PACIFIC FUTURE ENERGY

Building Our Future, Protecting Our Coast

PROJECT DESCRIPTION SUMMARY

PACIFIC FUTURE ENERGY REFINERY

June 2016

PROPONENT

Pacific Future Energy Corporation
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PREPARED BY

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SUBMISSION TO

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PREFACE

This Project Description is the start of our public conversation as we work to build our future and protect our coast in Northern British Columbia (BC) by creating the world's greenest bitumen refinery, while recognizing and respecting First Nations Aboriginal rights and title.

We will be listening very carefully to all of the feedback that we receive, and will incorporate community concerns and values in our Project's design. We believe that "social licence" or "permission" must be earned at the concept stage of this Project as well as throughout its lifecycle.

Approach

Pacific Future Energy (PFEC) was founded by like-minded leaders and entrepreneurs who fervently believe that a new approach is needed if Canada wants to gain new market access for Canada's bitumen.

We believe that this new approach must include building the greenest bitumen refinery in the world, transporting our feedstock in the safest manner over land, and not shipping any bitumen in tankers on the northwest coastal waters, in accordance with the oil tanker moratorium which is expected to be formalized and extended by the federal government.

There is overwhelming scientific evidence that our planet's climate is changing due to the use of fossil fuels. Innovative solutions will be required for the world to achieve its goal of limiting temperature change to 1.5°C from pre-industrial levels. We believe that our "Near Zero Net Carbon emissions" facility will be one of those innovative solutions, given that it will significantly reduce the overall carbon impact of the upstream feedstock we will be refining.

Industry will not gain market access through BC unless it is prepared to commit to the highest environmental standards. It must also be prepared to commit to the principle that British Columbia should receive its "fair share" of fiscal and economic benefits associated with gaining market access. PFEC does not see these as burdens, but as opportunities for everyone.

First Nations First

One of Pacific Future Energy's fundamental principles is that First Nations are a first order of government. We call this "First Nations First." We will proceed with our Project if we are welcomed and supported by First Nations.

PFEC is in full support of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). We know that we must respectfully request the free, prior and informed consent from First Nations who are the title-holders and affected by this Project. PFEC is in full support of the UN Declaration on the

Rights of Indigenous Peoples (UNDRIP). This is reflected in PFEC's commitment to directly engage Indigenous communities, including their families and citizens. This requires going beyond simply upholding the current legal requirements, to establishing meaningful relationships and in some cases, partnerships with the First Nation governing bodies and their business and administrative bodies.

We look forward to this conversation over the coming months. Together, we can build our future and protect our coast. Together we will make each other great and good.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIP	Agreement in Principle
AIR	Application Information Requirements
AOA	Archaeological Overview Assessment
ARU	Amine Regeneration Unit
ASU	Air Separation Unit
BC	British Columbia
BCEAA	BC *Environmental Assessment Act*
BCMF	BC Métis Federaion
BFW	Boiler Feed Water
C_4	Refers to a hydrocarbon with four carbon molecules
CDC	BC Conservation Data Centre
CEA	Cumulative Effects Assessment
CEAA 2012	*Canadian Environmental Assessment Act*, 2012
CEMP	Construction Environmental Management Plan
CMT	Culturally Modified Tree
CN or CN Rail	Canadian National Railway Company
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CO	Carbon monoxide
CO_2	Carbon dioxide
CWHvm1	Coastal Western Hemlock, Submontane Very Wet Maritime
CWHws1	Coastal Western Hemlock, Submontane Wet Submaritime
$CWHvm^2$	Coastal Western Hemlock, Very Wet Maritime
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EA Certificate	Environmental Assessment Certificate
EAO	BC Environmental Assessment Office
EC	Environment and Climate Change Canada
EIS	Environmental Impact Statement

LIST OF ACRONYMS AND ABBREVIATIONS (CONT'D)

EURO V	Refers to Tier V (of VI) heavy-duty vehicle diesel emissions standards regulated by the European Union.
FLNRO	BC Ministry of Forest, Land and Natural Resources Operations
FRPA	*Forest and Range Practices Act*
FSR	Forest Service Road(s)
IFRT	Internal Floating Roof Tank
IMBA	Impact Management and Benefits
LNG	Liquefied Natural Gas
LOO	Licence of Occupation
LPG	Liquefied Petroleum Gas
LRMP	Land and Resource Management Plan
MBCA	*Migratory Bird Convention Act*
MBS	Migratory Bird Sanctuaries
MoE	BC Ministry of Environment
MoF	BC Ministry of Forests
MoU	Memorandum of Understanding
MNBC	Métis Nation British Columbia
NAD	North American Datum
NEATBIT™	100% bitumen or raw bitumen with no diluent and no sand. Low-flammability.
NEB	National Energy Board
NZNC	Near Zero Net Carbon
OGC	BC Oil and Gas Commission
OGMA	Old-Growth Management Areas
OWS	Oily Water Sewer
PFEC	Pacific Future Energy Corporation
PM	Particulate Matter
PPE	Personal Protective Equipment
PTP	Pacific Trails Pipeline
RDKS	Regional District of Kitimat-Stikine

LIST OF ACRONYMS AND ABBREVIATIONS (CONT'D)

RTA	Rio Tinto Alcan Inc.
SARA	*Species at Risk Act*
SNC-Lavalin	SNC-Lavalin Inc.
SRU	Sulphur Recovery Unit
SWS	Sour Water Stripper
TCF	Terrace Community Forest
TDG	Transportation of Dangerous Goods
TDS	Total Dissolved Solids
TEK	Traditional Ecological Knowledge
TGTU	Tail Gas Treatment Unit
the Agency	Canadian Environmental Assessment Agency
the Project	Pacific Future Energy Refinery
TUP	Temporary Use Permit
UNDRIP	UN Declaration on the Rights of Indigenous Peoples
UTM	Universal Transverse Mercator
UWR	Ungulate Winter Range
WHA	Wildlife Habitat Area
WWTP	Waste Water Treatment Plant

UNITS OF MEASUREMENT

Bbls	Barrels
Bcf	Billion cubic feet
Bcf/day	Billion cubic feet per day
BPD	Barrels per day
°C	Degrees Celsius
GJ	Gigajoule
ha	Hectares
km	Kilometres
km/h	Kilometres per hour
km^2	Square kilometres
kPa(g)	Kilopascal gauge
m	Metre(s)
m^2	Square metres
m^3	Cubic metres
m^3/d	Cubic metres per day
m^3/hr	Cubic metres per hour
m^3/yr	Cubic metres per year
mm	Millimetres
MT	Metric Tonnes
MW	Megawatts
PJ	Petajoule

1 GENERAL INFORMATION AND CONTACT(S)

The Pacific Future Energy Refinery Project (the 'Project' or the 'Refinery') is a proposed bitumen refinery, to be located in northwest British Columbia (BC) between the City of Terrace and the District Municipality of Kitimat within an industrial-zoned site locally known as Dubose Flats **(Figures 1 to 3)**. The proponent is Pacific Future Energy Corporation (PFEC), a company formed in 2014 to finance, design, construct and operate the Project. The management team consists of leaders from the venture-capital, corporate, engineering, First Nations and government sectors, who share the belief that while it is in Canada's national strategic interest to diversify its markets for oil, it should be done in a socially and environmentally responsible manner while ensuring the protection of Canada's West Coast. PFEC's Executive Committee includes:

Samer F. Salameh, Executive Chairman

Mark Marissen, Chief Strategy & Communications Officer

Jacques Benoit, Chief Operating Officer

Mike Bonshor, Chief Negotiator

David Coles, Vice President Partnership & Sustainability

Robert Delamar, Senior Advisor

Shawn Atleo, Senior Advisor

Heather Squire, Senior Advisor

Stockwell Day, Senior Advisor

The mailing address for PFEC is:

Pacific Future Energy Corporation
701 W Georgia Street, Suite 1818
Vancouver, BC V7Y 1L2

All communications on behalf of PFEC regarding the proposed Project should be directed to the Chief Operating Officer, Jacques Benoit:

Jacques Benoit - Chief Operating Officer
Telephone: (604) 559-3611
Fax: (604) 336-1557
Email: info@pacificfutureenergy.com

The company website is http://www.pacificfutureenergy.com/

During the preparation of this document, PFEC initiated early engagement with the Kitselas Government, the Haisla Nation, BC Environmental Assessment Office (EAO), the Canadian Environmental Assessment Agency (the Agency) and BC Ministry of Forests (MoF), Lands and Natural Resources (FLNRO). PFEC will continue to engage and consult these groups, as well as others throughout Project development.

The Project is considered a “designated project” under the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) and a “reviewable project” under the BC *Environmental Assessment Act* (BCEAA).

