be formalised through the preparation and acceptance of the Application Information Requirements (or EIS guidelines). Woodside anticipates that the following types of studies will be undertaken prior to lodgement of an EA application:

- Geotechnical investigations across the onshore and nearshore development areas; and
- Physical and chemicals analysis of sediments and soils including pH, heavy metals and hydrocarbons.

### 5.1.2.2 Vegetation Resources

The Tsimpsean Peninsula sits within the very wet hypermaritime zone of the Coastal Western Hemlock biogeoclimatic region (CWHvh2). The CWHvh2 biogeoclimatic zone occupies the outer coastal areas, usually less than 25 km from salt water, and ranges in elevation from 0 m to 600 m. Coniferous forests predominate in the Coastal Western Hemlock Zone. Commonly called “temperate rainforests” due to the mild, wet climate in which they grow, these forests are complex and often highly productive ecosystems. Red cedar, sitka spruce and red alder, are the major vegetation cover in the immediate vicinity of Prince Rupert and at Grassy Point. The area also supports abundant mosses and lichens.

In addition to the sitka spruce vegetation along the coast line the Grassy Point site contains patches of coastal Muskeg. These areas are relatively flat lands characterised by poor drainage, peat bogs, and islands of bog forest, bog woodlands and some open stretches of ponded water. Muskeg vegetation is made up of stunted and contorted trees, including shore pine, yellow cedar, western hemlock and red cedar. In open areas, shrubs such as Labrador Tea, Bog Laurel, Spreading Juniper and many herb species dominate. Decomposition of several species of sphagnum moss form water-saturated peat hummocks.

Thirteen blue-listed and four red-listed ecosystems potentially occur within the Project area. This includes forest ecosystems, wetland ecosystems and estuarine tidal flat, appendix C-1. Four ecosystems are explicitly defined as red or blue listed ecological communities in the Central and North Coast Land Use Objectives Order for Ecosystem Based Management (EBM) Implementation.

There is a relatively high potential of species of concern occurring in the Project site. 31 plant species of conservation concern, including 25 blue-listed species and six red-listed species, have potential to occur within the Project area. This includes 15 vascular plant species, 11 true mosses (*Bryopsida*) and four peat-mosses (*Sphagnopsida*), and a lichen species (*Pseudocyphellaria rainierensis*). A list of key species, including species of concern and species listed in Schedule 1,2 or 3 of SARA, is documented in Appendix C-2.

Site specific sensitivities will be investigated through the next stage of the environmental assessment. Habitats will be classified with Terrestrial Ecosystem Mapping (TEM) following guidelines from the BC Resource Inventory Standards Committee.

## SARA Listed Species (Schedule 1, 2 or 3)

A review of the BC Conservation Data Centre found the following species at risk, listed in Schedule 1, 2 or 3 of SARA, with the potential to be found in the Project area:

Oldgrowth specklebelly (*Pseudocyphellaria rainierensis*) 1-SC (Jul 2012). This lichen is listed as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species at Risk Act (SARA).

## Potential Effects

During the construction of the Project the site will be physically altered from a number of activities including site preparation, clearing and earthworks. A summary of the potential effects is shown in **Table 20**.

Mitigation measures may include relocation of individual plants, offset programs and area avoidance. Detailed mitigation measures will be prepared within the Environmental Assessment application.

## Baseline Data Collection

Existing baseline data will be supplemented during the next stages of the environment assessment. The scope of the studies is expected to be formalised through the preparation and acceptance of the Application Information Requirements (or EIS guidelines). Woodside anticipates that the following types of studies will be undertaken prior to lodgement of an EA application:

- Habitat mapping through TEMS. Field surveys to validate TEMS data. Assessment of species composition and health of the habitat type;
- Field surveys to confirm presence or absence of species of conservation concern and SARA listed species (Schedule 1, 2 or 3);
- Identification of potential areas for vegetation relocation (if required);
- Identification of priority areas to avoid/minimise disturbance; and
- Investigate potential for application of remote sensing techniques to hindcast vegetation health and growth and provide historical baseline against which future monitoring can be undertaken.

**Table 19– Potential Effects Soils and Terrain**

Project Activity	Stage	Potential Effects
Site preparation including clearing, earthworks, blasting (if required)	Construction	Localised alteration of the surrounding landscape. Temporary or permanent storage of overburden (surface materials unsuitable for construction) and potential for acidic leachate runoff or ground contamination.

**Table 20– Potential Effects Terrestrial Vegetation**

Project Activity	Stage	Potential Effects
Site preparation including clearing, earthworks, and temporary structures	Construction	Direct loss (localised) of forest, wetland and estuarine habitat. Potential loss of or change in abundance of plant species of interest, including at risk, and a localised reduction in biodiversity resulting from direct Project activity. Localised change in abundance of ecological communities, including those of conservation interest e.g. provincially at risk. Potential introduction of invasive species. Localised alteration of groundwater-fed surface water and possible changes to wetland function.

## 5.1.2.3 Wildlife Resources

Within the region, common mammals including black bear (*Ursus americanus*), grizzly bear (*Ursus arctos*), gray wolf (*Canis lupus*) and black tailed deer (*Odocoileus hemionus*) may be present at the Grassy Point site. Smaller mammals such as mink, fisher, the little brown myotis, keen's myotis and beavers may also be present.

Amphibian and reptile species known to occur in the Prince Rupert region and considered likely to occur in the Project area include the western toad (*Anaxyrus boreas*), the coastal tailed frog (*Ascaphus truei*), the common garter snake (*Thamnophis sirtalis*), western garter snake (*Thamnophis elegans*), rough skinned newt (*Taricha granulosa*), long-toed salamander (*Ambystoma macrodactylum*) and the northwestern salamander (*Ambystoma macrodactylum*).

Both resident and migratory birds are expected to be found in the Project area. The Project Description for the adjacent Aurora LNG site (Aurora 2014) identified a number of migratory and other types of birds expected to be present within the region or associated with the two Important Bird areas (BC 124 and BC 125) including black turnstone (*Arenaria melanocephala*), brant (*branta bernicla*), colonial water birds and sea birds, dunlin (Claidris alpine), surf scoter (*melanitta perspicillata*), water fowl and harlequin duck (*Histrionicus histrionicus*).

Other common birds in the Prince Rupert region that can be expected to occur at Grassy Point include bald eagle (*Haliaeetus leucocephalus*), common raven (*Corvus corax*), dark-eyed junco (*Junco hyemalis*), and glaucous-winged gull (*Larus glaucescens*).

A known protected nesting habitat for the Marbled Murrelet is located immediately east of the Grassy Point LNG Facility site location. The Marbled Murrelet (*Brachyramphus marmoratus*) is a small, north Pacific seabird, which relies on coastal old growth trees for nesting. In British Columbia, and elsewhere in the Murrelet's breeding range, these habitats are disappearing with much of the low and middle-elevation forest already felled through forestry and urban development.

A list of key terrestrial species including species of conservation concern and species included in Schedule 1,2 or 3 of SARA, that may be found in the Project area is recorded in **Appendix B – 2**.

## SARA Listed Species (Schedule 1, 2 or 3)

A review of the BC Conservation Data Centre found the following species at risk, listed in Schedule 1, 2 or 3 of SARA, with the potential to be found in the Project area:

Terrestrial mammals - Keen's Myotis (*Myotis keenii*), 3 (Mar 2005);

Amphibians and reptiles - western toad (*Anaxyrus boreas*) 1-SC (Jan 2005), the coastal tailed frog (*Ascaphus truei*) 1-SC (Jan 2003);

Birds - the Northern Goshawk (*Accipiter gentilis*) 1-T (Jan 2003), the Marbled Murrelet (*Brachyramphus marmoratus*) 1-T (Jan 2003), Olive-sided Flycatcher (*Contopus cooperi*), 1-T (Jan 2003), Great Blue Heron (*Ardea herodias fannini*) 1-SC (Feb 2010), Rusty Blackbird (*Euphagus carolinus*), Peregrine Falcon (*Falco peregrinus pealei*), Western Screech-Owl (*Megascops kennicottii kennicottii*) 1-SC (Jan 2005), Band-tailed Pigeon (*Patagioenas fasciata*) 1-SC (Feb 2011), the Ancient Murrelet (*Synthliboramphus antiquus*) 1-SC (Aug 2006) and the Short-eared Owl (*Asio flammeus*) 1-SC (2012).

## Potential Effects

Construction and operation of the facility has the potential to affect terrestrial and avian species, including migratory birds as defined in the Migratory Birds Convention Act, 1994. During the construction of the Project the site will be physically altered from a number of activities including site preparation and clearing, earthworks and blasting (if required). This has the potential to disturb feeding areas, predator and prey relationships and potential roosting sites. Effects from noise and vibration and lighting during each stage of the Project also have the potential to impact on feeding and movement of avian and terrestrial species, including species at risk and those species included in Schedule 1, 2 and 3 of SARA. Discharges of treated waste waters are not expected to have any impact on terrestrial wildlife or resident/migratory birds.

Detailed baseline information on terrestrial wildlife resources, including migratory birds, will be collected as part of the preparation for the Environmental Assessment application.

Possible mitigation measures include use of green/blue lighting to minimise effects on migratory birds, vehicle speed restrictions, workforce awareness training. Detailed mitigation measures will be prepared within the Environmental Assessment application. A summary of the potential impacts is shown in **Table 21**.

## Baseline Data Collection

Existing baseline data will be supplemented during the next stages of the environment assessment. The scope of the studies is expected to be formalised through the preparation and acceptance of the Application Information Requirements (or EIS guidelines). Woodside anticipates that the following types of studies will be undertaken prior to lodgement of an EA application:

- Field based surveys and investigations to validate existing desk top data, including identification of key feeding, roosting and nesting areas;
- Field surveys will also confirm presence or absence of species of conservation concern including those listed in SARA Schedule 1, 2 or 3;

- Identification of priority areas to avoid/minimise disturbance;
- Desk top studies into predicted noise and vibration sources and an assessment on potential effects to feeding, roosting and nesting sites;
- Investigate potential for trapping and relocation of key species;
- Desktop study on optimal wavelength lighting to minimise disturbance to fauna; and
- Desktop study to identify waste water discharge streams and an assessment on potential for impact to fauna.

## 5.1.3 Aquatic Environment

### 5.1.3.1 Marine Environment and Resources

#### Physical Environment

The Grassy Point LNG Facility is located on the south side of the Tsimpsean Peninsula, in a bay within a naturally deep harbour (Port Simpson Harbour) that provides access to Chatham Sound through the Inskip passage. Chatham Sound connects to the Pacific Ocean through Hecate Strait or Dixon Entrance / Queen Charlotte Sound.

Regionally the coast features multiple islands and small rocky outcrops which provide varying levels of protection against the metocean conditions. Offshore water depths reach 2,000 m to the west of the Haida Gwaii (formerly Queen Charlotte Islands) and the nearshore generally characterised by deep water close to shore.

Port Simpson Harbour has a minimum navigation access width of 700 m through Inskip Passage where soundings show water depths of approximately 27 m with a single isolated bank of 16.5 m just inside the entrance. Water depths within the Port Simpson Harbour range from 20-48 m with anchorage indicated as mud bottom.

Tides in the region are mixed, mainly semi-diurnal with a tidal range approaching 8 m measured at Prince Rupert. The sea level record from Prince Rupert has been continuously measured over the past 90 years, with the observations indicating sea level rise on average of about 1mm / yr. This is at the lower end of global sea level rise predictions.

Due to the large tide ranges of the region, significant tidal currents can occur although the Port Simpson Harbour is at present considered as having 'ease of access with no tidal currents'. Regionally the large Pacific swells are largely blocked by the Haida Gwaii and the islands on the west side of Chatham Sound (Golders Associates).



Table 21– Potential Effects Wildlife Resources

Project Activity	Stage	Potential Effects
Site preparation including clearing, earthworks and blasting (if required)	Construction	Increased injury or mortality rates as a result of mammal and avian interaction with construction vehicles.
	Operations	<p>Behavioural changes in terrestrial species, including species of interest, associated with sensory disturbance e.g., noise, vibration and/or light emissions.</p> <p>Loss of feeding and breeding areas for listed and non-listed species including the fragmentation of habitat.</p> <p>Increased lighting along newly created roads and the marine terminal may lead to behavioural changes in listed and non-listed species (animal movement, alteration to migration corridor etc.).</p> <p>Bats, moths and other nocturnal animals potentially impacted by the additional light source altering navigation capabilities, competitive interactions, predator-prey relationship, physiology and reproductive behaviour.</p>

## Marine Resources

The subtidal, intertidal and foreshore areas along the Grassy Point site is predominantly rock, specifically categorized as 'Rock Platform with Sand and Gravel Beach', although a 'Sand Flat' occurs along the southern extent of the property in an area where one of several (unnamed) creeks terminates (Golder Associates). The rocky foreshore and intertidal marine environment provides habitat to a large number of plants, animals, fish and invertebrates, including some protected species.

Algal species including Rockweed (*Fucus gardneri*), sea lettuce (*Ulva* spp.) red algae and a variety of canopy forming and understory kelp species are present along the Tsimpsonian Peninsula and are likely to occur in the Project area (Dome 1981).

In addition two species of marine vascular plants, or sea grasses, commonly found along the shoreline of north western British Columbia, are present at the Grassy Point site. Eel grass (*Zostera marina*) is found subtidally along protected sand beaches and mudflats and Surfgrass (*Phyllospadix scouleri*) inhabits the rocky intertidal zone along the exposed shoreline. Eel grass can be found in protected waters close to shore within Port Simpson Harbour, Stumaun Bay and along the Project site. Eel grass provides a nursery in intertidal and subtidal zones of estuaries and bays. It provides critical habitat, food, breeding areas, and protective nurseries for many species of juvenile fish including salmon, and resident forage fish, Pacific Sand Lance (*Ammodytidae*) and invertebrates, migrating waterfowl, and wading birds. Several patches of eel grass are known to exist in narrow linear beds along steeply sloping sandy shores within the Project boundary (Dome Petroleum 1981). Known eel grass is illustrated on **Figure 10** close to the grassy point site however the majority of priority eel grass habitat falls outside of the proposed site.

Marine waters surrounding Grassy Point are within DFO Important Areas (IAs) for tanner crab (*Cancer baerdi*), green sea urchin (*Strongylocentrotus droebachiensis*) and Pacific herring (*Clupea pallasii*). A DFO IA for shrimp is also located near grassy point (Aurora 2014).