Legend

- Project Location
- Nearby Municipality
- Highway
- Road
- Ferry

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
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0 12.5 25 50 75 Km

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Pacific Future Energy Refinery
Project Location

By: ECH	Date: 2016/05/09	Scale: 1:1,750,000	Figure Number: 1	Rev.: 1
Chk'd: EM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-001	

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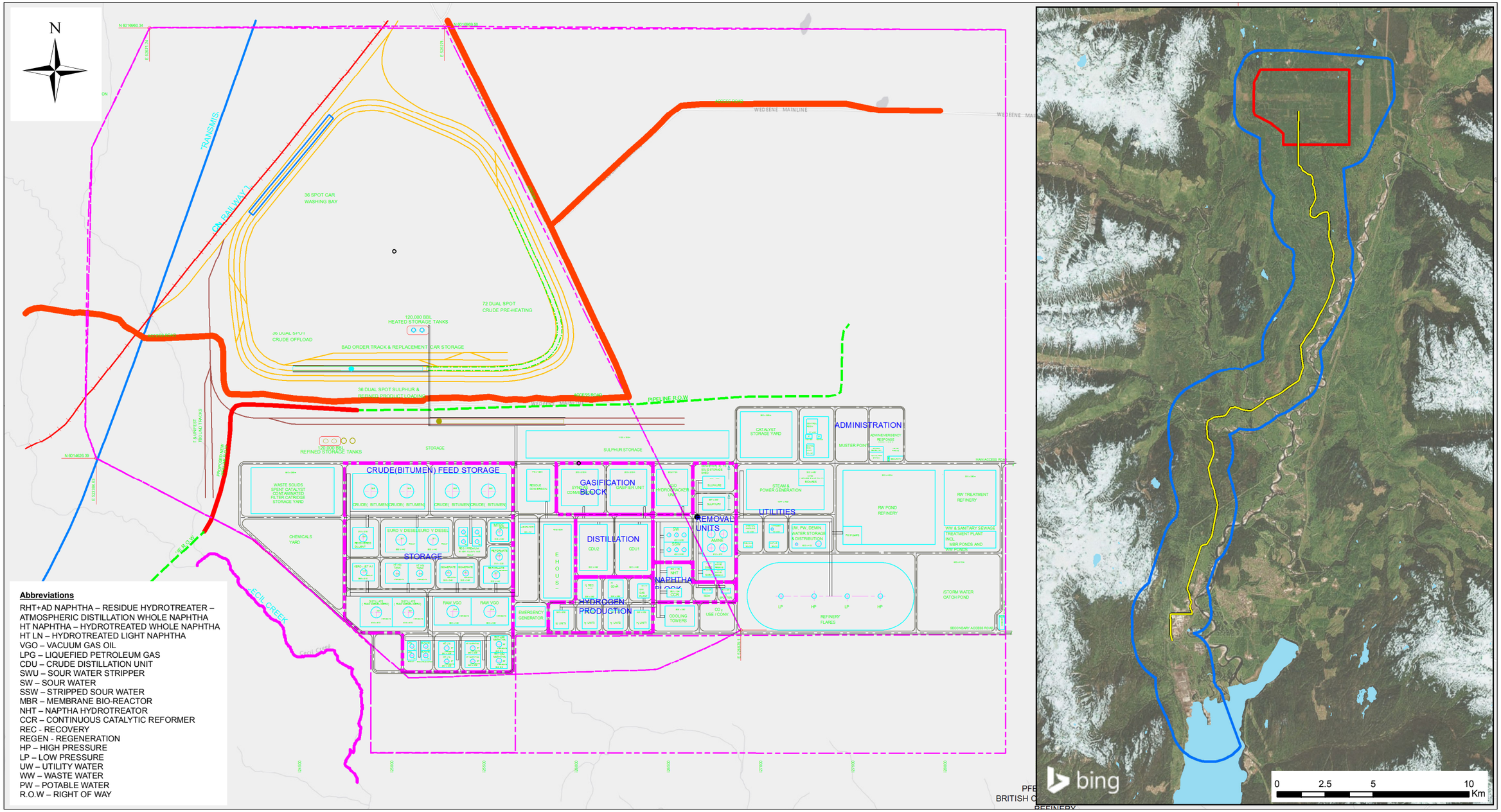

Abbreviations

RHT+AD NAPHTHA – RESIDUE HYDROTREATER – ATMOSPHERIC DISTILLATION WHOLE NAPHTHA
HT NAPHTHA – HYDROTREATED WHOLE NAPHTHA
HT LN – HYDROTREATED LIGHT NAPHTHA
VGO – VACUUM GAS OIL
LPG – LIQUEFIED PETROLEUM GAS
CDU – CRUDE DISTILLATION UNIT
SWU – SOUR WATER STRIPPER
SW – SOUR WATER
SSW – STRIPPED SOUR WATER
MBR – MEMBRANE BIO-REACTOR
NHT – NAPTHA HYDROTREATOR
CCR – CONTINUOUS CATALYTIC REFORMER
REC - RECOVERY
REGEN - REGENERATION
HP – HIGH PRESSURE
LP – LOW PRESSURE
UW – UTILITY WATER
WW – WASTE WATER
PW – POTABLE WATER
R.O.W – RIGHT OF WAY

Legend

- Refinery Boundary
- Main Road
- Secondary Access Road'
- Existing CN Rail Line
- Manifest & Unifest Rail
- Unit Train Rail Tracks
- Existing Access Road
- Cecil Creek
- Pipeline Right of Way
- Proposed BC Hydro Power Trasmission Line
- Proposed New Pipeline Right of Way
- Refinery Infrastructure
- Project Area
- Refinery Location
- Potential Module Access Road
- Water Bodies

Notes:
1. Intended for illustration purposes only.
2. Original in colour.
3. Site location is approximate.
4. Some smaller magnitude geohazards may exist that were too small to map.

References:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Pacific Future Energy Refinery
Refinery and Rail Yard Layout

By:	ECH	Date: 2016/06/15	Scale: As-Shown	Figure Number: 2	Rev: 2
Chk'd:	EM	Coord. Sys:	NAD 1983 UTM Zone 9N	Reference No.: 631180-101-013	

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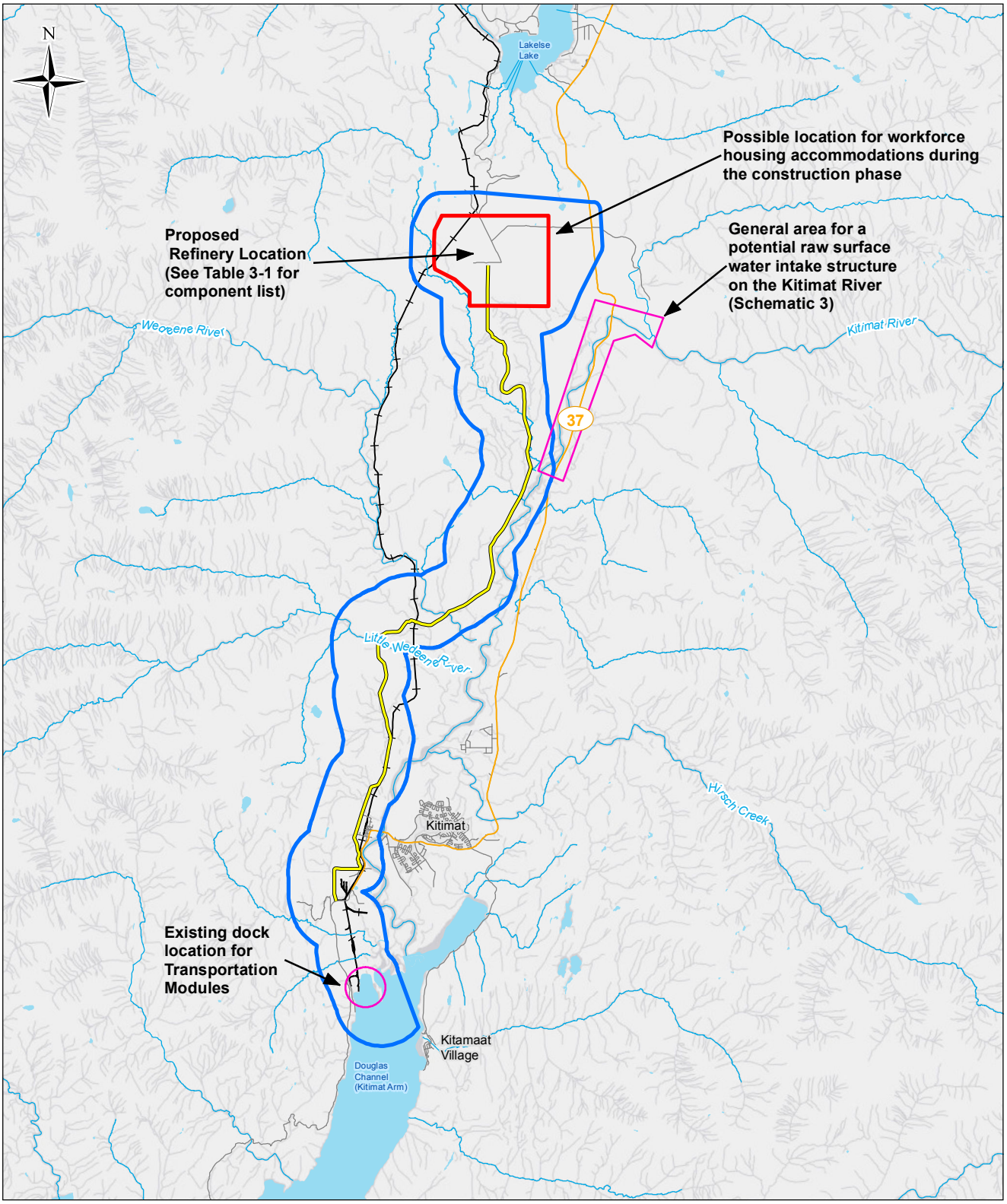

Legend

- Refinery Location
- Project Area
- Potential Module Access Road
- Highways
- Other Roads
- Rail Tracks
- Watercourses
- Water Bodies

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

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0 2.5 5 10 Km

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Pacific Future Energy Refinery Project Area

By: ECH	Date: 2016/06/16	Scale: 1:250,000	Figure Number: 3	Rev.: 2
Chk'd: SM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-002	

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2 PROJECT INFORMATION

2.1 *Project Overview*

PFEC is proposing to power the Project with clean energy[1], with the goal to open markets for Canadian bitumen through the creation of refined products. The Refinery will have an input capacity of 200,000 barrels per day (BPD) or 31,795 cubic meters per day (m^3/d) of bitumen called NEATBIT™. NEATBIT™ (neat bitumen) is a term used to refer to bitumen that has a very low amount of diluent (less than 2%) compared to dilbit (diluted bitumen) which has 30% diluent. NEATBIT™is a near-solid that has the consistency of peanut butter and does not flow unless heated (it must be heated to 81°C in order for it to flow easily). There is no sand in NEATBIT™. Since it has a very small amount of diluent — unlike other forms of oil transported by rail or pipeline — it has very low flammability. As a result, it is exempt from Transport Canada's *Transportation of Dangerous Goods Regulations* and can be transported safely by rail car.[2]

NEATBIT™ will be brought to the Refinery by unit trains and unloaded to storage tanks located at Dubose Flats. The design of the Refinery will be to achieve Near Zero Net Carbon (NZNC) emissions (approximately 0.5 MMTPA). In December 2015, PFEC submitted an application to the province for Licence of Occupation (LOO) and Temporary Use Permit (TUP) to undertake investigative studies (i.e., geotechnical, hydrogeological and airshed) at the Refinery, and will begin the tenure application process in fall 2016.

The purpose of this Project is to establish the key world-leading infrastructure necessary for opening world markets to Canadian oil and gas products by working closely with local First Nations. PFEC will build a state-of-the-art bitumen refinery, powered by clean energy, in northwest BC, for the purpose of processing Canadian near-solid NEATBIT™ into fully refined products such as diesel, gasoline and jet fuel. This Refinery will lead the world in minimizing carbon emissions from the refining process.

PFEC believes that "social licence" or "permission" must be gained at the concept stage of any project, and earned throughout the life-cycle of the project. This Project will be built in a manner that respects First Nations rights, title and treaty rights. PFEC recognizes First Nations as a first order of government in BC. We will fulfill the stated economic, social and environmental goals of all levels of government and we will fully comply with and/or exceed all of their regulatory requirements.

The Project will include the following:

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1 'Clean energy' as defined by the BC Clean Energy Act and the Clean or Renewable Resources Regulation. http://www.empr.gov.bc.ca/EAED/AEPB/Documents/CleanEnergyJune.pdf

2 NEATBIT™ is exempt under *Transportation of Dangerous Goods Regulations* Part 1, 1.33 Class 3, Flammmable Liquids: General Exemption SOR/2008-34. Transport Canada rail safety legislation will still apply.

- A new bitumen refinery constructed from about 100 to 150 modules that will be manufactured and shipped via heavy-lift vessels or barges from Asia;
- A new module access road to the Refinery, approximately 50 m wide and 40 kilometres (km) in length, with two clear-span crossings across Wedeene and Little Wedeene Rivers for the heavy-haul transportation of Refinery modules from an existing marine dock (former Eurocan dock) in Kitimat. The road will be used primarily during the construction phase; however, may continue to be used during operation subject to input from First Nations and the public;
- A new rail yard and associated buildings. The rail yard will have seven (7) yard tracks with a total length of 20.9 km. The Project will utilize the existing Canadian National (CN) rail line to receive NEATBIT™ on dedicated unit trains. Three to four unit trains per day (120 rail cars per unit train) are anticipated
- An industrial railroad connection to connect the Refinery rail yard to the existing CN rail line;
- On site storage for feedstock and refined product storage with the capability to yield by combustion greater than 3 Petajoules (PJ) of energy;
- Ancillary facilities for the Refinery such as control rooms, maintenance and administration buildings;
- Upgraded road access to the Refinery from Highway 37 (5 to 8 km);
- Tie-in to an existing natural gas pipeline (possible options include an existing gas line located parallel to Highway 37 (4 km) or a proposed third-party pipeline (500 m) that overlaps the Refinery area);
- Electrical power infrastructure capable of producing 300 MW of clean energy during operations. The Refinery will self-generate the majority of power requirements through the refining process; however, PFEC is assessing the feasibility of a cogeneration facility using wood waste biomass and geothermal as an efficient and environmentally beneficial means of providing a portion of the Project's electrical power needs. Other clean energy options will be considered through independent power producer(s) or a point of interconnection to the BC Hydro transmission system(1 to 5 km);
- Other plant utility infrastructures such as facilities for the intake and treatment of raw source water and treatment of wastewater. The Project will require approximately 48,000 m^3/d of raw source water for refining processes. PFEC is considering groundwater as the preferred source; however, surface water from the Kitimat River is also an option. Where possible, PFEC will recycle water through the refining process to reduce the amount of daily intake required;
- Potential surface water intake structure on the Kitimat River;
- A 6" water pipeline from the Refinery to Kitimat for the purpose of discharging treated water (approximately 200,000 to 800,000 m^3/yr) to Douglas Channel; and

- Workforce housing accommodations for the construction phase. PFEC is assessing the feasibility of new accommodations on site, as well as the use of existing accommodations in Terrace or Kitimat.

Based on the input capacity of the Refinery, the Project is considered a “designated project” under CEAA 2012. The construction and operation of a new oil refinery with an input capacity of more than 10,000 m^3/d is considered a designated project under Section 14(a) of the *Regulations Designating Physical Activities* and is subject to review by the Agency. The Project is not a part of larger project not listed in the *Regulations Designating Physical Activities*, nor is it an expansion of an existing project.

An energy storage facility with ≥ 3 PJ capacity (~112,000 m^3) is considered a "reviewable project" pursuant to the *Reviewable Project Regulations* (Part 4, section 10, Table 8) under BCEAA. Therefore, based on the currently expected permanent on site storage capacity only, the Project would constitute a provincially reviewable project.

2.2 *Project Location and Access*

The Project and its components are wholly located in BC within the Regional District of Kitimat-Stikine (RDKS), Kalum Forest District and Kalum Land and Resource Management Plan (LRMP) area, approximately 30 km south of Terrace and 32 km north of Kitimat, BC (**Figure 1**). The nearest known permanent residence is at Lakelse Lake, located 8 km north on Highway 37. There are no known permanent or temporary residences within the proposed Refinery location.

The Project area extends from Dubose Flats to Kitimat, as shown in **Figure 3**. The areal extent of the Project area is 15,714 hectares (ha), and encompasses the footprint of the Refinery, it's associated components, existing Eurocan marine dock (for receipt of Refinery modules during construction) and the access road. The Project area is intentionally large to accommodate design flexibility in the Project footprint.

The Refinery footprint, estimated at 1,000 ha, includes the Refinery, rail yard, utilities and ancillary facilities. The potential access road will have an estimated 200 ha footprint (40 km long with a 50 m right-of-way). A river water intake structure may need to be constructed on the Kitimat River. The general area for assessment is shown in **Figure 3**. PFEC will take into consideration the engineering requirements, advice and guidance from local First Nations, other government agencies, the general public and EA studies in planning the footprint and configuration of the Project’s components.

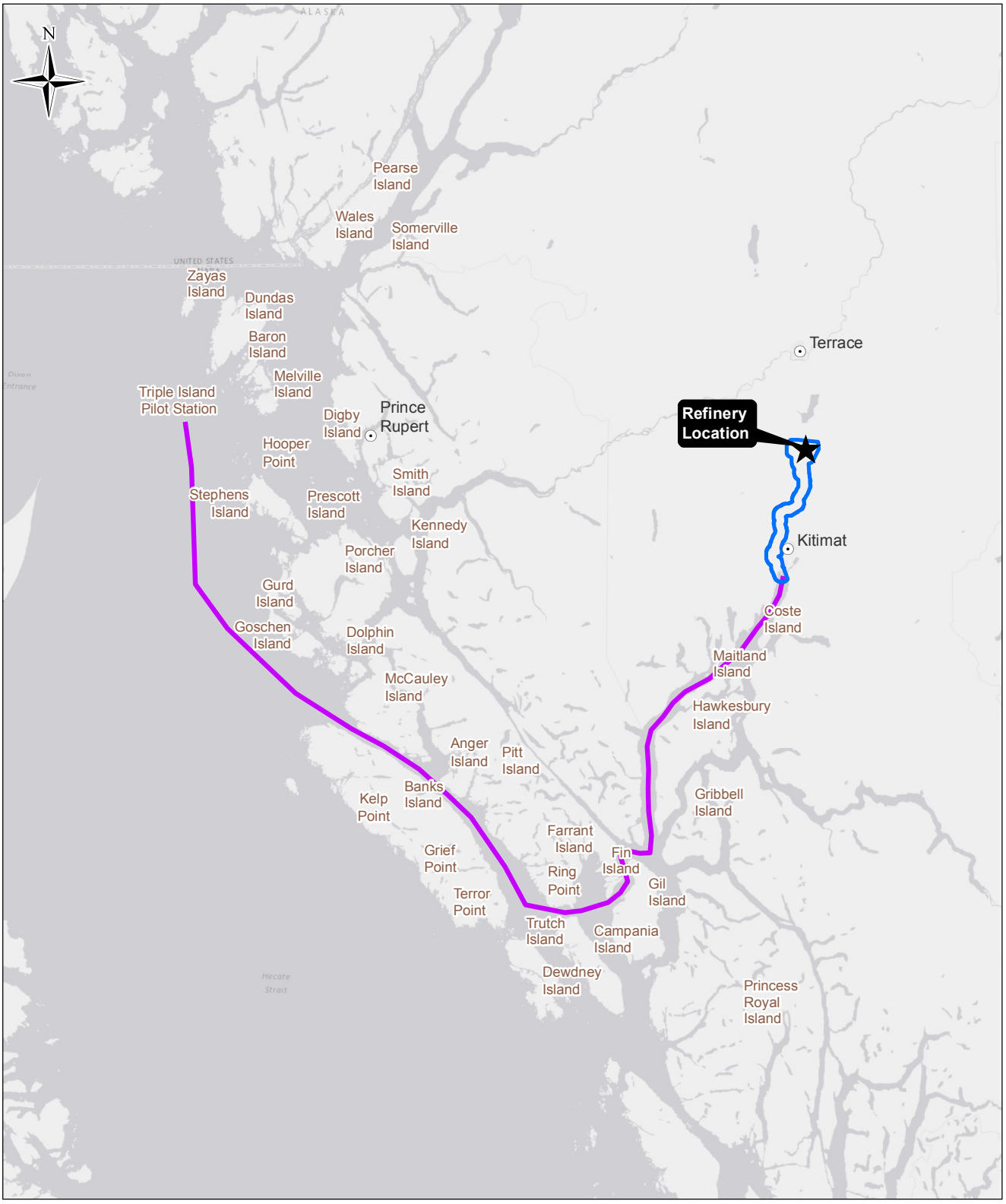
The centre coordinates of the Refinery are:

Universal Transverse Mercator (UTM):	NAD 83 9U 524897.2 m E 6015176.3 m N
Longitude and Latitude:	128°37'3.25" W 54°17'2.027" N

The Refinery will be accessed via the Wedeene Mainline and Highway 37 (Terrace-Kitimat Highway). CN Rail operates a branchline between Terrace and Kitimat, which overlaps the Refinery footprint (**Figure 2).** The branchline carries only freight trains. The nearest airport is the Terrace-Kitimat Regional Airport and is 20 km north on Highway 37. Vancouver is approximately 700 km to the south by air and 1,367 km via Highways 16, 97 and the TransCanada Highway. Prince George is 575 km to the east and Prince Rupert is 153 km to the west on Highway 16[3].