Pacific Salmon and Pacific Herring are the foundation of British Columbia's coastal ecosystems, delivering a critical protein source to wildlife, and nutrients to ecosystem processes. In spring, Pacific herring spawn in huge numbers in bays and channels up and down the coast. Port Simpson Harbour, the western shoreline of

the Tsimpsonian Peninsula and Stumaun Bay is known spawning grounds for Pacific Herring (Dome Petroleum 1981, Lax Kw'alaams 2014). Herring Roe is commercially fished in the area.

All five species of Pacific salmon, belonging to the genus *Oncorhynchus* family Salmonidae, pink (*O. gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), coho (*O. kisutch*) and chinook (*O. tshawytscha*) occur in the waters around Port Simpson Harbour.

The native range of Pacific Salmon includes the north Pacific Ocean, Bering Strait, south-western Beaufort Sea and surrounding fresh waters. They occur in an estimated 1300-1500 rivers and streams in BC and Yukon most notably, the Skeena River and Nass River in the north of the Province and the Fraser River in the south that accounts for about 75% of the total salmon numbers (DFO - Northern Pacific Salmon Integrated Fisheries Management Plan Summary 2013). Pacific salmon complete their life cycle by returning to their natal stream to spawn, in many cases to the particular gravel bed where they were hatched. The Grassy Point site is of low significance to the regional population of Pacific Salmon which are predominately dependant on the Skeena River to the south and the Nass River to the north.

Harvesting for commercial, recreational and/or Aboriginal fisheries is a high value industry in British Columbia and has heritage and cultural significance to Aboriginal Groups, with Fisheries and Oceans Canada (DFO) approval being critical in the development of any site. Key species commercially harvested in the study area include, Pacific salmon, Pacific salmon caviar, halibut (*Hippoglossus stenolepis*), Pacific herring (*Clupea pallasii*), rockfish, lingcod (*Ophiodon elongatus*), Pacific cod (*Gadus macrocephalus*) and sablefish (*Anoplopoma fimbria*). One other species of aboriginal importance is the Eulachon (*Thaleichthys pacificus*). Marine resources, including fisheries, within the vicinity of Grassy Point are shown in **Figure 10**.

Several species of marine mammal can be found in the waters surrounding Port Simpson including baleen and toothed whales, sea lions, seals and sea otters. Several marine mammals are likely to be present in the local study area including, humpback whale (*Megaptera novaeangliae*), northern resident killer whale (*Orcinus orca*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), harbour porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), Steller sea lion (*Eumetopias jubatus*) and the harbour seal (*Phoca vitulina*).

A list of key marine species including species of conservation concern and species included in Schedule 1,2 or 3 of SARA, can be found in **Appendix B – 2**.

### SARA Listed Species (Schedule 1, 2 or 3)

A review of the BC Conservation Data Centre found the following species at risk, listed in Schedule 1, 2 or 3 of SARA, with the potential to be found in the Project area:

Marine Plants – No species of concern listed;

Fish – Green sturgeon (*Acipenser medirostris*) 1-SC (Aug 2006), Northern abalone (*Haliotis kamtschatkana*) 1-T (Jun 2003);

Fish (Marine Mammals) - Fin Whale (*Balaenoptera physalus*) 1-T (Aug 2006), Humpback Whale (*Megaptera novaeangliae*) 1-T (Jan 2005), Killer Whale (West Coast transient population Orcinus orca pop. 3) 1-T (Jun 2003), Killer Whale (Northeast Pacific northern resident population Orcinus orca pop. 6) 1-T (Jun 2003), Sea Otter (*Enhydra lutris*) 1-SC (Jun 2003), Grey Whale (*Eschrichtius robustus*) 1-SC (Jul 2005), Steller Sea Lion (*Eumetopias jubatus*) 1-SC (Jul 2005), Harbour Porpoise (*Phocoena phocoena*) 1-SC (Jul 2005), North Pacific Right Whale (*Eubalaena japonica*) 1-E (Aug 2006), Sei Whale (*Balaenoptera borealis*) 1-E (Jan 2005), Blue Whale (*Balaenoptera musculus*) 1-E (Jan 2005).

### Potential Effects

Marine plants and fish, as defined in the Fisheries Act, need to be considered during the environmental assessment process. The construction and operation of the Project has the potential to affect those items listed above through a number of activities including site preparation and clearing, dredging (if required), construction activities, piling and shipping operations. In addition to physical disturbance both noise and light emissions from the facility, and its construction, have the potential to effect fish and aquatic species. A summary of the potential impacts is shown in **Table 22**.

Baseline data on fish, marine plants, aquatic species, water quality and sediment quality will be collected as part of the preparation for the Environmental Assessment application.

Mitigation measures may include tertiary treated waste water systems, storm water sediment control, selection and placement of lighting to minimise impacts to migratory birds and the use of marine mammal observers during migratory periods. Detailed mitigation measures will be prepared within the Environmental Assessment application.

The BC Oil and Gas Commission can regulate wastewater discharge from the Project for activities under the Schedule 1 of the BC Waste Discharge Regulation. Projects or operations listed in Schedule 1 (Oil and Natural Gas Industry – Large) require an authorisation, to discharge waste into the environment. The authorisation will require a detailed technical assessment in order to obtain permit approval. Baseline condition assessments will detail the composition of water, treatment strategy, discharge rates, a description of the receiving environment, and a proposed monitoring program.

Water and wastewater discharged from the site will meet published BC Ministry of Environment Compendium of Working Water Quality Guidelines for British Columbia, 2006 and Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines: Water Quality Guidelines for the Protection of Aquatic Life, 2014 guidelines. Through baseline pre-project monitoring, the assessment will identify individual parameters of concern, such as but not limited

to; temperature, turbidity, dissolved oxygen, conductivity and Total Suspended Solids. As a minimum Woodside will meet the more stringent of Provincial or Federal limits for discharges to marine waters, however it is anticipated that in some instances more stringent criteria may be applied to the Project as a result of the EA process.

Woodside have extensive experience working in sensitive marine environments in the presence of marine mammals. This includes operating facilities adjacent to the World Heritage Listed Ningaloo Marine Park, and the National Heritage Listed Dampier Archipelago in Australia. This experience coupled with local and traditional knowledge will be used to develop future marine studies and mitigation measures.

### Baseline Data Collection

Existing baseline data will be supplemented during the next stages of the environment assessment. The scope of the studies is expected to be formalised through the preparation and acceptance of the Application Information Requirements (or EIS guidelines). Woodside anticipates that the following types of studies will be undertaken prior to lodgement of an EA application:

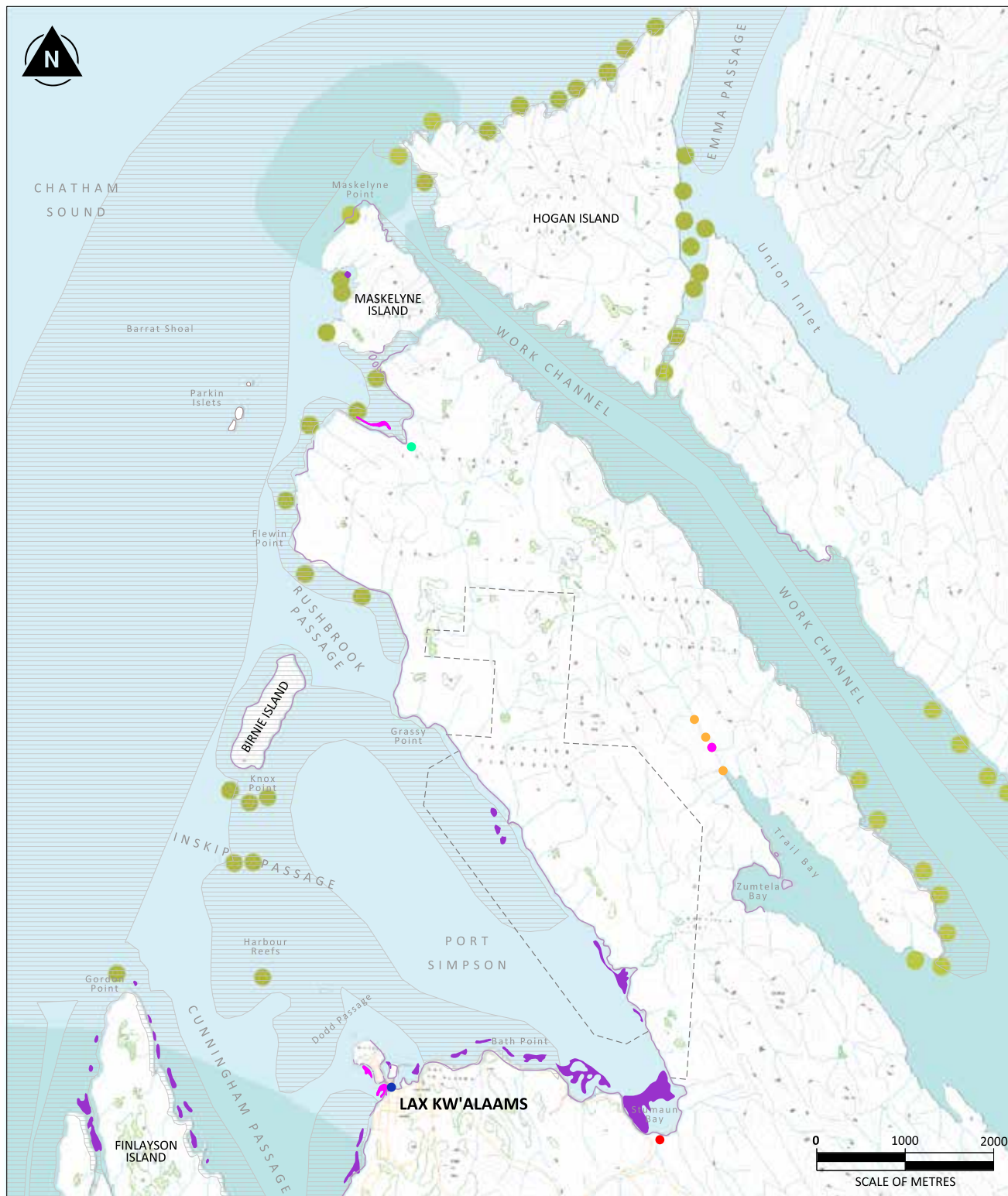
- Field based surveys to validate existing desktop data and investigations on nearshore habitat types and marine plants;
- Field surveys to confirm presence or absence of species of conservation concern including those listed in SARA Schedule 1, 2 or 3;
- Investigate potential for deployment of Baited Remote Underwater Video Stations (BRUVS) to validate fish sizes, abundance and diversity;
- Investigate potential for deployment of hydrophone buoys to validate presence of marine mammal species and their abundance;
- Desktop studies into predicted noise and vibration sources and an assessment on potential impact to marine mammals at both physiological and behavioural thresholds;
- Desktop study on optimal lighting wavelength to minimise disturbance to fauna;
- Desktop study to identify waste water discharge streams and an assessment for potential effects on marine plants and fish;
- Physical and chemical analysis of marine waters at the site including temperature, salinity, heavy metals total nitrogen and phosphorous; and
- Baseline assessment of the status of invasive marine species at the site.

Table 22– Potential Effects Marine, Marine Plants and Fish

Project Activity	Stage	Potential Effects
Site preparation (including dredging if required) and in water construction.	Construction	<p>Localised alteration of the intertidal and subtidal environment leading to a change in the coastal ecological community and possible changes to food web dynamics (including predator-prey relationships).</p> <p>Permanent alteration or destruction of marine plants (e.g. eel grass) including potential changes to the fish habitat quality and quantity.</p> <p>Increased sediment deposition and turbidity resulting in a reduction in light in the water column and smothering of marine plants and fish habitat.</p> <p>Lighting used during construction and operation, could affect competitive interactions and predator-prey relationships between marine mammals, birds and their prey.</p> <p>Underwater noise may cause behavioural and physiological change to marine mammals and fish in the vicinity of the sound source. Abandonment of area and localised change to species diversity.</p> <p>Underwater noise during construction could cause loss in ability of fish and marine mammals to communicate, forage, orientate spatially, and cause area avoidance and disruption of migration patterns.</p>
Shipping, dredging (if required) and maintenance dredging (if required)	Construction Operation	<p>Potential introduction of invasive species resulting in a reduction of local biodiversity and out-competition of native species further resulting in effects on fish and fish habitat.</p> <p>Periodic propeller wash causing disturbance to benthos and re-suspension of sediments.</p>
Shipping operations	Construction Operation	<p>Vessel discharge, leaks and/or hazardous material spills which temporarily degrade water quality and have subsequent effects on fish, marine fish habitat and marine mammals.</p> <p>Underwater noise may cause behavioural and physiological change to marine fish and marine mammals resulting in area avoidance.</p>
Sanitary and process waste water treatment and discharge	Construction Operation	<p>Increased nutrient loading resulting in nutrient-led algal blooms.</p> <p>Decrease in water quality could lead to changes in predator-prey relationships between marine mammals, fish, aquatic species, birds and their prey.</p>
Vessel and LNG carrier movement	Operation	<p>Vessel noise during transit to and from the dock and use of thrusters during positioning in deepwater could cause loss in the ability to communicate, forage, and orientate spatially and could cause area avoidance and disruption of migration patterns.</p> <p>Vessel discharge, leaks and/or hazardous material spills could temporarily degrade water quality and have subsequent effects on marine mammals.</p> <p>Increased injury to marine mammals due to vessel strikes.</p>
Storm water management and site dewatering	Construction Operation	<p>Increased potential for contaminated storm water and site dewatering effluent release into the marine environment which may be toxic to fish and marine fish habitat.</p>



Figure 10– Marine Resources within the vicinity of Grassy Point



## GRASSY POINT MARINE RESOURCES PLAN

**LEGEND:**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li><span style="color: yellow;">●</span> KELP BEDS</li> <li><span style="color: blue;">●</span> SEAFOOD PROCESSORS</li> <li><span style="color: orange;">●</span> FISH OBSERVATION POINT<br/>Pink Salmon, Rainbow Trout, Dolly Varden</li> <li><span style="color: pink;">●</span> FISH OBSERVATION POINT<br/>Pink Salmon</li> <li><span style="color: red;">●</span> FISH OBSERVATION POINT<br/>All Salmon</li> </ul> | <ul style="list-style-type: none"> <li><span style="background-color: #e0f0e0; border: 1px solid #ccc; display: inline-block; width: 15px; height: 10px;"></span> COMMERCIAL FISHING AREAS</li> <li><span style="background-color: #e0f0e0; border: 1px solid #ccc; display: inline-block; width: 15px; height: 10px;"></span> RECREATIONAL FISHING AREAS</li> <li><span style="border-bottom: 2px solid purple; width: 15px; display: inline-block;"></span> HERRING SPAWNING GROUNDS</li> <li><span style="border-bottom: 2px dashed black; width: 15px; display: inline-block;"></span> PROJECT BOUNDARY</li> <li><span style="border-bottom: 2px solid purple; width: 15px; display: inline-block;"></span> EELGRASS BIOBAND</li> <li><span style="border-bottom: 2px solid pink; width: 15px; display: inline-block;"></span> PRIORITY EELGRASS HABITAT</li> <li><span style="color: green;">●</span> FISH OBSERVATION POINT<br/>Dolly Varden, Coho Salmon, Sculpin (General)</li> </ul> |
|--|---|

Datum: NAD83  
 Projection: NAD 1983 BC Environment Albers  
 Source: Government of British Columbia  
 British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*

### 5.1.3.2 Freshwater Environment and Resources

The proposed Project site is located outside the dominant regional river watersheds of the Skeena River and Nass River. Stumaun Creek (Simpson Creek) is one of the larger watersheds (approximately 1563 Hectares) in the region and is located outside the proposed Project site to the east of Lax Kw'alaams. Stumaun Creek provides the community water under permit from the designated 856 Hectare Stumaun Community Watershed. Given the Stumaun Community Watershed is located some 2.5 kilometres south of the proposed Project site boundary it is unlikely that there will be any impact by the Project on this resource.