The shortest marine access route is from the Triple Island Pilotage Station through Principe Sound, Douglas Channel to the Kitimat Arm as shown in **Figure 4**. The marine access route is to serve the transport of Refinery modules from Asia to Kitimat during the construction phase.

[3] http://www.terrace.ca/visitors/about_terrace



Legend

- Refinery Location
- Nearby Municipality
- Project Area
- Proposed Marine Route

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
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0 15 30 60 Km

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Pacific Future Energy Refinery Proposed Marine Access Route for the Refinery Modules

By: ECH	Date: 2016/05/09	Scale: 1:1,500,000	Figure Number: 4	Rev.: 1
Chk'd: SM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-011	

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3 PROJECT COMPONENTS

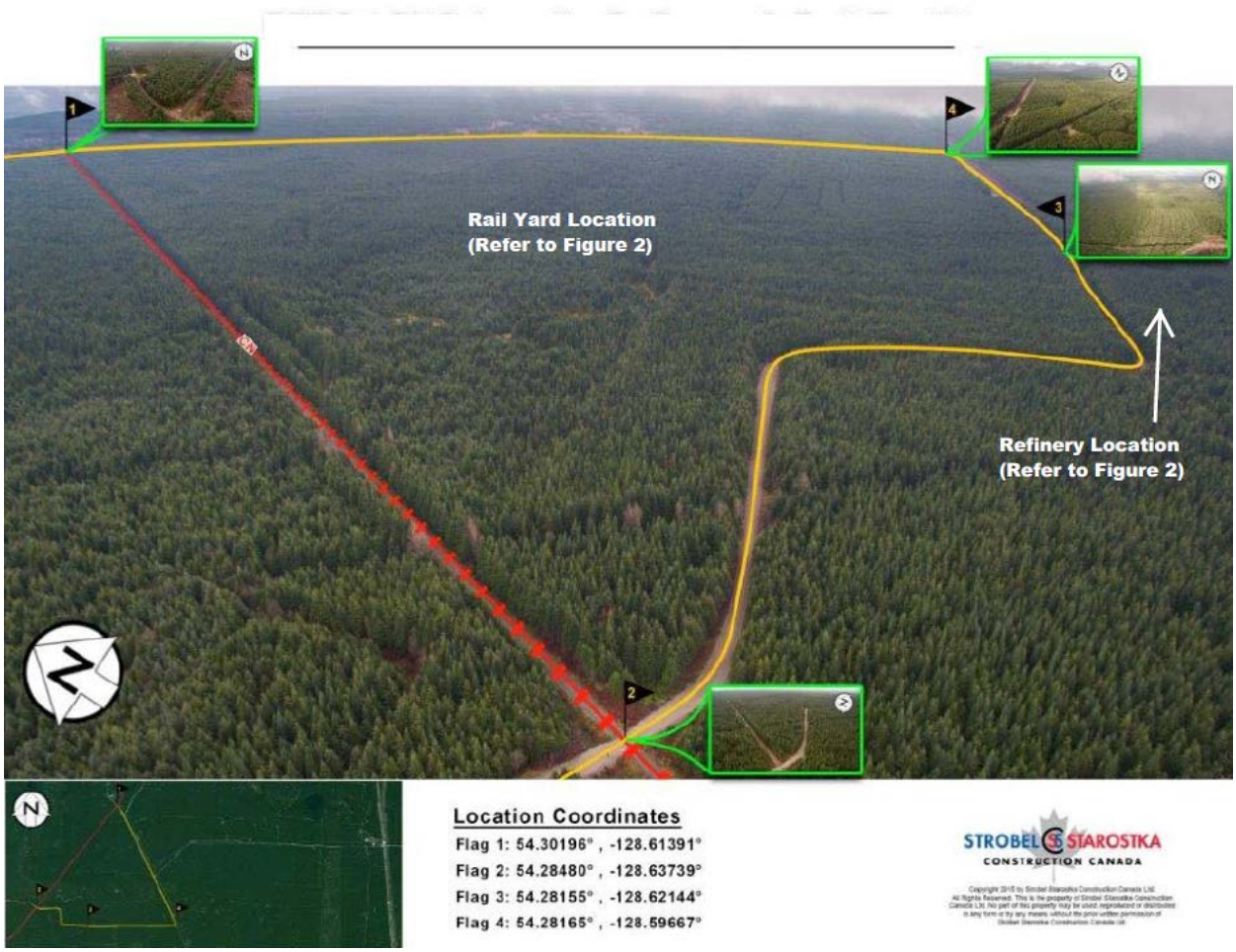
Key components of the Project are listed in Table 3-1 and discussed in more detail in this section. A layout of the Refinery and rail yard are shown in **Figure 2**. **Photographs 1 and 2** provide an aerial view of the location for the proposed Refinery and rail yard.

Table 3-1 Physical Components of the Project

Project	Components
Refinery Infrastructure (1,000 ha)	• Refer to Figures 2, 3, 5, 6 • Bitumen oil refinery built from 100 to 150 pre-fabricated modules, each weighing between 2,500 and 5,000 metric tonnes (MT) (**Figure 5**); • Rail yard(unloading and loading) with seven tracks, capable of receiving up to four unit trains per day (120 rail cars each) (**Figure 6**); • Upgraded road access to the site from Highway 37 (5 to 8 km); • Tie-in to an existing natural gas pipeline (500 m to 4 km); • On site storage for feedstock and refined products with a total capacity of greater than 500,000 m^3; • Administrative building to hold 100 persons (approximately 3 floors, each 1,000 m^2); • Four explosion-proof control rooms (approximately 800 m^2 each) that will be located in the proximity of the group of refining process units. There will be a control room for each of the following groups: – Distillate Hydrotreater, gas oil Hydrocracker/ Hydrotreater, Hydrogen Production Unit, Sour Water Stripper (SWS), Amine Recovery Unit (AMU) and Sulphur Recovery Unit (SRU); – Distillation Units, Isomerization Unit, and Catalytic Reforming Unit; – Residue Conversion Unit and Gasifier Unit; and – Oil Movement. • Building for laboratory analysis (approximately 500 m^2); • Control Room for Power Generation, Raw Water Treatment and Wastewater Treatment (approximately 800 m^2); • Shop for turbines for the power generation (approximately 2,000 m^2); • Shop for spare parts and Personal Protective Equipment (PPE) (approximately 2,000 m^2); • Shop for catalyst and chemicals (approximately 2,000 m^2); • Building for Electrical, Instrumentation and Maintenance (approximately 1,200 m^2); • Building for firefighting equipment and first aid (approximately 1,500 m^2); • Refinery Utility Infrastructure: – Electrical power infrastructure; – Biomass facility; – Emergency power; – Raw water system; – Boiler Feed Water (BFW) and steam; – Sanitary and potable water system; – Domestic sewage system; – Surface water management system;

Table 3-1 (Cont'd) Physical Components of the Project

Project	Components
Refinery Infrastructure (1,000 ha) (Cont'd)	– Fuel gas and natural gas; – Instrument and Utility Air System; – Fire, gas and smoke detection; – Fire water system (oxygen and nitrogen); – Hydrocarbon drain system; and – Relief and flare. • Water and Waste Management; • A 6" water pipeline from the Refinery to Kitimat.
Potential Surface Water intake structure	• Refer to **Schematic 3** • Intake structure on Kitimat River (no diversion); • Minimum river depth of 0.7 m at point of intake; • Concrete structure; • Scour protection and wedge weir screen; • Protection of fish through screen; • Access road from Refinery to intake structure; • Pipe from the intake to the Refinery; • Dual pipes from structure to the pump station; • Pump station at river bank at elevation to take care of flooding based on historical data.
Construction-related infrastructure	• Refer to **Figure 3** • Trailers, fabrication shops, and material storage shop • Existing off-loading dock (former Eurocan dock) in Kitimat to receive Refinery modules during construction. • Access Road (200 ha; 40 km long by 50 m wide) with a clear-span crossing on Wedeene River and Little Wedeene River The road will be used primarily during the construction phase; however, may continue to be used during operation subject to input from First Nations and the public. • Workforce housing accommodations for the construction phase.

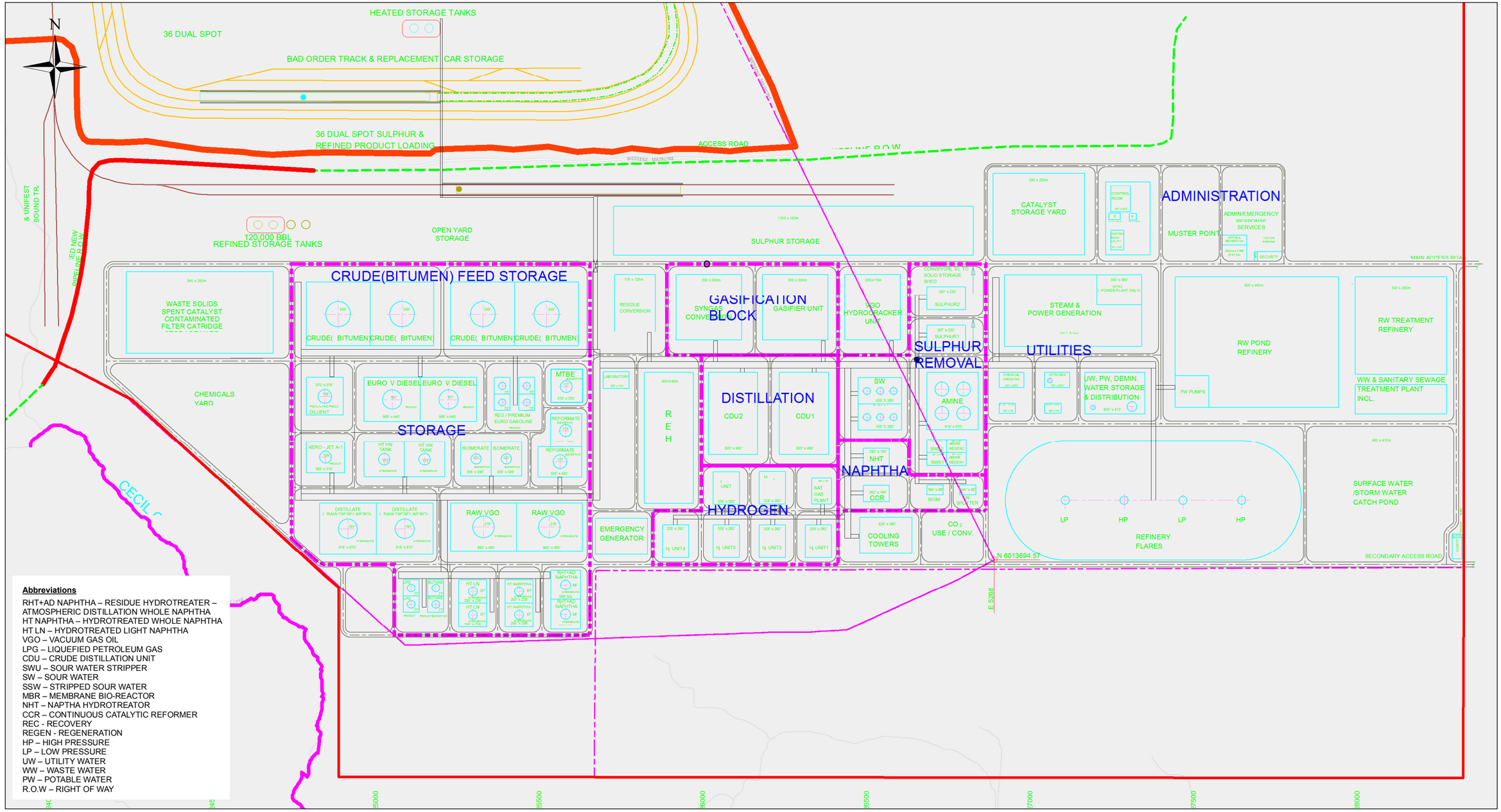


Photograph 1 Aerial view of the proposed Rail and Refinery Site.

Photograph 2 Aerial view of the proposed Rail and Refinery Site (Inset from Point 1).

3.1 *Refinery*

PFEC is proposing to process 200,000 BPD of NEATBIT™ from Western Canada, powered by clean energy. The Refinery will produce transportation fuel and refined product for new markets, while the design intent and approach will be such that carbon emission is minimized; to achieve NZNC emissions. To cover the range of NEATBIT™ qualities that are produced in the larger reservoir areas in Western Canada, NEATBIT™ from both the Athabasca and Cold Lake regions will be considered in the design of the Project. NEATBIT™ will be brought to the Refinery by unit trains and unloaded to storage tanks located at Dubose Flats. Refer to **Figure 2** and **5** for the Refinery layout.



Abbreviations

RHT+AD NAPHTHA – RESIDUE HYDROTREATER – ATMOSPHERIC DISTILLATION WHOLE NAPHTHA
HT NAPHTHA – HYDROTREATED WHOLE NAPHTHA
HT LN – HYDROTREATED LIGHT NAPHTHA
VGO – VACUUM GAS OIL
LPG – LIQUEFIED PETROLEUM GAS
CDU – CRUDE DISTILLATION UNIT
SWU – SOUR WATER STRIPPER
SW – SOUR WATER
SSW – STRIPPED SOUR WATER
MBR – MEMBRANE BIO-REACTOR
NHT – NAPTHA HYDROTREATOR
CCR – CONTINUOUS CATALYTIC REFORMER
REC - RECOVERY
REGEN - REGENERATION
HP – HIGH PRESSURE
LP – LOW PRESSURE
UW – UTILITY WATER
WW – WASTE WATER
PW – POTABLE WATER
R.O.W – RIGHT OF WAY

Legend

- Refinery Location
- Refinery Boundary
- Unit Train Rail Tracks
- Main Road
- Secondary Access Road'
- Manifest & Unifest Rail
- Existing Access Road
- Cecil Creek
- Pipeline Right of Way
- Proposed New Pipeline Right of Way
- Refinery Infrastructure

Notes:
1. Intended for illustration purposes only.
2. Original in colour.
3. Site location is approximate.
4. Some smaller magnitude geohazards may exist that were too small to map.

References:
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PACIFIC FUTURE ENERGY
Building Our Future, Protecting Our Coast

SNC·LAVALIN

Pacific Future Energy Refinery Plan

By:	ECH	Date: 2016/06/15	Scale: As-Shown	Figure Number: 5	Rev: 2
Chk'd:	EM	Coord. Sys: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-014	

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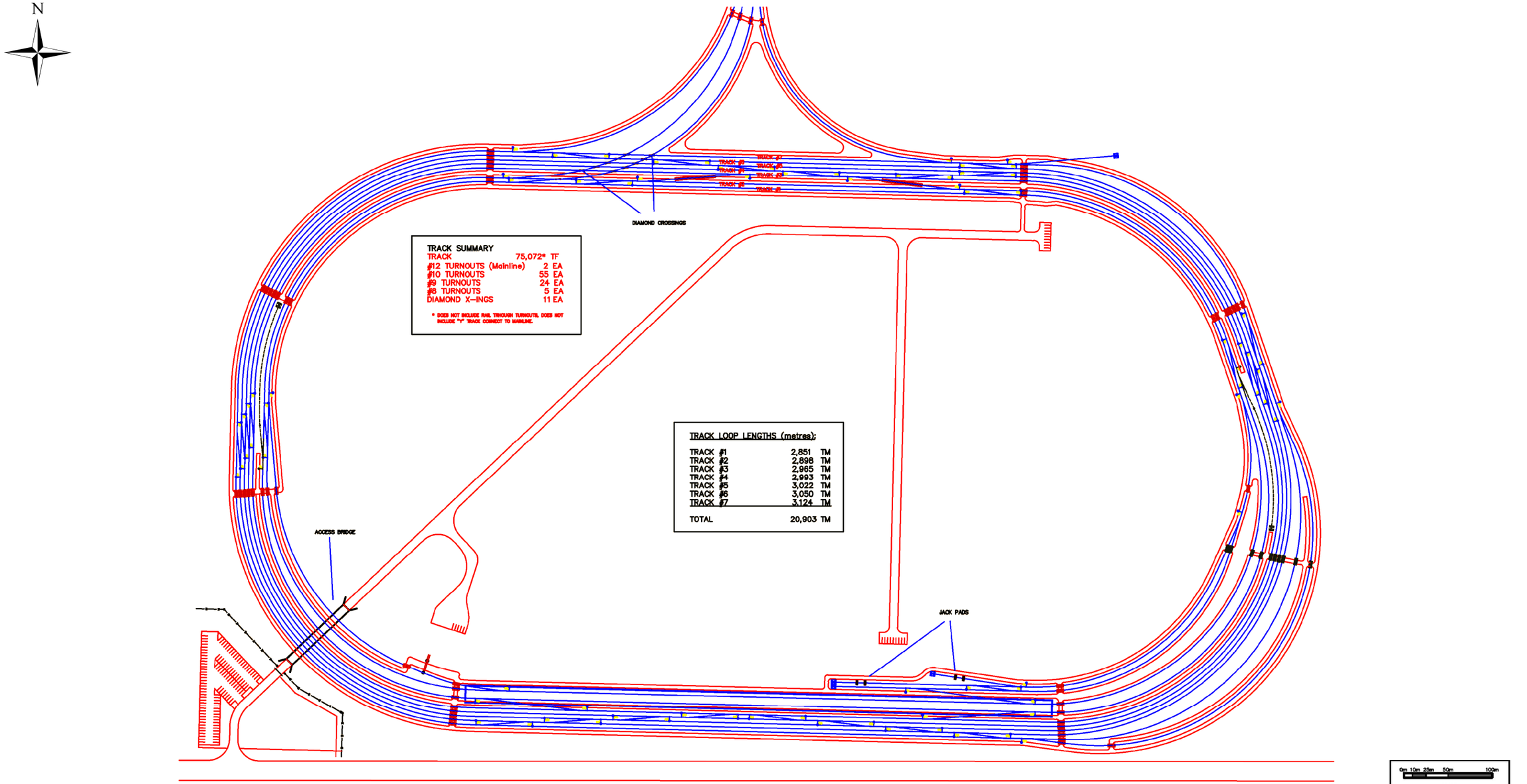

Legend

- Tracks
- Roads
- Future Track
- Fencing

Notes:

1. Intended for illustration purposes only.
2. Original in colour.
3. Site location is approximate.
4. Some smaller magnitude geohazards may exist that were too small to map.

References:

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PACIFIC FUTURE ENERGY
Building Our Future, Protecting Our Coast

STROBEL STAROSTKA
CONSTRUCTION CANADA

SNC·LAVALIN

Pacific Future Energy Refinery
Rail Yard Concept

By:	ECH	Date: 2016/06/10	Scale: As-Shown	Figure Number: 6	Rev: 0
Chk'd:	EM	Coord. Sys: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-015	

MXD Path: \\sl2606\projects\LOB\EIAM-BC\Current Projects\Pacific Future Energy\631180 Dubose Flats - PFEC Refinery\4.0 Execution\4.5 GIS and Drawings\GIS\Maps\MXD\Report Figures\631180-101-0015_Rail_Yard_Concept .mxd

3.1.1 Refinery Modules

The Project is planning for the purchase of pre-built Refinery modules from Asia for transport to an off-loading terminal in Kitimat (**Figures 3** and **4**). The purchase of pre-manufactured modules from overseas is economical, reducing the capital expenditures required for the Project.