The proposed Project site is within the smaller BC Watershed Atlas watershed group Work Channel (WORC), and the site covers in the order of thirteen watersheds, ranging in size from approximately 5.4 Hectares to 432 Hectares, of which the most notable watersheds are:

- Neaxtoalk Lake/ Neaxtoalk Creek (approximately 329 Hectares);
- Trail Bay Creek (approximately 393 Hectares); and
- An unnamed creek (approximately 432 Hectares), located at the north end of the Tsimpsean Peninsula.

Neaxtoalk Lake and Creek are the surface water features that result from the small watershed (approximately 329 Hectares) in the south and east of the grassy point lease. The lake is just below high tide levels and is therefore subjected to some tidal influences and expected to be brackish (Dome Petroleum 1981). Lee Doran Associates Ltd. (1975) suggested that a small trout population exists in the lake and no suitable spawning habitat for salmonids exists in the creek, however this supposition has not been validated. Neaxtoalk Lake will be the subject of further evaluation during the baseline studies and discussions with First Nations and/or other users of the area.

The Trail Bay Creek watershed is located to the east of Lizzie Hill and flows south east into Trail Bay and the Work Channel, away from Simpson Port and the location of the proposed Project site. Trail Bay Creek has recorded fish observation and this area is also a protected area for the Marbled Murrelet see **Section 3.2.3.2**.

The unnamed creek watershed (approximately 432 Hectares) is located at the north end of the Tsimpsean Peninsula. It flows through the proposed Aurora project (North Site), away from the location of the proposed Project site, and discharges into a bay located south-west of Dudevoir Passage on the northern tip of Tsimpsean Peninsula. The proposed Project site is located at the upper reaches of this watershed.

During the LNG site selection process (summer 2013) and site visits with members of the Lax Kw'alaams (summer 2014) a number of dry channels were observed within the Grassy Point site. Anecdotal advice from Lax Kw'alaams suggests that these channels act as streams during periods of high rainfall, draining surface water to the ocean. As these streams appear to be ephemeral in nature it is unlikely that they are regionally significant in terms of fresh water habitats. One unnamed stream to the north of the site appeared to be flowing into the bay during the site investigations during the summer of 2013. This stream is currently outside of the construction footprint and is not expected to be effected. Water courses within the vicinity of Grassy Point are shown in **Figure 11**.

Surface water associated with Muskeg can be observed at the site. Muskeg is an acidic soil type consisting of dead plants in various states of decomposition (as peat), ranging from fairly intact sphagnum moss, to sedge peat, to highly decomposed humus. It is assumed that the water table is near the surface as this is typical of Muskeg areas.

The groundwater setting shall be determined as part of the aseline data collection within the Environmental Assessment process.

### Potential Effects

During the construction and operation of the Project some streams may be physically altered by a number of activities including site preparation and clearing. As these streams appear to be ephemeral in nature the impact to freshwater fish habitat and fish is not expected to be regionally significant. Based on topography and the location of the proposed Project, the main effects from during the construction and operations phases will be to manage surface water flows to minimise erosion and sediment run off. As part of the baseline study program, streams will be mapped and further investigated.

Project effects may also include the localised alteration of the groundwater features in the project area leading to altered water tables across the Project site.

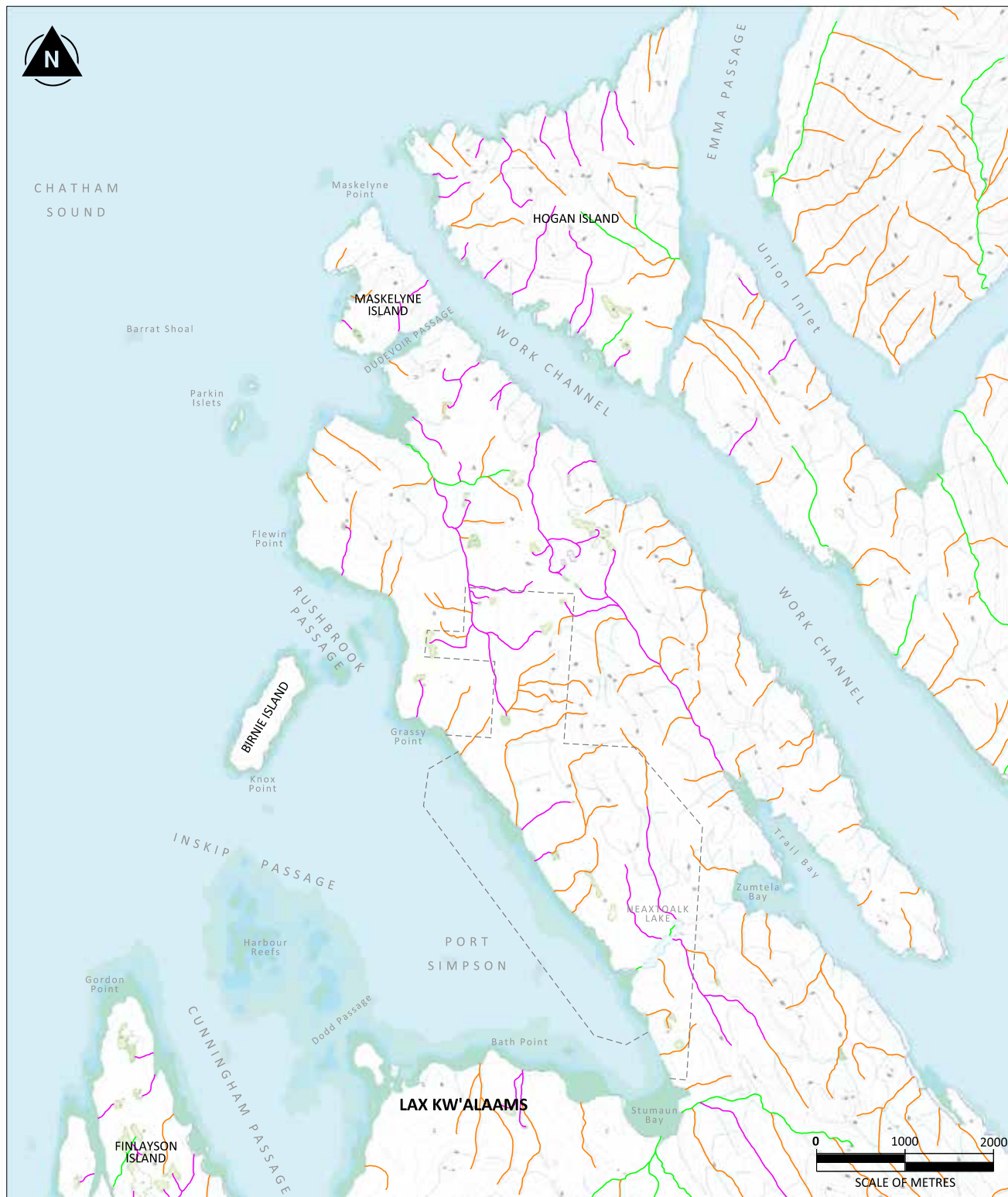
Possible mitigation measures may include providing buffers between site activities and water courses, water course diversions and the use of silt screens. Detailed mitigation measures will be prepared within the Environmental Assessment application. A summary of the potential impacts is shown in **Table 23**.

### Baseline Data Collection

Existing baseline data will be supplemented during the next stages of the environment assessment. The scope of the studies is expected to be formalised through the preparation and acceptance of the Application Information Requirements (or EIS guidelines). Woodside anticipates that the following types of studies will be undertaken prior to lodgement of an EA application:

- Field based studies to identify key perennial and ephemeral surface water features;
- Physical and chemical analysis of surface water features in the Project area;
- Investigate baseline ground water levels, recharge potential and physical and chemical characteristics of ground water to be used in the water supply assessment;
- Field based studies confirming presence or absence of key fish species associated with surface water features; and
- Field based surveys to validate pH levels of muskeg and an assessment of potential effects on ground water and the marine environment.

Figure 11- Water Courses within the Vicinity of Grassy Point



### GRASSY POINT WATER COURSES

**LEGEND:**

- |       |  |  |                 |
|-------|--|--|-----------------|
| ----- | PROJECT BOUNDARY                       |  | LAKE            |
| ---   | UNDEFINED WATER COURSE                 |  | MARSH/SWAMP     |
| —     | FRESHWATER ATLAS STREAM - DEFINITE     |  | WETLAND - MARSH |
| —     | FRESHWATER ATLAS STREAM - INDEFINITE   |  | WETLAND - SWAMP |
| —     | FRESHWATER ATLAS STREAM - INTERMITTENT |  |                 |

Datum: NAD83  
 Projection: NAD 1983 BC Environment Albers  
 Source: Government of British Columbia  
 British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*



**Table 23– Potential Effects Freshwater and Fish Habitat**

Project Activity	Stage	Potential Effects
Site preparation including clearing, earthworks and blasting (if required)	Construction	Bank destabilising occurring as a result of vegetation stripping and surface runoff leading to increased sediment deposition, turbidity, light reduction and smothering of benthos.
	Operation	Loss of fish and fish habitat associated with streams. Localised alteration of hydrogeological features of the site leading to a changed water table and water courses. Localised alteration of groundwater-fed surface water and wetland features on the site resulting in a loss of habitat. Localised alteration of flows into the sea leading to changes in nearshore/intertidal salinity fluctuations Increased turbidity due to construction activities across the site resulting in smothering effects to aquatic biota and the reduction of available light. Transportation of deleterious substances via sediments laden run-off from the work site to waterways.
Water management	Operations	Potential for low pH material to leach or run-off stockpiled muskeg and/or construction materials (i.e., concrete) and enter the waterway.

## 5.2. Economic

The Project's impact in the Prince Rupert, Lax Kw'alaams and adjacent areas is assessed in this document through Employment and Commercial Resource Usage.

Prince Rupert is the largest city in the Skeena-Queen Charlotte Regional District. The most recent 2011 Census data provides that the District population is 19,664, the Prince Rupert Census agglomeration population is 13,052 and the Lax Kw'alaams Reserve population, which neighbours the proposed Grassy Point LNG facility site, is 678.

Prince Rupert was first incorporated as a city in March 1910. For many years its economy was mainly based on a fish and cold storage plant and a pulp mill, until the 1960s when the access to Prince Rupert was facilitated by the opening of an airport and ferries terminals (City of Prince Rupert 2007). Since then, the city shifted focus to port development, port operation and the forestry industry which has provided the residents of Prince Rupert and the surrounding communities with employment and commerce services. (Prince Rupert LNG, AECOM, 2013).

### 5.2.1 Employment

The Grassy Point LNG Facility will contribute substantially to the regional and provincial socioeconomic setting by creating employment opportunities during construction and operational stages. Employment is expected to include direct employment at the facility, employment by contractors of the Project and those employed by auxiliary companies supplying goods and services to the contracted companies. Project employment is likely to lead to wages being repatriated into the local economy.

In recent time the area has had relatively high unemployment rates compared to the rest of British Columbia. Census data from 2011 and 2012 show that the unemployment rate for Skeena-Queen Charlotte Regional District and the City of Prince Rupert is more than twice that of the BC average, at 14.2% and 14.6% respectively.

### 5.2.2 Commercial Resource Usage

Commercial fishing remains an important source of employment in the Prince Rupert area, despite declining employment in the industry in recent years. Recreational fishing also ties into the broader tourism industry which can take place throughout the Prince Rupert area and provides local employment.

### 5.2.3 Local and Regional Skills

The Project will require a diverse range of labour from skilled specialists, skilled trade occupations and general labour. Stakeholders and Aboriginal Groups have identified skills and training as a barrier in achieving higher local employment in major projects. In Prince Rupert and the Skeena-Queen Charlotte Regional District, the proportion of the labour force with no certificate, diploma or degree was close to twice the BC average at 21.9% and 24.3%, respectively. The proportion of the labour force with a university certificate, diploma or degree at bachelor's level or above was close to nine percentage points lower in all three areas compared to BC, ranging between 12% and 14% (Statistics Canada, 2006a). Barriers to accessing employment opportunities and additional training included low high school graduation rates, poor math and literacy skills among children and transportation barriers (Northwest Regional Workforce Table, 2013).

### 5.2.4 Potential Economic Effects and Mitigation

The Project is anticipated to create employment opportunities for people in the local communities, the broader region and beyond. Project demand for skilled labour may lead to lower labour availability for other businesses and Projects in the region; similarly, these other projects will affect labour availability for the Project. The Project expenditure and employment will generally lead to higher local incomes.

Vessels transporting LNG will affect marine traffic in the immediate vicinity of the Project. This may have impacts on commercial fishing and eco-tourism (i.e., fishing, whale watching) in the area.

Mitigation measures for potential economic effects will be prepared within the Environmental Assessment application.

## 5.3. Social

The social interaction of the Project on the immediate and surrounding areas can be quantified by assessing Transportation, Emergency Services, Health Services, Accommodation and Recreational Activities.

### 5.3.1 Transportation

At present there are no roads leading to the Project location with the closest road ending at Lax Kw'alaams. Requirements for a regional road and transportation system connecting Prince Rupert, the Tsimpsean peninsula (Lax Kw'alaams, Metlakatla, and potentially Grassy Point), and Digby Island are being considered by the Province at this time. The City of Prince Rupert, Port Edward, Metlakatla and Lax Kw'alaams have all indicated a desire to improve road access in the region.

### 5.3.2 Emergency Services

The closest, adequately equipped, fire department is Prince Rupert Fire Rescue Department. This currently consists of a Fire Chief, Deputy Chief, four shift Captains and fourteen career Fire Fighters. As a result of attrition, and reductions currently occurring within the career staff, an Auxiliary Department is being organised. The Fire Station is located in downtown Prince Rupert, and the department maintains a small fleet of firefighting apparatus (City of Prince Rupert, 2014a).

The Prince Rupert RCMP provides policing services to the Lax Kw'alaams and consists of approximately 28 regular members, including the General Investigation Section, a Police Service Dog and Dog Handler, a Forensic Identification Specialist, and a Crime Prevention/Media Relations Officer. The Rural Section of the Prince Rupert RCMP serves communities stretching from Lax Kw'alaams to Hartley Bay (City of Prince Rupert, 2014a).

Although the number of police has remained constant in the city of Prince Rupert since 2001, on a per capita basis the number of officers has increased due to the decline in population. The caseload peaked in 2011 at 99 cases per officer. Policing the non-incorporated areas around Prince Rupert (provincial), the number of officers increased to seven in 2005 and has remained at this figure (Correct as of 2011; Ministry of Public Safety and Solicitor General, 2011).

### 5.3.3 Health Service

The Prince Rupert Regional Hospital serves Prince Rupert, Port Edward, Lax Kw'alaams and Metlakatla. The hospital has 24 beds of which 20 are acute care, two maternity beds and two intensive care beds and is staffed by in-house surgeons for general surgery, obstetrics/gynecology and orthopedics, as well as a permanent specialist for pediatrics, internal medicine, psychiatrist and dentistry. Specialists that visit at least once a month include dermatology, plastic surgery, podiatry, geriatric, mental health, urology and cardiology (City of Prince Rupert, 2014b).

Hospital services include diagnostics, ultrasound, CAT scan, surgery, emergency, day care, acute care and extended care with additional services such as diabetes education, healthy heart and rehabilitation programs. Other facilities include the Acropolis Manor, a modern residential care facility (Rural Coordination Centre of BC, 2012).

Occupancy at the hospital averages between 90 and 95%, but can fluctuate from 70% to overfull at times. The facility is short of beds on average one week per month, but it can use BC BEDLINE to both find and fill vacancies (City of Prince Rupert, 2014).

A Report to Council found that the services provided by Prince Rupert Regional Hospital meet or exceed that provided by other communities. In particular, it was identified as a leader in the provision of cancer care (City of Prince Rupert, 2014).

### 5.3.4 Accommodation

The type and location of the workforce accommodation will be the subject of future studies. The construction accommodation will need to be within close proximity of the LNG Facility and provide sufficient separation to comply with safety and noise requirements. It is likely that this will result in the accommodation facilities not being located within the site of the LNG Facility.

### 5.3.5 Recreational Activity

The Prince Rupert, region offers a range of services including, shopping centres, grocery stores, restaurants, local pubs and night clubs, recreational buildings, care facilities, sports centres, social clubs, churches, libraries and museums. Recreational trails and parks in the area offer opportunities for a wide variety of public use activities throughout the Prince Rupert region. There are some recreational and subsistence fisheries around the region that are regulated by the *Fisheries Act* (1985) and enforced by DFO.

### 5.3.6 Potential Social Effects and Mitigation

Due to the influx of new residents to the area, the potential social effects of the Project are likely to include demographic change and the resulting higher demand on local education, medical, social services, emergency services, housing, temporary accommodation and transportation infrastructure. Higher population levels will also lead to higher revenues from property taxes, permit fees and user-fees for services, and this is expected to support the increased or improved provision of these services and infrastructure. During the construction and operational stages worker accommodation will lead to a relatively large increase in the number of people living in the area, a short term increased requirement for local services and a shift in local demographics to a higher population of young to middle-aged males.

There may be effects to recreational activities in the surrounding waters (recreational fishing and boating) from LNG carrier movement.

Mitigation measures for potential social effects will be prepared within the Environmental Assessment application.

## 5.4. Health Effects

Grassy Point is on a remote peninsula over 30km from Prince Rupert. Health effects in the broader regional community are expected to be limited (health effects on the town of Lax Kw'alaams are covered in **Section 5.6.1**). Baseline health data is available for the Northwest Health Service Delivery Area (HSDA), which includes Prince Rupert, Port Edward, Lax Kw'alaams,

Metlakatla, and other communities in the northwest region. Health indicators for the Northwest HSDA are generally below the BC average, including physical and mental health, injury rates, mortality from preventable and treatable causes, chronic disease, obesity, and hospitalization rates (AECOM 2013).

### Potential Health Effects

The Project has limited potential to affect human health on the regional scale. A number of different mechanisms to effect change include increased financial benefits to people and organisations and effects from increased numbers of workers travelling to and within the region. Emissions and discharges from the facility are not expected to affect Prince Rupert or have transboundary effects. Potential air, light and noise effects on the nearby town of Lax Kw'alaams are covered in **Section 5.6.1**.

Mitigation measures for potential health effects will be prepared within the Environmental Assessment application.

## 5.5. Effect on Federal Lands or Other Jurisdictions

With the exception of indirect impacts associated with the emission of carbon dioxide, there are no anticipated effects as a result of the construction or operational stages of the Grassy Point LNG Facility on federal lands, or trans-boundary effects on provinces outside British Columbia or outside of Canada .

## 5.6. Potential Effects on Aboriginal Peoples from Changes in the Environment

The Project may result in changes to the environment that may affect marine and terrestrial resources traditionally harvested by Aboriginal Groups as well as heritage resources, human health and socio-economic conditions. The following sections identify potential effects as a result of changes to the environment from the Project on the CEAA 2012, Section 5(1)(c) factors.

Woodside will engage and consult with Aboriginal Groups throughout the environmental assessment process to understand potential effects of the Project on their Aboriginal Interests, including residual and cumulative effects. Woodside will also work with Aboriginal Groups with respect to traditional use studies and socioeconomic studies to further identify potential Project effects. Mitigation measures will be developed in consultation with Aboriginal Groups through the Environmental Assessment process.

### 5.6.1 Health and Socio-economic Conditions

The Project may affect health and socio-economic conditions as a result of changes to the environment through potential biophysical effects on marine and terrestrial resources used for traditional harvesting, changes to the physical characteristics to the landscape and through emissions and discharges of waste.

Fisheries are a high value industry in Western Canada and represent high socio-economic and cultural significance to Aboriginal Groups. In addition to subsistence fishing, Coast Tsimshian Seafood, a 100% Lax Kw'alaams owned business, operates a fish processing plant close to the town of Lax Kw'alaams. The plant produces canned and frozen fish, canned

crab, and fish roe and fish oil. The plant employs approximately 100 people for up to 11 months of the year with peak employment reaching 170 during the salmon season. Products are sold under several brands to customers in China, Japan, Korea and the United States.

Due to the proximity of Lax Kw'alaams to the Project location, it is expected that visual quality of viewpoints at Lax Kw'alaams and in surrounding waters will be affected, including through light emissions transiently during construction and more permanently during operations.

Based on an understanding that there is no major industry proximal to the Project site, and that ship movements are limited, it is expected that the existing ambient sound pressure levels are low. The introduction of an LNG facility into the location can be expected to increase the ambient noise levels, both transiently during construction and more permanently during operations.

Baseline noise (sound pressure) monitoring will be conducted at sensitive receptor sites including at the community of Lax Kw'alaams. It is expected that through baseline noise monitoring, a model can be completed to predict a sound map for the local study area. Mitigation measures will be developed with the engineering design team in consultation with Aboriginal groups, including ensuring careful placement of equipment in consideration of the vicinity of the local community.

Underwater noise may be a concern in terms of the potential impacts to marine mammals and fish populations. Baseline noise and sound mapping is planned to extend to the marine environment.

The introduction of an LNG facility into the location will increase the light emissions in the area, both transiently during construction and more permanently during operations.

Light monitoring will be conducted at sensitive receptor sites including the community at Lax Kw'alaams. Working alongside the engineering design team will allow for mitigation in design and the placement of lighting equipment to consider the vicinity of the local community.

Currently, the BC Oil and Gas Commission (BC OGC) is the only agency which has established noise standards provincially. The British Columbia Noise Control Best Practices Guideline is a receptor-based regulation, which specifies allowable sound levels at designated receptor points (including residences). It sets out permissible sound levels (PSLs) for outdoor noise and attenuation of noise through the walls of a dwelling to decrease indoor sound levels so that normal sleep patterns are not disturbed. Woodside anticipate that ambient noise limits at nearby residences will be developed in consultation with Lax Kw'alaams and OGC during the EA process.

As noted in **Section 2.8.1**, there are a range of air emissions that may be associated with the construction and operation of the Project, which may result in potential health effects. Baseline air quality monitoring will be conducted at sensitive receptor sites including within the community of Lax Kw'alaams. Understanding the baseline conditions will allow modelling to be undertaken that will predict air emission levels over the local study area. Mitigation measures will be developed alongside the engineering design team in consultation with Aboriginal Groups, including considering placement of equipment to reduce the potential for health impacts from air emissions on the local community.



**Table 24– Potential Health Effects**

Project Activity	Stage	Potential Effects
Construction and operation of the LNG facility	Construction	An improvement in health for those employed by or receiving financial benefits from the Project
	Operation	<p>Potential environmental health issues related to the generation of noise, water emissions and air emissions</p> <p>A potential increase in accidents and injuries related to traffic</p> <p>A potential increase in pressure on health care services, including availability of facilities and staff.</p>

## Potential Effects

During the construction and operation stages of the Project, sound pressure levels are likely to increase within the vicinity of the Grassy Point facility due to a range of activities that include: blasting (if required), vessel and vehicle movements, piling, earthworks, modular assembly, concrete batch plant operations, flaring, and start-up. This may result in an reduction in Aboriginal peoples' experience using the land and marine areas in the vicinity of the LNG facility. Increased sound pressure levels may also result in avoidance behaviours in a range of marine, terrestrial and avian species, which could potentially affect harvesting activities, potentially affecting changes to consumption of country foods and harvested species resulting in health effects or socio-economic effects.

During the construction and operation stages of the Project, the requirement for lighting to provide a safe work place is likely to increase the amount of light spill in the area. In addition, there will be increased lighting associated with a range of activities including vessel and vehicle movements, piling, earthworks, modular assembly, concrete batch plant operations, flaring (during start up or associated with emergency events). This may result in a reduction in aesthetic or cultural experience for Aboriginal peoples in the vicinity of the LNG facility. Increased lighting may also result in avoidance behaviours for some marine, terrestrial and avian species, or attraction of predator species, both of which could potentially impact harvesting activities, potentially affecting changes to consumption of country foods and harvested species resulting in health effects or socio-economic effects.

The construction and operation of the LNG facility will permanently alter the local landscape at Grassy Point. The visual amenity of Grassy Point will change from viewpoints at Lax Kw'alaams and surrounding waters, and may result in a reduction in aesthetic experience for Aboriginal peoples in the vicinity of the LNG facility.

During the construction and operation of the stages of the Project, emissions to air associated with a range of activities are likely to result in a localised decrease to air quality within the vicinity of the Grassy Point facility. Dependent on exposure to air emissions and received levels, this may have potential for health impacts to receiving populations and may affect vegetation resources traditionally harvested by Aboriginal peoples, potentially effecting consumption of country foods.

Currently, the BC Oil and Gas Commission (BC OGC) is the only agency which has established noise standards provincially. The British Columbia Noise Control Best Practices Guideline is a receptor-based regulation, which specifies allowable sound levels at designated receptor points (including residences). It sets out permissible sound levels (PSLs) for outdoor noise and attenuation of noise through the walls of a dwelling to decrease indoor sound levels so that normal sleep patterns are not disturbed. Woodside anticipate that ambient noise limits at nearby residences will be developed in consultation with Lax Kw'alaams and OGC during the EA process.

Woodside will engage and consult with Aboriginal Groups throughout the environmental assessment process to understand potential effects of the proposed Project on their Aboriginal Interests, including residual and cumulative effects. Woodside will also work with Aboriginal Groups with respect to traditional use studies and socioeconomic studies to further identify potential Project effects. Mitigation measures will be developed in consultation with Aboriginal Groups through the environmental assessment process. A summary of potential socioeconomic and health effects as a result of changes in the environment from the proposed Project is shown in **Table 25**.

Woodside anticipate that ambient noise limits at nearby residences will be developed in consultation with Lax Kw'alaams and OGC during the EA process.

## 5.6.2 Physical and Cultural Heritage

Physical and cultural heritage resources important to potentially affected Aboriginal Groups may include specific traditional use or sacred areas, including sites or features on the landscape. It is expected that traditional use areas, sites of spiritual significance, culturally modified trees, or ceremonial sites may be identified through consultation with Aboriginal Groups, including through traditional use studies, and through Project-related studies, including an Archaeology Overview Assessment.

Salmon and cedar are culturally important species for Aboriginal Groups. Through initial desktop research it has been identified that salmon is harvested annually at specific sites along the coastal fjords. This activity has been passed down through the generations via the clan system and activities, locations, and timing around this practice can vary depending on affiliation with a specific clan. Cedar is harvested from designated trees, the knowledge of which is proprietary to that clan, and used to make fibres, clothing and long houses.

Previous site-specific research has identified potential archaeological sites, including culturally modified trees, whose use and association with cultural practices will be better understood through engagement and consultation activities.

## Potential Effects

Potential effects on physical and cultural heritage resources would be most likely to result from site preparation and construction, including vegetation clearing and excavation activities. During the construction and operation stages of the Project, sound pressure levels and light spill are likely to increase within the vicinity of the Grassy Point facility from a range of activities including vessel and vehicle movements, piling, earthworks, modular assembly, concrete batch plant operations, flaring and start-up. This may result in a reduction in experience for Aboriginal peoples undertaking cultural practices or activities in the vicinity of the LNG facility. Increased sound pressure levels may also result in avoidance behaviours in culturally significant species such as salmon, which could potentially impact harvesting activities and knowledge transfer.