Approximately 100 to 150 modules will be required for the Refinery, each with dimensions ranging from 40-50 m in length, 35-47 m in width and 17-27 m in height. Each module is estimated to weigh between 2,500 and 5,000 metric tonnes (MT).

3.1.2 Feedstock and Refined Product Storage

3.1.2.1 Feedstock

The primary feedstock for the Project will be NEATBIT™ from Western Canada, which will be delivered by three to four unit trains per day on the CN Rail branchline. The Project will have a large rail unloading facility to allow for two unit trains at once, where one unit train is unloaded and the other is heated while in queue.

Blendstocks such as methanol will be produced at the Refinery for the purpose of gasoline quality improvement.

Natural gas is planned to be delivered by pipeline. Natural gas will be used as feed gas for the steam methane reforming process (as part of the Hydrogen Production Unit). The Project is proposing to tie-in to an existing natural gas line, either from the anticipated 36-inch Pacific Trails Pipeline (with an alignment running through Dubose flats, See **Figures 2 and 5**), the existing Pacific Northern Gas (PNG) pipeline (with a six or 10-inch pipe alignment parallel to Highway 37 on the east side) or the proposed 24-inch PNG looping pipeline (parallel to the existing PNG pipeline between Lakelse and Kitimat).

3.1.2.2 Products

EURO V grade diesel and gasoline will be the main products of the Project. Jet A-1 kerosene, Liquefied Petroleum Gas (LPG), butane, and sulphur will also be produced.

3.1.2.3 NEATBIT™ and Refined Products Storage

The proposed design for the Project includes storage tanks for material listed in **Table 3-2**. The storage facility will be located at the Refinery, as shown in **Figure 5**. The storage capacities shown are preliminary estimates only and will be refined as design progresses. At this time, the combined storage quantity on site for both NEATBIT™ and refined products will have the capability to yield greater than 3 PJ of energy. Each of the unit intermediates will have a day-storage tank other than feed and products storage.

Table 3-2 List of Materials Requiring Storage, Tank Numbers and Storage Capacities

Material	Number of Storage Tanks	Total Capacity (Bbls)	Total Capacity (m3)	Type
NEATBIT™	4	1,600,000	254,400	Cone Roof Tank
Recovered Diluent	1	40,000	6,360	IFRT
LPG	2	30,000	4,770	Bullet
Butane	2	25,000	3,975	Sphere
Resid Hydrotreater – Atmospheric Distillation Whole Naphtha	2	150,000	23,850	IFRT
Hydrotreated Whole Naphtha	2	50,000	7,950	IFRT
Hydrotreated Heavy Naphtha	2	150,000	23,850	IFRT
Distillate (Raw Diesel – Kero)	2	560,000	89,040	Cone Roof Tank
Raw VGO	2	600,000	95,400	Cone Roof Tank
EURO V diesel	2	450,000	71,550	Cone Roof Tank
Reformate	2	150,000	23,850	IFRT
Isomerate	2	108,000	17,172	IFRT
Hydrotreated Light Naphtha	2	80,000	12,720	IFRT
Regular Euro Gasoline	2	120,000	19,080	IFRT
Premium Euro Gasoline	2	120,000	19,080	IFRT
Kero – Jet A-1	2	170,000	27,030	IFRT
Recycled Hydrocarbon (i.e., Slop)	3	300,000	47,700	IFRT
Sour Water	3	210,000	33,390	Cone Roof Tank
Stripped Sour Water	3	210,000	33,390	Cone Roof Tank
Nitrogen Storage	3	500	79.5	Vessel
Demineralized Water	3	26,000	4,134	Cone Roof tank
Potable Water	1	5,000	795	Tank
Amine Surge	2	2000	318	Cone Roof Tank
Amine Make-up	2	1000	159	Cone Roof Tank
Sulphur (tonnes)	1	48,000 MT	48,000 MT	Building
Total Capacity (m^3)			**820,043 m^3** (excludes sulphur as it is a solid)	

3.1.3 Carbon Management

PFEC is committed to reduce greenhouse gas emission from this facility and will employ all possible means to achieve low carbon intensity and NZNC emissions (.5 MMTPA). PFEC will use innovative but proven technologies in order to meet this commitment (**Section 3.1.4**). In particular, this Refinery will eliminate the production of coke. Coke products are a significant source of greenhouse gas emissions and will not be produced by this Refinery.

Some of the steps that will be taken by PFEC to reduce carbon emissions are:

1. Selection of refining technologies such as:
    - Heavy residue hydrocracking that eliminates coke production. The elimination of coke production significantly reducing carbon dioxide (CO_2) emission per gigajoule (GJ);
    - Gasoline production without thermal catalytic cracking processes. Thermal catalytic cracking produces some coke;
    - Selection of hydrocracking & hydrotreating technologies that produce EURO V quality diesel and gasoline. No heavy fuel oil will be produced from this Refinery; and
    - Converting carbon residue into fuels. A small portion of the feedstock will remain as pitch; this pitch will be further gasified into a syngas for the production of liquid hydrocarbon (diesel).
2. Minimize CO_2 emission with flue gases through following means:
    - Use of fuel gas (natural gas) as clean fuel instead of fuel oil;
    - Improving energy efficiency of the processes through design;
    - Integration of multiple units;
    - Using steam generated from various processes for motor drives and power generation; and
    - Using biomass for power generation as carbon neutral fuel.
3. PFEC is considering capture of CO_2 emitted from various sources such as:
    - Process CO_2 from tail gas in the hydrogen production unit through the use of specific solvent;
    - Process CO_2 from residue gasification/syngas treatment unit through the use of specific solvent; and
    - Capture CO_2 from flue gases through the use of proprietary technology.

4. PFEC is in discussion with technology suppliers for the use of CO_2 for manufacturing of various products.

3.1.4 Refinery Process Technologies

PFEC has selected relatively conventional and largely proven refining processes with the specific intent of reducing process technology risk while at the same time considering innovative but proven technologies to improve the energy efficiency of the Refinery to minimize the environmental impact. To ensure minimal risk of process failure, PFEC has consulted and will continue to consult with technology providers of the petroleum refining industry, incorporating inputs on the design of the overall refining process, as well as the design of specific components. In addition, third-party reviews will be conducted at various times during design and construction to further mitigate risk of process failure.

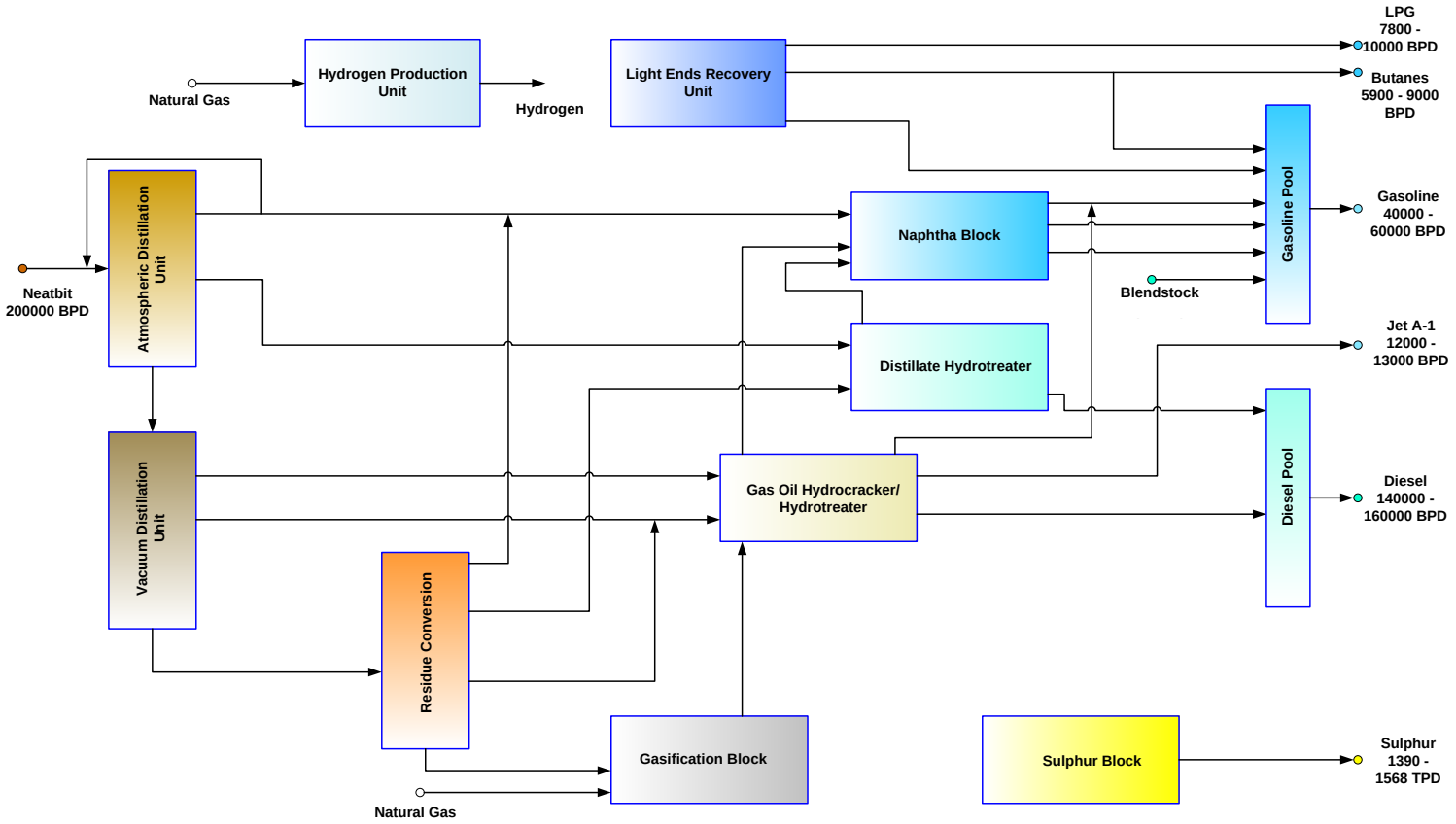
3.1.5 Description of the Refining Process

The optimisation process for the Refinery is in progress and the following description was prepared based on current available information. The final configuration may change based on optimization among various competing configurations and updated information from technology providers. Key process units that are a part of the Refinery configuration are:

- Atmospheric Distillation Unit;
- Vacuum Distillation Unit;
- Residue Conversion Unit;
- Distillate Hydrotreater;
- Gasoil Hydrocracker/Hydrotreater;
- Gasification Block:
  - Gasifier & Syngas Cleaning Unit; and
  - Syngas Conversion Unit.
- Naphtha Block:
  - Naphtha Hydrotreater/ Splitter;
  - Catalytic Reformer Unit; and
  - Isomerization Unit.
- Hydrogen Production Unit;
- Light Ends Recovery Unit/Gas Plant;

- Sulphur Block:
  - Sour Water Stripper (SWS);
  - Amine Recovery Unit (ARU);
  - Sulphur Recovery Unit (SRU);
  - Tail Gas Treatment Unit (TGTU); and
  - Sulphur Forming Unit.