**Table 25– Potential Health and Socio Economic Effects**

Project Activity	Stage	Potential Effects
Vehicle and vessels movements, site preparation and facility operation	Construction	Increases in the baseline sound pressure levels can have a nuisance effect for the residents within the vicinity of the LNG facility.
	Operation	<p>Increased light levels can have a nuisance effect for the residents within the vicinity of the LNG facility.</p> <p>Localised decrease in air quality in the vicinity of the LNG facility.</p> <p>Permanent alteration of the localised area leading to reduction in visual quality and possible effects on amenity value of landscape.</p> <p>Localised increases in light levels can lead to behavioural changes associated with sensory disturbance and abandonment of the area by marine, terrestrial and avian species, or can lead to an increase in predatory species, both of which may result in changes to harvesting and consumption of country foods.</p> <p>Permanent alteration of the localised area, including potential exclusion zones, leading to reduction in the future potential use of the land by Aboriginal Groups (e.g. eco-tourism activity or by commercial users).</p> <p>Localised increases in sound pressure can lead to behavioural changes associated with sensory disturbance and abandonment of the area by marine, terrestrial and avian species which may result in changes to harvesting and consumption of country foods.</p>

Woodside will consult with Aboriginal Groups throughout the environmental assessment process to understand potential effects of the proposed Project on their Aboriginal Interests including residual and cumulative effects. Woodside will also work with Aboriginal Groups with respect to traditional use studies to further identify potential Project effects. Mitigation measures will be developed in consultation with Aboriginal Groups through the Environmental Assessment process and will include standard industry practices, including implementing a Chance Find Procedure. A summary of potential physical and cultural effects as a result of changes in the environment from the proposed Project is shown in **Table 26**.

### 5.6.3 Sites of Heritage, Archaeological, Paleontological or Architectural Significance

Usage of the lands at Grassy Point by members of potentially affected Aboriginal Groups predates European settlement. A review of archaeological sites, conducted in April 2014 (Golders Associates), revealed that the archaeological site types that are most likely to be encountered within the Project Area are culturally modified trees, shell middens, surface and subsurface artefact scatters and petro forms e.g. canoe runs and fish traps.

The review identified that there are 33 recorded archaeological sites (GdTo-23, 57, 59 – 89) within the project area and an additional three recorded archaeological sites within 500 m of the site, see **Figure 12**. The approximate location of these archaeological sites are shown in **Figure 12**.

The identified potential archaeological sites will be explored further through future engagement and consultation activities. It is expected that sites of significance, including culturally modified trees and shell middens, may be identified through consultation with Aboriginal Groups, including through traditional use studies, and through Project-related studies, including an Archaeology Overview Assessment.

### Potential Effects

Potential effects on heritage, archaeological, paleontological, and architectural sites of significance would be most likely to result from site preparation and construction, including vegetation clearing and excavation activities. The Project may also result in loss of access to, or disturbance of, archaeological or significant sites, due to the facility or its associated activities.

Woodside will consult with Aboriginal Groups throughout the environmental assessment process to understand potential effects of the proposed Project on their Aboriginal Interests including residual and cumulative effects. Woodside will also work with Aboriginal Groups with respect to Traditional Use Studies to further identify potential Project effects. Mitigation measures will be developed in consultation with Aboriginal Groups through the Environmental Assessment process but could include avoidance or relocation of artefacts. A summary of potential archaeological, paleontological or architectural effects as a result of changes in the environment from the proposed Project is shown in **Table 27**.

### 5.6.4 Current Use of Lands for Traditional Purposes

Research of publicly available sources indicate that Tsimshian groups (see **Section 6**) have used, and continue to use, the areas that stretch from the lands and waters surrounding the Nass and Skeena watersheds and the coastal areas from the Nass to Queen Charlotte Sound. Members of Aboriginal Groups may use the Project site and adjacent areas for traditional purposes such as hunting, fishing, trapping, gathering, or cultural purposes. Initial desktop research has identified large terrestrial mammals, such as moose, deer, mountain goats, bears and wolves occupy the local environment, which have significant subsistence, trade, cultural and spiritual values to potentially affected Aboriginal Groups. Smaller mammals, such as beaver, marten, fox, otter, mink and porcupine are hunted and trapped while migratory water fowl are hunted along the flats and mouths of rivers. Seagull eggs are collected from nesting sites along the coast and other bird species are hunted for feathers, which are used ceremonially.

A number of berries and trees are collected and used as food, medicine, materials, and for trade. These plant species include salmon berries, blueberries, laughing berries, hemlock, cedar, Sitka spruce, juniper, skunk cabbage, cow parsnip, crab apple, labrador tea and hellebore.

Aboriginal Groups are active in the region harvesting marine resources including fish, fish roe, shellfish, marine mammals and seaweed. Fish are the most important natural resource for a number of communities. Fish (including herring, eulachon, salmon, cod, halibut, cuttlefish, dogfish, flounder and rockfish) are harvested seasonally in specific locations, inherited through the clan. Fisheries make up the majority of the subsistence and commercial economy. In addition to the importance of salmon, eulachon grease continues to be of great value. Prior to contact with Europeans, it was used in place of money, traded far inland on trading routes known as 'grease trails'. Eulachon grease was ceremonially burned at potlatches and continues to be culturally important.

Marine mammals, such as seals, sea lions, otters, porpoises and whales are both culturally and economically important for subsistence. The intertidal zones are rich with shellfish and other invertebrates, which are harvested for food and medicine.

Key species harvested in the study area are likely to include: Key species commercially harvested in the study area include, Pacific

salmon, Pacific salmon caviar, halibut (*Hippoglossus stenolepsis*), Pacific herring (*Clupea pallasii*), rockfish, lingcod (*Ophiodon elongates*), Pacific cod (*Gadus macrocephalus*) and sablefish (*Anoplopoma fimbria*).

## Potential Effects

Changes to the environment from the Project that may result in effects on current use of the land and resources for traditional purposes include effects to marine and terrestrial resources, including vegetation, used for harvesting or cultural activities.

**Section 5.1.2.1 – 5.1.2.4** describes the potential effects to marine and terrestrial resources. These effects could lead to the loss of access to areas used for harvesting and reductions in yields of harvested species.

Woodside will consult with Aboriginal Groups throughout the environmental assessment process to understand potential effects of the proposed Project on their Aboriginal Interests including residual and cumulative effects. Woodside will also work with Aboriginal Groups with respect to traditional use studies to further identify potential Project effects. Mitigation measures will be developed in consultation with Aboriginal Groups through the Environmental Assessment process. A summary of potential effects on traditional use as a result of changes in the environment from the proposed Project is shown in **Table 28**.

**Table 26– Potential Physical and Cultural Effects**

Project Activity	Stage	Potential Effects
Vehicle and vessels movements, site preparation and facility operation	Construction	Increases in the baseline sound pressure levels or light spill can result in a reduction of cultural experience within the vicinity of the LNG facility. Localised increases in sound pressure can lead to behavioural changes which may result in changes to harvesting of culturally significant species such as salmon. Permanent alteration of the localised area leading to reduction in the future potential use of the land by Aboriginal Groups for cultural activity and knowledge transfer. Loss of access to physical or cultural sites as a result of the Project construction, operation or other associated activities.
	Operation	

**Table 27– Potential Archaeological, Paleontological or Architectural Effects**

Project Activity	Stage	Potential Effects
Vehicle movements, site preparation and facility operation	Construction	Loss of access to, or disturbance of archaeological, paleontological and architectural sites, including culturally modified trees and shell middens, due to physical footprint of LNG facility and associated activities.
	Operation	

**Table 28– Potential Effects on Current Use of Lands and Resources for Traditional Purposes**

Project Activity	Stage	Potential Effects
Site preparation including clearing, earthworks and blasting (if required)	Construction	Direct loss of marine and terrestrial habitat from clearing, earthworks, dredging (if required), blasting (if required), removal of material, ground improvement and rock dumping.
		Reduction in quantities of natural resources harvested through hunting, gathering and fishing due to direct and indirect project effects on the habitat and wildlife of the area. Loss of access or destruction of historical and heritage sites, including culturally modified trees, due to physical footprint of LNG facility. Changes to behaviour of traditional harvested species caused by sensory disturbance such as noise and light.
Vessel movements	Construction	Vessel collision due to increased marine traffic. Interference with traditional and commercial fishing activities.
Sanitary and process waste water treatment and discharge	Construction and Operations	Decrease in water quality could have adverse effects on fish and aquatic species, which may result in changes to harvesting and consumption of country foods.
Operations and shipping	Operations	Restriction on access to harvesting and fishing grounds associated with shipping or safety exclusion zones around infrastructure. Effects on tourism and recreational opportunities due to physical presence of facility. Effects of ship wake on intertidal habitats and traditional harvesting.



Figure 12– Archaeological Areas in Grassy Point Region



## GRASSY POINT ARCHAEOLOGICAL AREAS

**LEGEND:**

- ARCHAEOLOGICAL SITE (size is indicative)
- PROJECT BOUNDARY

Datum: NAD83

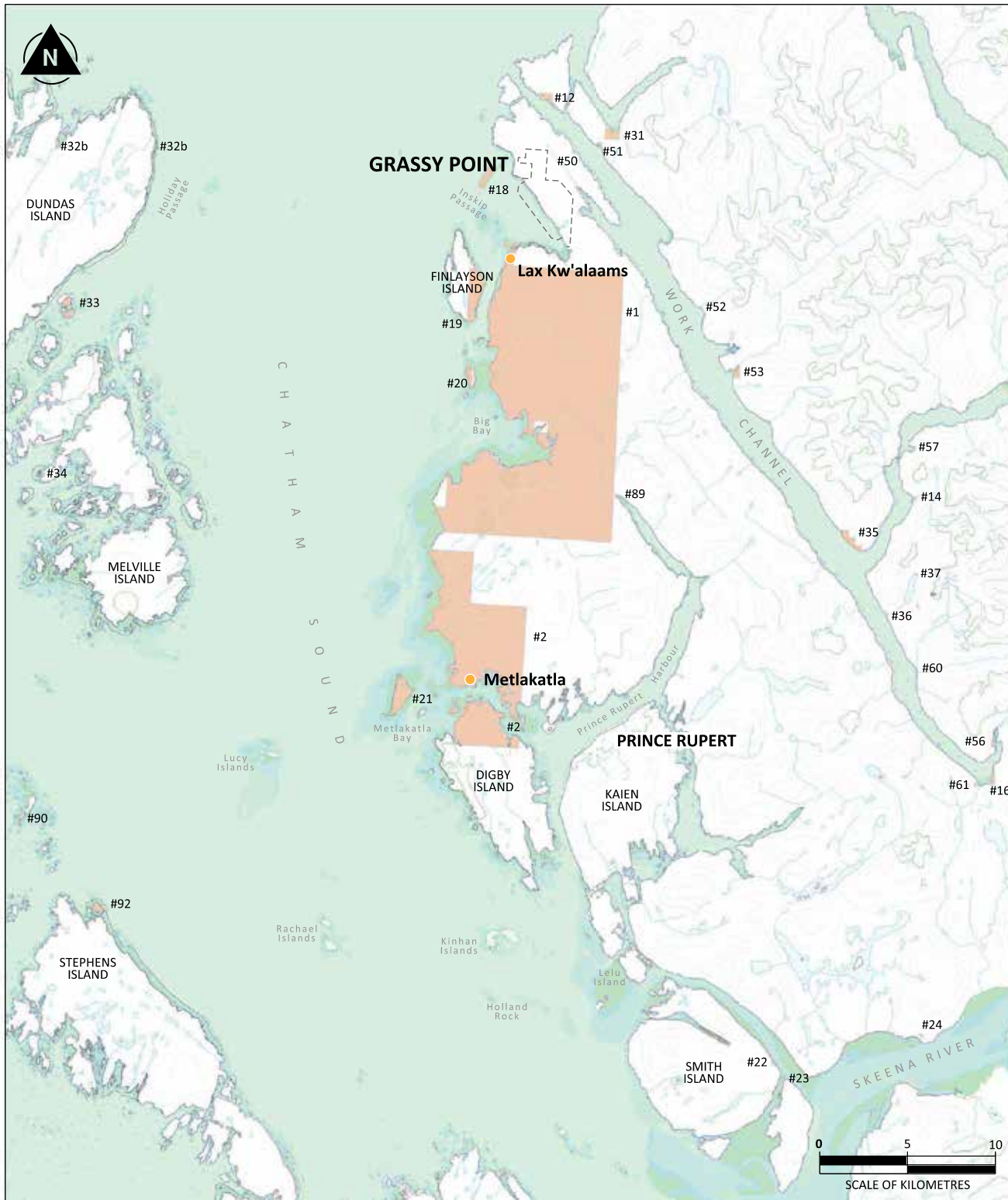
Projection: NAD 1983 BC Environment Albers

Source: Government of British Columbia  
Golder Associates

British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))  
Archaeological sites obtained from RAAD (2014-03-28)

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

Figure 13- Indian Reserves at a Regional Scale



### GRASSY POINT INDIAN RESERVES

**LEGEND:**

- |  |                        |                       |                      |
|--|------------------------|-----------------------|----------------------|
|  INDIAN RESERVE     | #12 - TYMGOWZAN        | #31 - UNION BAY       | #53 - ENSHESHESE     |
|  PROJECT BOUNDARY   | #14 - WILSKASKAMMEL    | #32b - DUNDAS ISLAND  | #56 - MAGANKTOON     |
|  NEARBY COMMUNITIES | #16 - LACHMACH         | #33 - CHANNEL ISLANDS | #57 - SPANAKNOK      |
| #1 - LAX KW'ALAAMS   | #18 - BIRNIE ISLAND    | #34 - FAR WEST POINT  | #60 - SPAYAKS        |
| #2 - S1/2 TSMIPSEAN  | #19 - FINLAYSON ISLAND | #35 - NISHANOCKNAWNAK | #61 - WUDZIMAGON     |
| #3 - WILNASKANCAUD   | #20 - CLIFF ISLANDS    | #36 - KASIKA          | #89 - TUCK INLET     |
| #4 - SHOOWAHTLANS  | #21 - TUGWELL ISLAND   | #37 - BILL LAKE       | #90 - RUSHTON ISLAND |
|  | #22 - DASHKEN          | #50 - KSABASN         | #92 - AVERY ISLAND   |
|  | #23 - KSHAOM           | #51 - KTAMGAODZEN     |                      |
|  | #24 - MEANLAW          | #52 - KNAMADEEK       |                      |

Datum: **NAD83**  
 Projection: **NAD 1983 BC Environment Albers**  
 Source: **Government of British Columbia**  
 British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*

## 6. Engagement and consultation with aboriginal groups

Engagement with Aboriginal Groups is integral to the overall Project success. Extensive engagement and participation will occur through the next stages of the Project. Developing meaningful long-term and collaborative relationships with Aboriginal Groups is key to the success of the proposed Grassy Point LNG Facility. Woodside aims to develop these relationships by:

- Listening and responding to Aboriginal Groups' concerns and Aboriginal Interests
- Sharing information on the proposed Grassy Point LNG Facility in an honest and transparent manner
- Working to ensure that Aboriginal Groups' concerns are integrated into Project design, as appropriate
- Achieving mutually beneficial outcomes with engagement and negotiations consistent with Aboriginal Groups' values and principals
- Taking a pro-active and consistent approach to understanding and mitigating adverse environmental and social impacts and creating positive social impacts.

### 6.1. List of Groups that may be impacted

Woodside has identified four (4) Aboriginal Groups that may have an interest in the proposed Grassy Point LNG Facility and its associated activities, shown in **Table 29**, and guided by First Nations traditional territory boundaries identified in **Figure 13**. Woodside notes this list is not exhaustive, and as discussions with Aboriginal Groups continues, or through the direction of the BC EAO, there may be other Aboriginal Groups that have not yet been identified and may assert an interest in the proposed Grassy Point LNG Facility or its associated activities.

Metlakatla First Nation, Kitselas First Nation, Kitsumkalum First Nation and Lax Kw'alaams Band are engaged in the BC treaty process. Metlakatla First Nation, Kitselas First Nation and Kitsumkalum First Nation began treaty negotiations as a collective through the Tsimshian Tribal Council Society, which reached Stage 4: Agreement in Principle (AIP); however, the Society dissolved in 2005. Kitsumkalum First Nation members approved their AIP on April 10, 2013 and Kitselas First Nation members voted in favour of their AIP on February 20, 2013. Lax Kw'alaams Band is currently at Stage 2: Readiness of the BC treaty process.

### 6.2. Engagement activities to date

Woodside has conducted introductory informal meetings with Lax Kw'alaams, Metlakatla, Kitselas and Kitsumkalum Aboriginal Groups. Preliminary discussions have included an outline by each of the groups to Woodside about the potential impact of the proposed Project on their interests in relation to the Grassy Point area including current and historic uses of Grassy Point and the surrounding marine environment. This information, plus a limited review of publicly available anthropological studies indicate that areas north of the proposed site, and in adjacent lands and waters, were used historically by Aboriginal people for hunting, fishing, and harvesting of marine and terrestrial resources.

Woodside's engagement with the Aboriginal Groups is at an early stage. Engagement activities began in February 2013 during site selection. Introductory letters requesting formal Chief and Council meetings, telephone calls, electronic correspondence and meetings to discuss the proposed Grassy Point LNG Facility began in March 2014. An overview of engagement with Aboriginal Groups up to June 2014 is provided below (**Table 30**).

**Table 29– Aboriginal Groups**

Aboriginal Group	Contact
Lax Kw'alaams Band	Address: 206 Shashaak Street, Lax Kw'alaams, BC V0V 1H0 Telephone: 250 625 3293 Fax: 250 625 3246
Metlakatla First Nation	Address: PO Box 459, Prince Rupert, BC V8J 3R2 Telephone: 250 628 3234 Fax: 250 628 2905
Kitselas Band	Address: 2225 Gitau Road, Terrace, BC V8G 0A9 Telephone: 250 635 5084 Fax: 250 635 5335
Kitsumkalum Indian Band	Address: PO Box 544, Terrace, BC V8G 4B5 Telephone: 250 635 6177 Fax: 250 635 4622



**Table 30– Aboriginal Group Engagement**

Date	Topic of Communication
<b>Lax Kw'alaams Band (Lax Kw'alaams)</b>	
May 2013	Introductory meeting between Woodside and Lax Kw'alaams representative.
February 2014	Letter to advise Lax Kw'alaams of access agreement with Government of BC regarding development of the proposed Grassy Point LNG Facility and request meeting to share information on proposed Grassy Point LNG Facility.
March 2014	Meeting to discuss Woodside, development of proposed Grassy Point LNG Facility and learn about Lax Kw'alaams interest and concerns with the proposed Project.
April 2014	Meeting to review possible LNG facility options and high level feedback on concerns/issues.
May 2014	Correspondence provided that included a copy of the draft Project Description.
June 2014	Meeting (cancelled due to unforeseen circumstances) intended to discuss proposed site (geo-technical and geo-physical) investigative work and to receive feedback on draft Project Description.
<b>Metlakatla First Nation (Metlakatla)</b>	
February 2014	Letter to advise Metlakatla of access agreement with Government of BC regarding development of Grassy Point LNG Facility and request meeting to share information on proposed Grassy Point LNG Facility.
March 2014	Metlakatla cancelled scheduled introductory meeting due to unforeseen circumstances. Meeting rescheduled.
April 2014	Meeting to review possible LNG facility options and high level feedback on concerns/issues.
May 2014	Correspondence provided that included a copy of the site Investigative Use Licence application and associated documentation sent to the BC government. The covering letter included a summary of the proposed investigative work program.
May 2014	Correspondence provided that included a copy of the draft Project Description
June 2014	Meeting to discuss proposed site (geo-technical and geo-physical) investigative work and to receive feedback on draft Project Description.
<b>Kitselas Band (Kitselas)</b>	
February 2014	Letter to advise Kitselas of access agreement with Government of BC regarding development of Grassy Point LNG Facility and request meeting to share information on proposed Grassy Point LNG Facility.
March 2014	Introductory meeting between Woodside and Kitselas Council and Lands and Resources staff to discuss the proposed Project and learn about Kitselas' interests and concerns.
April 2014	Meeting to review possible LNG facility options and high level feedback on concerns/issues.
May 2014	Correspondence provided that included a copy of the site Investigative Use Licence application and associated documentation sent to the BC government. The covering letter included a summary of the proposed investigative work program.
May 2014	Correspondence provided that included a copy of the draft Project Description.
June 2014	Meeting to discuss proposed site (geo-technical and geo-physical) investigative work and to receive feedback on draft Project Description.
<b>Kitsumkalum Indian Band (Kitsumkalum)</b>	
February 2014	Letter to advise Kitsumkalum of access agreement with Government of BC regarding development of Grassy Point LNG Facility and request meeting to share information on proposed Grassy Point LNG Facility.
April 2014	Meeting to review possible LNG facility options and high level feedback on concerns/issues.
May 2014	Correspondence provided that included a copy of the site Investigative Use Licence application and associated documentation sent to the BC government. The covering letter included a summary of the proposed investigative work program.
May 2014	Correspondence provided that included a copy of the draft Project Description.
June 2014	Meeting to discuss proposed site (geo-technical and geo-physical) investigation work and to receive feedback on draft Project Description.

### 6.3. Key Concerns

Although engagement with Aboriginal Groups is at an early stage, the following concerns have been identified to-date regarding the proposed Grassy Point LNG Facility:

- Potential impact to commercial and Aboriginal fisheries
- Potential impact to marine use, including harvesting activities
- Potential impact to both water and air quality
- Cumulative effects of proposed and current projects
- Potential negative socio-economic impacts to the region.

This is not an exhaustive list, and as engagement activities continue Woodside plan to develop a comprehensive understanding of the Aboriginal Interests and concerns of the potentially affected Aboriginal Groups. Given the preliminary nature of the discussions issues have been recorded as general across the groups rather than specific to each.

Aboriginal Groups have also expressed an interest in participating in the development of the proposed Grassy Point LNG Facility, both through short-term employment and contracting opportunities and ensuring long-term economic benefits from the proposed Grassy Point LNG Facility.

Following a Section 11 Order delegating aspects of consultation, Woodside will establish an Aboriginal Consultation Plan that will detail how these activities will unfold and how engagement will be recorded.

Woodside is also committed to providing economic benefits associated with the proposed Grassy Point LNG Facility to Aboriginal Groups. Woodside plans to proactively work with Aboriginal Groups to identify employment and contracting opportunities throughout the Environmental Assessment process, as well as the design, construction and operation of the proposed Grassy Point LNG Facility.

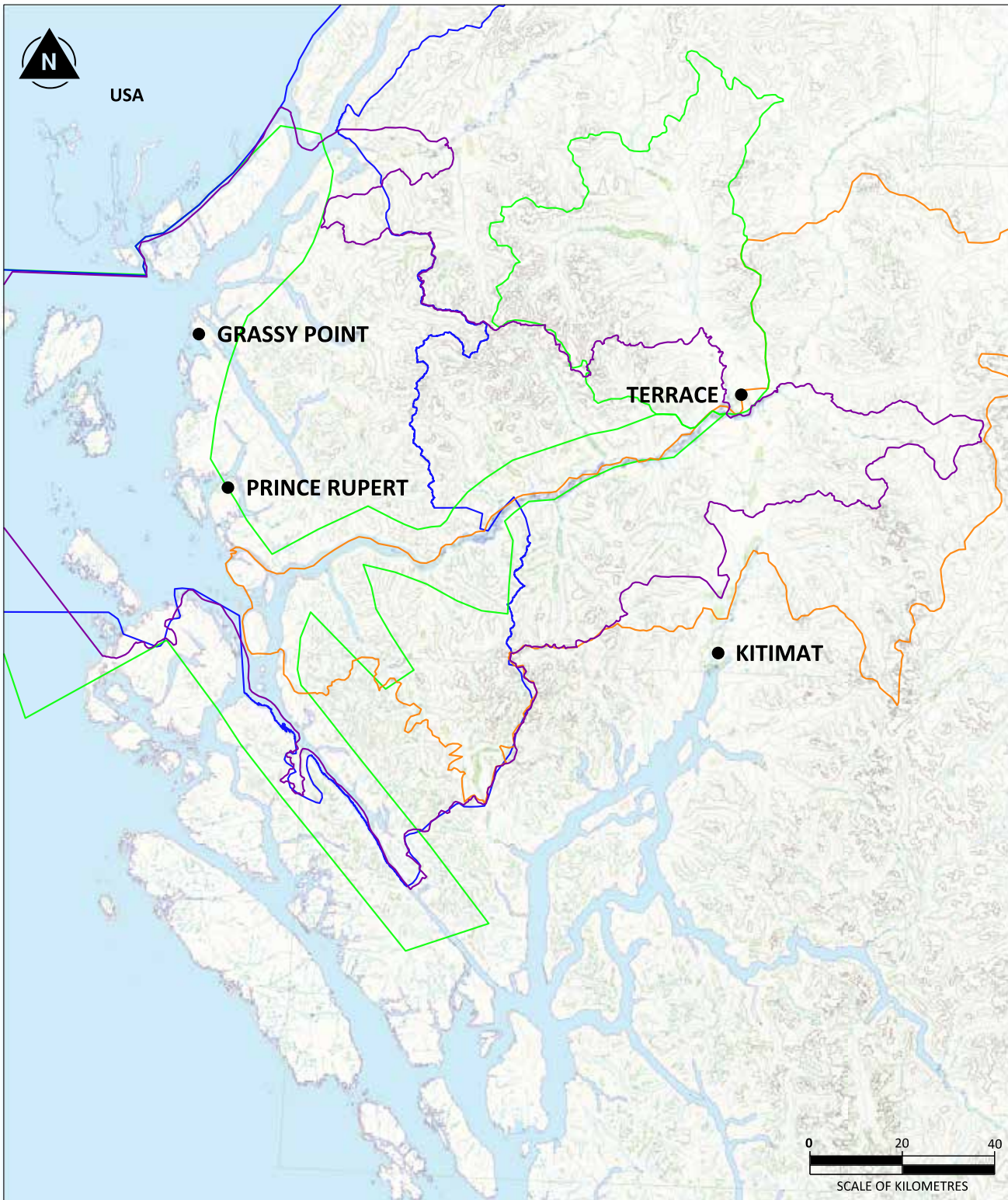
### 6.4. Forward Engagement Activities

Woodside recognises that establishing long-term and meaningful relationships with the communities where it operates is fundamental to achieving its social license to operate. Woodside plans to continue proactive engagement with potentially affected Aboriginal Groups, to share information on the proposed Grassy Point LNG Facility and understand the potential project interactions on Aboriginal interests and other concerns.

Key engagement activities anticipated include:

- Understanding and developing an appropriate consultation process with Aboriginal Groups
- Sharing the Project Description
- Sharing other regulatory documents, including, but not limited to, the Valued Component (VC) selection document and draft Application Information Requirements (dAIR)
- Capacity funding discussions to ensure that Aboriginal Groups are able to meaningfully participate in the Environmental Assessment process for the proposed Grassy Point LNG Facility
- Discussing permitting activities, as applicable
- Participation in environmental and engineering fieldwork, as applicable
- Gathering relevant traditional use information.

Figure 14– Approximate Boundaries of Asserted Traditional Territories.



## GRASSY POINT APPROXIMATE BOUNDARIES OF TRADITIONAL TERRITORIES

**LEGEND:**  
FIRST NATION TRADITIONAL TERRITORY (APPROXIMATE BOUNDARIES)

- LAX KW'ALAAMS
- METLAKATLA
- KITSUMKALUM
- KITSEIAS

Datum: *NAD83*  
 Projection: *NAD 1983 BC Environment Albers*  
 Source: *Government of British Columbia*  
*British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))*

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*



## 7. Consultation with the public and other parties

Woodside recognises the importance of long-term and meaningful relationships with the communities in which it operates. Woodside will consult and engage with the public and other parties throughout planning and development of the proposed Grassy Point LNG Facility. This will include a multi-round process with consultation activities occurring before, during and after the environmental assessment process.

Woodside has developed a communications and consultation plan that will guide its activities throughout Project planning and development, which is summarised in **Section 7.4**.

### 7.1. List of Stakeholders

Woodside has developed an initial list of stakeholders that may have an interest in the proposed Grassy Point LNG Facility and its associated activities (**Table 31**). This list is not exhaustive and will be updated throughout Project planning and development.