The Process Flow Scheme (shown in the **Schematic 1**) of the Project shows the major processing blocks included in the configuration and the distribution of the major streams to meet the target product qualities (EURO V Gasoline and EURO V diesel).



1. Ranges in product quantities are due to variation in feedstock (Athabasca or Cold Lake origin), catalyst run and variation in technology selections.
2. Gasoline quantities include both regular and premium gasoline.
3. PFEC may produce other liquid hydrocarbons such as methanol from the Gasification Block.

PROCESS FLOW SCHEME

Schematic 1 Process Flow Scheme

3.1.6 Other Refinery Infrastructure

Besides the Refinery process units that need to be built, there is a need for additional infrastructure, both temporary and permanent.

The temporary facilities will be built or installed at early stage of Refinery construction. These include trailers, fabrication shops and material storage shops. These will be located at the Refinery site (**Figure 3**).

Permanent infrastructure necessary for the operation of the Refinery include the following (**Figure 5**):

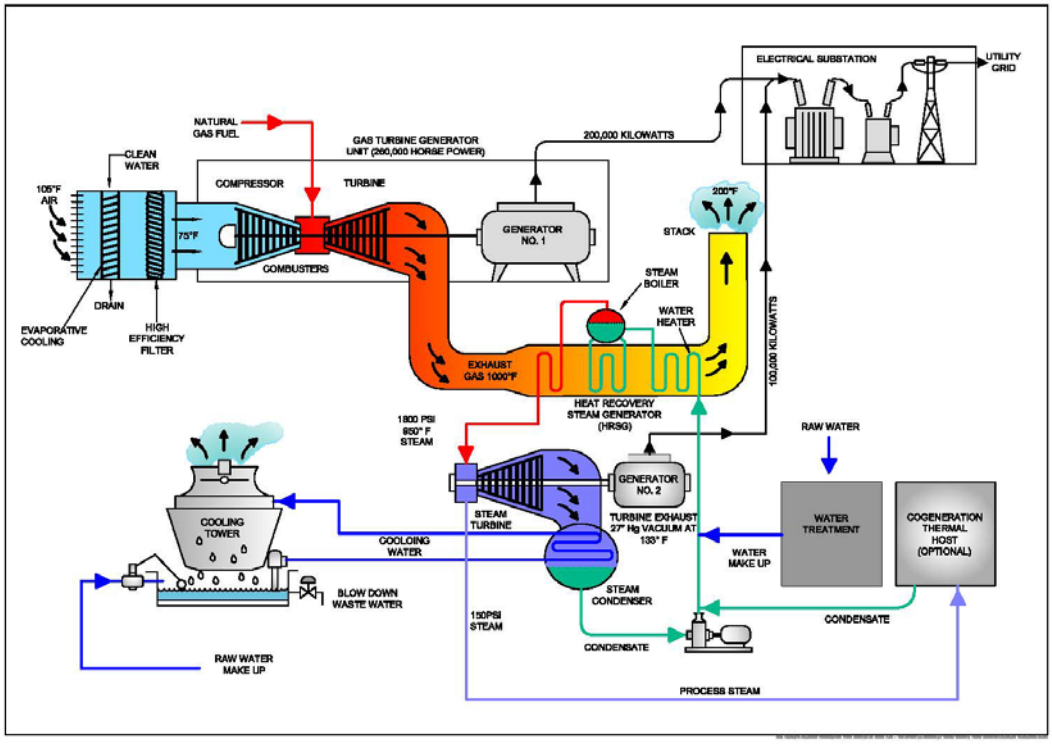
- Administrative building to hold 100 persons (approximately 3 floors, each 1,000 m^2);
- Four explosion-proof control rooms (approximately 800 m^2 each) that will be located in the proximity of the group of process units that will be controlled. There will be a control room for each of the following groups:
  - Distillate Hydrotreater, gas Oil Hydrocracker/ Hydrotreater, Hydrogen Production Unit, SWSs, ARU and SRU;
  - Distillation units, Isomerisation Unit, and Catalytic Reforming Unit;
  - Residue Conversion Unit and Gasifier Unit; and
  - Oil Movement.
- Building for laboratory analysis (approximately 500 m^2);
- Control Room for Power Generation, Raw Water Treatment and Waste Water Treatment (approximately 800 m^2);
- Shop for turbines for the power generation (approximately 2,000 m^2);
- Shop for spare parts and Personal Protective Equipment (PPE) (approximately 2,000 m^2);
- Shop for catalyst and chemicals (approximately 2,000 m^2);
- Building for Electrical, Instrumentation and Maintenance (approximately 1,200 m^2); and
- Building for firefighting and first aid (approximately 1,500 m^2).

There will be a need for other minor size buildings such as a substation, analyzer booth etc.

3.2 *Utilities at the Refinery*

The operating utility requirements for the Refinery will be supported by the following systems:

- **Electrical power (and biomass facility):** PFEC is considering various options for power supply such as natural gas-fired cogeneration facility and biomass power generation; as well as external supply from the existing BC Hydro transmission grid(1 to 5 km), geothermal and combination of all or some of these options. The Project will require approximately 300 MW of electrical power.
- The Refinery will produce a significant amount of steam for power generation and steam turbine drives of large compressors and pumps. A gas turbine generator is proposed to provide the remaining load, the start-up load and to supply critical load for the Refinery.
- For Combined Cycle Gas Turbine (CCGT) power plants, a widely used combination is the use of a gas turbine burning natural gas whose hot exhaust, in turn, powers a steam power generation unit. **Schematic 2** shows the concept of a CCGT power plant.
- For a 300 MW CCGT power plant, as an example, a gas turbine may generate 200 MW power and a steam turbine may generate 100 MW power. The power plant may export steam to the Refinery as an option. The water cooling may be replaced by air cooling to reduce water usage.



Schematic 2 Gas Turbine Combined Cycle

- **Biomass Facility:** PFEC is proposing to utilize existing wood-waste biomass as part of a cogeneration facility for the Refinery (**Figure 5**). The supply of biomass is expected to originate from pulp wood and hog fuel (tree bark and forest residue) from ongoing timber harvest operations and from wood waste, a product of the milling process. The Refinery will receive wood waste shipments via rail along the existing rail transportation corridors between Prince George and Prince Rupert. PFEC is currently assessing the reliability of this biomass-based cogeneration facility operation with respect to the Refinery operation. The biomass facility is anticipated to produce 25-75 MW (nameplate capacity) of the total 300 MW required to power the Refinery. Approximately one million tonnes of biomass equates to 75 MW of electricity. PFEC estimates the volume of biomass required can match or exceed the consumption of mid-level pulp mills located in the Prince George area, which consumes approximately one million m^3/y of pulp wood, which is relatively equivalent to one million tonnes of wood fibre.
- **Other Options for Electrical Power:** Other clean-energy options will be considered through independent power producer(s) (e.g., geothermal) or a point of interconnection to the existing 287 kV BC Hydro transmission line (5 km) or the proposed 287 kV BC Hydro Terrace to Kitimat Transmission line on the west side of Highway 37 (1 km) (**Figure 3**). This new transmission line is anticipated to meet the demands for electricity for the proposed LNG facilities and other future industrial developments in the Kitimat area (BC Hydro 2015). There are no ancillary facilities anticipated to be needed for these options.
- **Emergency power:** In the event of failure of the power supply from steam turbine generators, critical plant loads will derive electricity from an emergency power system. The emergency power system will consist of a combination of standby fuel gas- or natural-gas-driven generators for critical loads. A battery-backed uninterruptible power supply will be available for critical functions such as the plant control systems and computer systems.
- **Raw water system:** Water to the Refinery is planned to be supplied from surface and/or groundwater. PFEC will undertake hydrogeological and hydrological investigations to determine the availability of the sources within the Project area.
- **Sanitary and potable water system:** A supply of sanitary and potable water is required throughout the construction and operation. PFEC will investigate water source options and seek relevant permits to obtain the water supply.
- **Boiler Feed Water (BFW) and steam:** The Project will produce steam in sufficient amounts to meet the requirements for Refinery processes and utilities (heating, machine drive etc.). Significant amounts of steam are produced from the following units:
  - Hydrogen Production Unit;
  - SRU; and
  - Gasifier Unit.