The primary audiences for Woodside's communications and consultation activities are the communities of Prince Rupert, Port Edward and the unincorporated areas within the Skeena-Queen Charlotte Regional District near to the Project site.

### 7.2. Engagement Activities to Date

Engagement activities have taken place between March 2014 and June 2014 as per **Table 32**.

**Table 31**– List of Stake holders

<b>Local and Regional Government</b>
City of Prince Rupert
District of Port Edward
Skeena-Queen Charlotte Regional District
<b>Provincial Government</b>
BC Ministry of Aboriginal Relations and Reconciliation (BC MARR)
BC Ministry of Natural Gas Development (MNGD)
BC Ministry of Environment (BC MOE)
BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO)
BC Ministry of Jobs, Tourism and Skills Training (JTST) and Responsible for Labour
BC Ministry of Transportation and Infrastructure (BC MOTI)
BC Environmental Assessment Office (BC EAO)
BC Oil and Gas Commission (OGC)
BC Hydro
Climate Change Secretariat
<b>Federal Government</b>
Aboriginal Affairs and Northern Development Canada (AANDC)
Canadian Environmental Assessment Agency (CEA Agency)
Environment Canada (EC)
Fisheries and Oceans Canada (DFO)
Health Canada (HC)
Natural Resources Canada (NRCan)
Pacific Pilotage Authority
Transport Canada
<b>Elected Officials (MLAs and MPs)</b>
Jennifer Rice, MLA – North Coast (NDP)
John Horgan, MLA – Energy Critic (NDP)
Nathan Cullen, MP – Skeena-Bulkley Valley (NDP)
<b>Economic Development and Infrastructure</b>
Prince Rupert Port Edward Economic Development Corporation
Prince Rupert & District Chamber of Commerce
Community Futures of the Pacific Northwest

Northern Development Initiative Trust
Prince Rupert Port Authority
Port Edward Harbour Authority
Prince Rupert Airport Authority
<b>Tourism</b>
Tourism Prince Rupert
Northern British Columbia Tourism Association
Tourism Operators
<b>Labour</b>
United Fishermen and Allied Workers Union-CAW
Prince Rupert Labour Council
<b>Fisheries</b>
Fishing Associations
Fishing Companies
<b>Environment</b>
T. Buck Suzuki Foundation
Living Oceans
Skeena Wild Conservation Trust
Skeena Watershed Conservation Coalition
Northwest Institute for Bioregional Research
WWF Canada – North Coast
<b>Social Services/Education/Health</b>
School District 52 Prince Rupert
Northwest Community College
Northern Health (Prince Rupert Regional Hospital)
Hecate Strait Employment Development Society
<b>First Responders</b>
Prince Rupert Fire Rescue
Royal Canadian Mounted Police
Ambulance
MCTS Prince Rupert – Canadian Coast Guard
<b>Other Stakeholders</b>
Brinkman & Associates Reforestation Ltd. (license holder)

**Table 32– Stakeholder Engagement to Date**

Date	Topic of Communication
City of Prince Rupert	
March 2014	Introductory meeting between Woodside and City of Prince Rupert City Manager. Review of possible LNG facility options and high level feedback on concerns/issues.
April 2014	Introductory meeting between Woodside and Mayor of Prince Rupert. Review of possible LNG facility options and high level feedback on concerns/issues.
April 2014	Introductory meeting between Woodside and Acting CFO, Corporate Administrator and Economic Development Officer of City of Prince Rupert. Review of possible LNG facility options and high level feedback on concerns/issues.
June 2014	Public presentation to Prince Rupert Mayor and Council regarding the draft Project Description for the Grassy Point LNG facility.
District of Port Edward	
April 2014	Introductory meeting between Woodside and CAO of District of Port Edward. Review of possible LNG facility options and high level feedback on concerns/issues.
June 2014	Public presentation to District of Port Edward Mayor and Council regarding the draft Project Description for the Grassy Point LNG facility.
Skeena-Queen Charlotte Regional District	
April 2014	Introductory meeting between Woodside and CAO of Skeena-Queen Charlotte Regional District. Review of possible LNG facility options and high level feedback on concerns/issues.
Prince Rupert Port Authority	
April 2014	Follow up meeting with VP Trade Development of Prince Rupert Port Authority.
June 2014	Public presentation to Skeena-Queen Charlotte Regional District Chair and Board regarding the draft Project Description for the Grassy Point LNG facility.

### 7.3. Environmental Approvals and Decision Making

Over the past 2 years, Woodside has met with provincial and federal agencies that have environmental assessment or regulatory decisions to make with respect to the Project. These include the provincial Environment Assessment Office, the Oil and Gas Commission and the Ministry of Forests, Lands and Natural Resource Operations. At the federal level this has so far been limited to CEAA.

These meetings have been to introduce Woodside and the Grassy Point Project to the agencies and begin preliminary discussions on the approval processes in the two jurisdictions. Ongoing consultation with provincial and federal government agencies is essential to the success of the Project. Agencies listed in **Table 31** will continue to be consulted through the life of the Project.

### 7.4. Key Concerns

- Required improvement in transportation links between Digby Island and Prince Rupert (District of Port Edward);
- Potential improvement in road access between Digby Airport, Metlakatla community and Lax Kw'alaams township (City of Prince Rupert);
- Cumulative effects on regional infrastructure such as accommodation and land fill capacity (City of Prince Rupert); and
- Cumulative social effects of proposed and current projects (City of Prince Rupert and District of Port Edward).

Woodside noted the above concerns and will continue to consult and engage with the public and other parties to identify additional concerns and interests prior to, during and after the environmental assessment and provide response to the key concerns raised.

### 7.5. Forward Engagement Activities

Woodside has developed a comprehensive communications and consultation plan which will guide its communications and consultation activities throughout planning and development for the Grassy Point LNG Facility.

Woodside proposes to continue its stakeholder consultation with the following communication goals:

- Accurately communicate information about Woodside to stakeholders and the public, including the company's expertise in LNG development and its corporate values
- Ensure local, regional and provincial stakeholders are aware of opportunities to provide input during each stage of consultation
- Build relationships with stakeholders and the public based on trust, by demonstrating that Woodside considers public and stakeholder issues and concerns
- Communicate how Project development will result in benefits to local, regional and provincial economies, the creation of jobs and other community benefits.

With regards to consultation, Woodside proposes to:

- As the project progresses provide a wide range of opportunities and methods for gathering public input in shaping the Grassy Point LNG Facility
- Inform the public, community and stakeholders about opportunities to provide feedback regarding the Grassy Point LNG Facility
- Gather a range of public, community and stakeholder input on project elements, features and mitigation measures

- Report on input received following each round of consultation, by issuing Consultation Summary Reports that will be posted online and distributed to consultation participants
- Consider community, stakeholder and public input following each round of consultation

To ensure that the community, public and stakeholders are informed about Woodside and kept up to date on Project developments, a variety of communications tools may be used. These will include a Project webpage, regular Project updates, an inquiry-response line (email and phone) and others.

Planned Woodside-led public consultation activities are outlined in **Table 33**, along with the anticipated public comment periods as part of the environmental assessment process. Notification of consultation opportunities will be broad, and may include email invitations, phone calls, print and radio advertising, postcard mailers and use of social media.

Communications and community relations activities will occur continuously throughout Project planning and development.

**Table 33– Stakeholder Engagement Activities**

Consultation Round	Overview	Timing	Lead	Topics
Preliminary Stakeholder Engagement	Engaging key stakeholders to build relationships and determine interests and concerns	March-April, 2014  (complete)	Woodside	<ul style="list-style-type: none"> <li>▪ Preliminary feedback on stakeholder interests and concerns</li> </ul>
Public Comment on the Project Description	Public comment period on the Project Description	TBD	Regulator	<ul style="list-style-type: none"> <li>▪ Provides basic Project-related information for public comment.</li> <li>▪ Opportunity to comment on description of the Project and description of the physical and biological environments potentially affected by the Project.</li> </ul>
Preliminary Design Consultation	Consultation about the Project and scope of technical studies	TBD	Woodside	<ul style="list-style-type: none"> <li>▪ Provides Project information including proposed design and layout, benefits and effects</li> <li>▪ Opportunity to provide feedback on the scope of technical and environmental studies, which will be used to assess Project impacts</li> </ul>
Public Comment Period on draft Application Information Requirements	Public comment period on draft Application Information Requirements	TBD	Regulator	<ul style="list-style-type: none"> <li>▪ Opportunity to provide comment on the draft Application Information Requirements including:</li> <li>▪ Issues and scope of studies to be included in the environmental assessment</li> <li>▪ The detailed information required to address those issues</li> </ul>
Project Design and Impact Mitigation Consultation	Consultation about Project design elements and mitigation measures for anticipated impacts	2015	Woodside	<ul style="list-style-type: none"> <li>▪ Opportunity to provide feedback on elements of Project design that can be refined</li> <li>▪ Opportunity to provide feedback on mitigation measures for anticipated impacts</li> </ul>
Public Comment Period on Application for an Environmental Assessment Certificate	Public comment period following the submission of the Application for an Environmental Assessment Certificate	TBD	Regulator	<ul style="list-style-type: none"> <li>▪ Opportunity to provide feedback on the Project, Project effects and proposed mitigation measures</li> </ul>



# Appendix A - Regional Infrastructure



## GRASSY POINT LOCAL INFRASTRUCTURE PLAN

**LEGEND:**

- PROJECT BOUNDARY
- NEARBY COMMUNITIES
- ✈ AIRPORT
- FERRY ROUTE
- MAJOR ROADS
- POWER TRANSMISSION LINE
- CN RAILWAY
- PRINCE RUPERT PORT AUTHORITY JURISDICTION

Datum: *NAD83*  
 Projection: *NAD 1983 BC Environment Albers*  
 Source: *Government of British Columbia WMS*  
*British Columbia DataBC Catalogue ([www.data.gov.bc.ca](http://www.data.gov.bc.ca))*

*Although there is no reason to believe that there are any errors associated with the data used to generate this map, users are advised that errors in the data may be present.*

# Appendix B - Ecological communities and key species (including species of conservation concern and species listed in Schedule 1, 2 or 3 of *SARA*) known to occur or with potential to occur in, or adjacent to, the project area

## B – 1 Ecological Communities of Conservation Concern Potentially Located within the Project Area

Scientific Name	English Name	Prov Status	BC List
<i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Equisetum arvense</i>	red alder / salmonberry / common horsetail	S3	Blue
<i>Carex sitchensis</i> - <i>Oenanthe sarmentosa</i>	Sitka sedge - Pacific water-parsley	S3	Blue
<i>Carex sitchensis</i> / <i>Sphagnum</i> spp.	Sitka sedge / peat-mosses	S2	Red
<i>Glyceria borealis</i> Fen	northern mannagrass Fen	S3	Blue
<i>Juniperus communis</i> / <i>Trichophorum cespitosum</i> / <i>Racomitrium lanuginosum</i>	common juniper / tufted clubrush / hoary rock-moss	S4	Yellow
<i>Myrica gale</i> / <i>Carex sitchensis</i>	sweet gale / Sitka sedge	S2	Red
<i>Picea sitchensis</i> / <i>Calamagrostis nutkaensis</i>	Sitka spruce / Pacific reedgrass	S3	Blue
<i>Picea sitchensis</i> / <i>Carex obnupta</i>	Sitka spruce / slough sedge	S2S3	Blue
<i>Picea sitchensis</i> / <i>Eurhynchium oregonum</i>	Sitka spruce / Oregon beaked-moss	S3	Blue
<i>Picea sitchensis</i> / <i>Gaultheria shallon</i>	Sitka spruce / salal	S3	Blue
<i>Picea sitchensis</i> / <i>Maianthemum dilatatum</i> Wet Hypermaritime <sup>1</sup>	Sitka spruce / false lily-of-the-valley <sup>2</sup>	S2	Red
<i>Picea sitchensis</i> / <i>Malus fusca</i>	Sitka spruce / Pacific crab apple	S3	Blue
<i>Picea sitchensis</i> / <i>Polystichum munitum</i>	Sitka spruce / sword fern	S3	Blue
<i>Picea sitchensis</i> / <i>Trisetum canescens</i>	Sitka spruce / tall trisetum <sup>2</sup>	S1S2	Red
<i>Pinus contorta</i> - <i>Xanthocyparis nootkatensis</i> / <i>Racomitrium lanuginosum</i>	lodgepole pine - yellow-cedar / hoary rock-moss	S4	Yellow
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Xanthocyparis nootkatensis</i> / <i>Trichophorum</i>	shore pine - yellow-cedar / tufted clubrush	S5	Yellow
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Lysichiton americanus</i>	western redcedar - Sitka spruce / skunk cabbage <sup>1</sup>	S3?	Blue
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Oplopanax horridus</i> Very Wet Hypermaritime <sup>2</sup>	western redcedar - Sitka spruce / devil's club <sup>1</sup>	S3	Blue
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Polystichum munitum</i>	western redcedar - Sitka spruce / sword fern	S2S3	Blue
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Tiarella trifoliata</i>	western redcedar - Sitka spruce / three-leaved foamflower	S4	Yellow
<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i>	western redcedar - western hemlock / salal	S4	Yellow
<i>Thuja plicata</i> - <i>Xanthocyparis nootkatensis</i> / <i>Coptis aspleniifolia</i>	western redcedar - yellow-cedar / spleenwort-leaved goldthread	S4S5	Yellow
<i>Tsuga heterophylla</i> - <i>Picea sitchensis</i> / <i>Rhytidiadelphus loreus</i>	western hemlock - Sitka spruce / lanky moss	S3	Blue
<i>Tsuga heterophylla</i> - <i>Xanthocyparis nootkatensis</i> / <i>Gaultheria shallon</i>	western hemlock - yellow-cedar / salal Very Wet Hypermaritime <sup>2</sup>	S5	Yellow
<i>Zostera marina</i> Herbaceous Vegetation	common eel-grass Herbaceous Vegetation	SNR	No Status

Provincial Conservation Status applies to an ecological community's conservation status in BC. The ranks have the following meanings: S1 = critically imperiled because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province; S2 = imperiled because of rarity due to very restricted range, very few occurrences (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province; S3 = special concern, vulnerable in the province due to a restricted range, relatively few occurrences (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

<sup>1</sup>Identified in the central and north coast land and resource management plan as blue listed.

<sup>2</sup>Identified in the central and north coast land and resource management plan as red listed.

## B – 2 Species, including Species of Concern and Species of Concern listed under SARA, Known or with Potential to Occur within the Project Area

Scientific Name	English Name	Prov	Status	COSEWIC	BC List	SARA	Name Category	Class (English)	Class
<b>Plant Species</b>									
<i>Bryhnia hultenii</i>							Nonvascular Plant		Bryopsida
<i>Callitriche heterophylla</i> var. <i>heterophylla</i>	two-edged water-starwort	S1S2			Red		Nonvascular Plant	dicots	Dicotyledoneae
<i>Callitriche palustris</i> var. <i>radicans</i>	yellow marsh-marigold	S2S3			Blue		Vascular Plant	dicots	Dicotyledoneae
<i>Carex glareosa</i> var. <i>amphigena</i>	lesser saltmarsh sedge	S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Carex gmelinii</i>	Gmelin's sedge	S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Cornus suecica</i>	dwarf bog bunchberry	S1S3			Red		Vascular Plant	dicots	Dicotyledoneae
<i>Dicranodontium asperulum</i>		S3			Blue		Nonvascular Plant		Bryopsida
<i>Diplazomium leskeoides</i>		S1			Red		Nonvascular Plant		Bryopsida
<i>Diphyscium foliosum</i>		S2S3			Blue		Nonvascular Plant		Bryopsida
<i>Eleocharis kamtschatica</i>	Kamchatka spike-rush	S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Eriodon concinnus</i>		S3			Blue		Nonvascular Plant		Bryopsida
<i>Hageniella micans</i>		S1S2			Blue		Nonvascular Plant		Bryopsida
<i>Isotenygopsis muelleriana</i>		S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Lilaea sciloides</i>	flowering quillwort	S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Malaxis brachypoda</i>	white adder's-mouth orchid	S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Malaxis paludosa</i>	bog adder's-mouth orchid	S2S3			Blue		Vascular Plant	monocots	Monocotyledoneae
<i>Micranthes nelsoniana</i> var. <i>carlotae</i>	dotted saxifrage	S3			Blue		Vascular Plant	dicots	Dicotyledoneae
<i>Philonotis vezoana</i>		S2S3			Blue		Nonvascular Plant		Bryopsida
<i>Piperia candida</i>	white-tip rein orchid	S2			Red		Vascular Plant	monocots	Monocotyledoneae
<i>Pleurozopsis ruthenica</i>		S2S3			Blue		Nonvascular Plant		Bryopsida
<i>Pohlia columbica</i>		S3			Blue		Nonvascular Plant		Bryopsida
<i>Polystichum setigerum</i>	Alaska holly fern	S2S3			Blue		Vascular Plant	ferns	Filicopsida
<i>Pseudocypripella rainierensis</i>	oldgrowth specklebelly	S2S3		SC (Apr 2010)	Blue		Fungus		Ascomycetes
<i>Sanguisorba menziesii</i>	Menzies' burnet	S2S3			Blue	1-SC (Jul 2012)	Vascular Plant	dicots	Dicotyledoneae
<i>Sphagnum aongstroemii</i>		S2S3			Blue		Nonvascular Plant		Sphagnopsida
<i>Sphagnum contortum</i>		S3			Blue		Nonvascular Plant		Sphagnopsida
<i>Sphagnum obtusum</i>		S1			Red		Nonvascular Plant		Sphagnopsida
<i>Sphagnum subobesum</i>		S2S3			Blue		Nonvascular Plant		Sphagnopsida
<i>Tetradontium brownianum</i>		S2			Blue		Nonvascular Plant		Bryopsida
<i>Triglochin concinna</i>	graceful arrow-grass	S2			Red		Vascular Plant	monocots	Monocotyledoneae
<i>Juncus arcticus</i> ssp. <i>alaskanus</i>	arctic rush	S3S4			Yellow		Vascular Plant	monocots	Monocotyledoneae
<i>Zostera marina</i>	common eel-grass	S5			Yellow		Vascular Plant	monocots	Monocotyledoneae
<b>Fish</b>									
<i>Acipenser medirostris</i>	Green Sturgeon	S1N		SC (Nov 2013)	Red	1-SC (Aug 2006)	Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Oncorhynchus clarki clarkii</i>	Cutthroat Trout, clarkii subspecies	S3S4			Blue		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Oncorhynchus gorbuscha</i>	Pink Salmon	S5			Yellow		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Oncorhynchus tshawytscha</i>	Chum Salmon	S5			Yellow		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Oncorhynchus kisutch</i>	Coho Salmon	S4		E (May 2002)	Yellow		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Oncorhynchus nerka</i>	Sockeye Salmon	S4		E (May 2003)	Yellow		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Oncorhynchus tshawytscha</i>	Chinook Salmon	S4		T (Apr 2006)	Yellow		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Salvelinus confluentus</i>	Bull Trout	S3S4		SC (Nov 2012)	Blue		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Thaleichthys pacificus</i>	Eulachon	S2S3		E (May 2011)	Blue		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Clupea pallasii</i>	Pacific Herring	SNR			No Status		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Hippoglossus stenolepis</i>	Pacific Halibut	SNR			No Status		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Ophiodon elongatus</i>	Lingcod	SNR			No Status		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Gadus macrocephalus</i>	Pacific Cod	SNR			No Status		Vertebrate Animal	ray-finned fishes	Actinopterygii
<i>Anoplopoma fimbria</i>	Sablefish	SNR			No Status		Vertebrate Animal	ray-finned fishes	Actinopterygii
<b>Marine Invertebrates</b>									
<i>Haliotis kamtschatkana</i>	Northern Abalone	S2		T (May 2000)	Red	1-T (Jun 2003)	Invertebrate Animal	gastropods	Gastropoda
<b>Marine Mammals</b>									
<i>Balaenoptera borealis</i>	Sei Whale	SHN		E (Apr 2013)	Red	1-E (Jan 2005)	Vertebrate Animal	mammals	Mammalia
<i>Balaenoptera musculus</i>	Blue Whale	S1N		E (May 2012)	Red	1-E (Jan 2005)	Vertebrate Animal	mammals	Mammalia
<i>Balaenoptera physalus</i>	Fin Whale	S2N		T (Nov 2005)	Red	1-T (Aug 2006)	Vertebrate Animal	mammals	Mammalia
<i>Callorhinus ursinus</i>	Northern Fur Seal	S2M		T (Nov 2010)	Red		Vertebrate Animal	mammals	Mammalia
<i>Enhydra lutris</i>	Sea Otter	S3		SC (Apr 2007)	Blue	1-SC (Jun 2003)	Vertebrate Animal	mammals	Mammalia
<i>Eschrichtius robustus</i>	Grey Whale	S3		SC (May 2004)	Blue	1-SC (Jul 2005)	Vertebrate Animal	mammals	Mammalia
<i>Eubalaena japonica</i>	North Pacific Right Whale	SH		E (May 1990)	Red	1-E (Aug 2006)	Vertebrate Animal	mammals	Mammalia
<i>Eumetopias jubatus</i>	Steller Sea Lion	S3B,S4N		SC (Nov 2013)	Blue	1-SC (Jul 2005)	Vertebrate Animal	mammals	Mammalia
<i>Megetopias novaeangliae</i>	Humpback Whale	S3		SC (May 2011)	Blue	1-T (Jun 2003)	Vertebrate Animal	mammals	Mammalia
<i>Orcinus orca</i> pop. 3	Killer Whale (West Coast transient population)	S2		T (Nov 2008)	Red	1-T (Jun 2003)	Vertebrate Animal	mammals	Mammalia
<i>Orcinus orca</i> pop. 6	Killer Whale (Northeast Pacific northern resident population)	S2		T (Nov 2008)	Red	1-T (Jun 2003)	Vertebrate Animal	mammals	Mammalia
<i>Phocoena phocoena</i>	Harbour Porpoise	S3		SC (Nov 2003)	Blue	1-SC (Jul 2005)	Vertebrate Animal	mammals	Mammalia
<i>Physeter macrocephalus</i>	Sperm Whale	S3S4		SC (Nov 2008)	Blue	1-SC (Jul 2005)	Vertebrate Animal	mammals	Mammalia
<i>Phoca vitulina</i>	Harbour Seal	S5		NAR (1999)	Yellow		Vertebrate Animal	mammals	Mammalia

Scientific Name	English Name	Status	COSEWIC	BC List	SARA	Name Category	Class (English)	Class
<b>Amphibians &amp; Reptiles</b>								
<i>Anaxyrus boreas</i>	Western Toad	S3S4	SC (Nov 2012)	Blue	1-SC (Jan 2005)	Vertebrate Animal	amphibians	Amphibia
<i>Ascaphus truei</i>	Coastal Tailed Frog	S3S4	SC (Nov 2011)	Blue	1-SC (Jun 2003)	Vertebrate Animal	amphibians	Amphibia
<i>Thamnophis sirtalis</i>	Common Gartersnake	S5		Yellow		Vertebrate Animal	reptiles	Reptilia
<i>Thamnophis elegans</i>	Terrestrial Gartersnake	S5		Yellow		Vertebrate Animal	reptiles	Reptilia
<i>Taricha granulosa</i>	Roughskin Newt	S4S5		Yellow		Vertebrate Animal	amphibians	Amphibia
<i>Ambystoma macrodactylum</i>	Long-toed Salamander	S4S5	NAR (Apr 2006)	Yellow		Vertebrate Animal	amphibians	Amphibia
<i>Ambystoma gracile</i>	Northwestern Salamander	S4S5	NAR (May 1999)	Yellow		Vertebrate Animal	amphibians	Amphibia
<b>Terrestrial Mammals</b>								
<i>Glulo gulo</i>	Wolverine	S3	SC (May 2014)	No Status		Vertebrate Animal	mammals	Mammalia
<i>Luscius sibilans</i>	Wolverine, luscus subspecies	S3	SC (May 2014)	Blue		Vertebrate Animal	mammals	Mammalia
<i>Myotis lucifugus</i>	Little Brown Myotis	S4	E (Nov 2013)	Yellow		Vertebrate Animal	mammals	Mammalia
<i>Pekania pennanti</i>	Fisher	S2S3		Blue		Vertebrate Animal	mammals	Mammalia
<i>Ursus arctos</i>	Grizzly Bear	S3	SC (May 2002)	Blue		Vertebrate Animal	mammals	Mammalia
<i>Myotis keenii</i>	Keen's Myotis	S2S3	DD (Nov 2003)	Blue	3 (Mar 2005)	Vertebrate Animal	mammals	Mammalia
<b>Birds</b>								
<i>Accipiter gentilis laingi</i>	Northern Goshawk, laingi subspecies	S2B	T (Apr 2013)	Red	1-T (Jun 2003)	Vertebrate Animal	birds	Aves
<i>Ardea herodias fannini</i>	Great Blue Heron, fannini subspecies	S2S3B,S4N	SC (Mar 2008)	Blue	1-SC (Feb 2010)	Vertebrate Animal	birds	Aves
<i>Brachyramphus marmoratus</i>	Marbled Murrelet	S3B,S3N	T (May 2012)	Blue	1-T (Jun 2003)	Vertebrate Animal	birds	Aves
<i>Contopus cooperi</i>	Olive-sided Flycatcher	S3S4B	T (Nov 2007)	Blue	1-T (Feb 2010)	Vertebrate Animal	birds	Aves
<i>Cypseloides niger</i>	Black Swift	S4B	C (Jul 2011)	Yellow		Vertebrate Animal	birds	Aves
<i>Dendragapus fuliginosus</i>	Sooty Grouse	S3S4		Blue		Vertebrate Animal	birds	Aves
<i>Euphagus carolinus</i>	Rusty Blackbird	S3S4B	SC (Apr 2006)	Blue	1-SC (Mar 2009)	Vertebrate Animal	birds	Aves
<i>Falco peregrinus pealei</i>	Peregrine Falcon, pealei subspecies	S3B	SC (Apr 2007)	Blue	1-SC (Jun 2003)	Vertebrate Animal	birds	Aves
<i>Fratercula cirrhata</i>	Tufted Puffin	S3B,S4N		Blue		Vertebrate Animal	birds	Aves
<i>Grus canadensis</i>	Sandhill Crane	S4B	NAR (May 1979)	Yellow		Vertebrate Animal	birds	Aves
<i>Hirundo rustica</i>	Barn Swallow	S3S4B	T (May 2011)	Blue		Vertebrate Animal	birds	Aves
<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, kennicottii subspecies	S3	T (May 2012)	Blue		Vertebrate Animal	birds	Aves
<i>Patagioenas fasciata</i>	Band-tailed Pigeon	S3S4B	SC (Nov 2008)	Blue	1-SC (Jan 2005)	Vertebrate Animal	birds	Aves
<i>Synthliboramphus antiquus</i>	Ancient Murrelet	S2S3B,S4N	SC (Nov 2004)	Blue	1-SC (Aug 2006)	Vertebrate Animal	birds	Aves
<i>Phalacrocorax pelagicus pelagicus</i>	Pelagic Cormorant, pelagicus subspecies	S2B		Red		Vertebrate Animal	birds	Aves
<i>Ptychoramphus aleuticus</i>	Cassin's Auklet	S2S3B,S4N	C (Jul 2011)	Blue		Vertebrate Animal	birds	Aves
<i>Uria aalge</i>	Common Murre	S2B,S4N		Red		Vertebrate Animal	birds	Aves
<i>Melanitta perspicillata</i>	Surf Scoter	S3B,S4N (2005)		Blue		Vertebrate Animal	birds	Aves
<i>Asio flammeus</i>	Short-eared Owl	S3B,S2N (2009)	Blue	SC (2008)	1-SC (2012)	Vertebrate Animal	birds	Aves
<i>Haliaeetus leucocephalus</i>	Bald Eagle	S5B,S5N	NAR (May 1984)			Vertebrate Animal	birds	Aves
<i>Corvus corax</i>	Common Raven	S5B				Vertebrate Animal	birds	Aves
<i>Junco hyemalis</i>	Dark-eyed Junco	S5B				Vertebrate Animal	birds	Aves
<i>Larus glaucescens</i>	Glaucous-winged Gull	S5B				Vertebrate Animal	birds	Aves

Provincial Conservation Status applies to a species' conservation status in BC. The ranks have the following meanings: S1 – critically imperilled because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province; S2 – imperilled because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province; S3 – special concern, vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.





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Project Description - Grassy Point LNG  
September 2014

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Revision 1

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