- **Domestic sewage system:** PFEC will incorporate a new domestic waste water/sewage treatment system at the Refinery. Relevant permits will be obtained for the construction and operation of a sewage treatment plant.
- **Surface water management system:** Two streams of surface water runoff will be generated from the Project and water management systems will be developed for both.
  - Surface water runoff from snowfall or rain events will be contained in pond(s) located at the Refinery. These will be separate from process-area runoff ponds. The pond sizes will be suitable for a minimum one day holding volume for a maximum 1:100-year rainfall event. The water from such pond(s) will be recycled back into the process units to supplement raw water provided from the external sources.
  - Surface water from process areas will drain to the process-area water runoff pond(s) or collected in an open sump, and then pumped to the process-area water runoff pond(s) depending on the chemical analysis of the water.
- **Fuel gas and natural gas:** Primary fuel for the Refinery will be composed of light gas streams recovered from process units and, if required, a small amount supplied from off site. Natural gas will be received through pipeline from external sources. Natural gas will be mainly used for the steam-methane reforming process (in the Hydrogen Production Unit) as feed gas. The natural gas system will be connected to the fuel gas system to provide back-up fuel when required.
- **Instrument and Utility Air System:** Air will be supplied by the Refinery and instrument-air package, which will draw air from the atmosphere. Air supply is essential to the safe operation of the Refinery and must be made available for start-up and shutdown of the entire plant. Refinery air is to be distributed throughout the site to a number of utility stations.
- **Fire, gas and smoke detection:** A fire, gas, and smoke monitoring system shall be provided to detect the presence of fire and flammable or toxic gases at an early stage and to initiate automatic safeguards, as required. Detectors will be located across the Refinery and specifically in sensitive locations where there is a higher probability of fire.
- **Fire water system:** A fire water system will be designed to provide water to process units/areas for fire control. Water for the fire system will be drawn from source water and held in reserve in the raw water pond(s). Surface runoff water collected from non-process areas will be a secondary source for the fire water system.
- **Oxygen:** is required to feed the burners in the gasifier and the SRU (for oxygen enrichment).
- **Nitrogen:** is required to free the system of air at start-up and to prevent the release of hydrocarbon vapours during shutdown. Nitrogen requirements will be drawn from the Air Separation Unit (ASU), which produces nitrogen. Excess nitrogen will be vented to the atmosphere. To provide sufficient nitrogen for start-up / shutdown purging, liquid nitrogen storage vessels will be used.

- **Hydrocarbon drain system:** The Refinery will have a closed and an open drain system.
- **Closed Drain System:** All hydrocarbon drains will be routed to a closed drain system and returned to the slop tank. Water will be routed to the waste water treatment plant (WWTP). Drain vessels will be vented to a flare.
- **Open Drain/ Oily Water Sewer (OWS) Drain System:** Waste water from this system will be collected in atmospheric vessels and returned to the slop tank. Waste water is generated from desalters, process oily water drains, intermittent maintenance drains, etc.
- **Relief and flare:** The Refinery will be protected by three flare systems (all of which include liquid knockout facilities, flame ignition and burner management):
  - A High-Pressure Hydrocarbon Flare;
  - A Low-Pressure Hydrocarbon Flare; and
  - An Acid Gas Flare.

  The flares are all emergency flares for protection of environment, personnel and property. The flares act to safely release gas build-up from the refining process during process upset, start-up and shutdown. This safe disposal is achieved through complete combustion of gas releases. During normal operation, only a pilot flame will be on in these flares.

3.3 *Rail Yard*

The rail yard, with seven yard tracks for a total length of 20.9 km, will have a capacity to handle 200,000 BPD of NEATBIT™ and will allow for four unit trains per day. Each unit train will typically consist of two locomotives, two buffer cars and 120 tankcars of NEATBIT™. Once on site, the NEATBIT™ in the tankcars will go through a process of preheating (to reduce the viscosity of the NEATBIT™ and allow it to be easily pumped out of the tankcars) and then offloading where it will be pumped into the NEATBIT™ storage tank awaiting processing by the Refinery.

After the offloading process is completed, each tankcar will undergo an inspection that will determine if any preventative maintenance is required. Tankcars requiring preventative maintenance will be removed from service and sent to an onsite repair facility.

The rail yard will be equipped with adequate additional facilities for regular operation and maintenance of the yard.

3.4 *Off-loading Dock for the Refinery Modules*

The 100 to 150 Refinery modules will arrive on heavy-lift vessels or barges from Asia. (**Figure 4**). PFEC will use the existing Eurocan dock in Kitimat harbour to receive the modules (**Figure 3**). The existing dock will not require upgrades or expansion in order to accept PFEC's pre-built Refinery modules, which are estimated to weigh between 2,500 and 5,000 MT (up to 50 m long and 47 m wide). The District of Kitimat (2015) notes that the Port of Kitimat has a vehicle clearance to 320,000 deadweight tonnes (DWT) according to a recent Transport Canada TERMPOL[4] assessment. Kitimat harbour is 130-180 metres deep and currently has four inner harbour anchorages and four holding areas (District of Kitimat 2015).

The existing off-loading terminal and main staging area for these components, is in the traditional territory of the Haisla First Nation. PFEC will work with Haisla to best determine the location of the staging area and off-loading terminal.

3.5 *Access Road*

PFEC plans to construct a 50 m wide access road, extending from the former Eurocan dock in Kitimat to the Refinery. A possible route has been identified on the west side of the Kitimat River (**Figure 3**) and is estimated at 40 km in length. **Photographs 3** through **5** provide on-the-ground views of various locations along the existing access road leading into the proposed Refinery location. The current alignment will not cross the Kitimat River; however, clear-span crossings are planned for the Wedeene River and Little Wedeene River.

The current route was chosen based on grade, local geology and minimized water crossings (as a way to minimize impacts to fish). Engineering, geotechnical, environmental and public input will be incorporated into a finalized route as Project design is advanced. First Nations advice and guidance as well as public input will be taken into consideration.

The access road will be used primarily during construction to transport the Refinery modules. The 100 to 150 modules will arrive in pairs at the former Eurocan dock in Kitimat and once on land, the modules will be driven to the Site along a new construction access road by heavy-haul transport truck at a speed of no more than 5 km/hr. A two-day trip is estimated for each pair of modules.

4 "TERMPOL" stands for "Technical Review Process of Marine Terminal Systems and Transhipment Sites."

Photograph 3 View of existing access road looking north west towards the entry to the proposed Refinery.

Photograph 4 View of existing access road approximately 5 km south east of the proposed Refinery.

Photograph 5 Cecil Creek crossing along an existing access road located approximately 7 km south east of the proposed Refinery.

3.6 *Workforce Housing*

Workforce housing will be required for the construction phase. PFEC is assessing the feasibility of constructing new accommodations on site, as well as the use of existing accommodations in Terrace or Kitimat.

3.7 *Water and Waste Management*

The Project will require a source of raw water to meet the following needs:

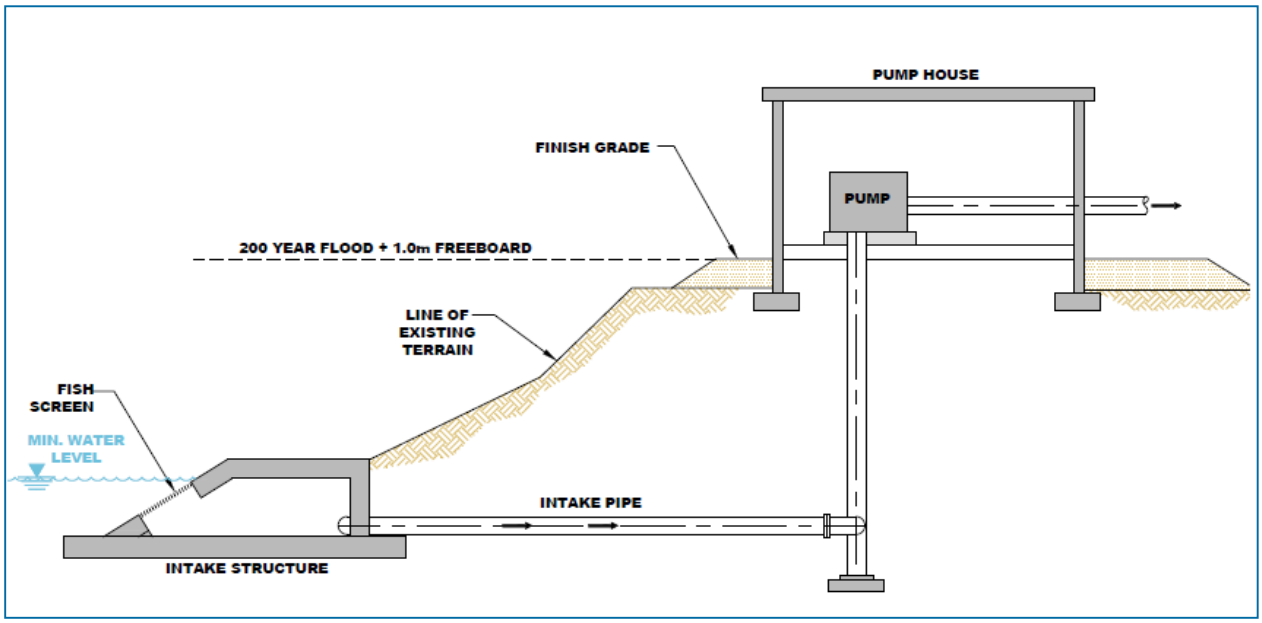
- Makeup water for cooling tower evaporative losses and blow down;
- BFW makeup for steam losses and blow down;
- Process water makeup;
- Utility water purposes throughout the Refinery, including wash water;
- Sanitary and potable water; and
- Fire-water.

The principal source for the raw water for the facility is groundwater. The adequacy and quality of raw water supply will be a crucial factor in determining the site location. Different sources of water supply may be evaluated if hydrogeological investigations determine the groundwater source is insufficient for use.

If groundwater is insufficient, surface water will be considered as a source for raw water. **Photograph 6** provides a view of the location for the potential surface water intake location. In this scenario, the construction of a river water intake structure at the Kitimat River, raw water transfer pumps and a pipeline to the Refinery, and a water treatment plant **(Figure 2** and **5**) at Dubose Flats will be required.

Photograph 6 Looking downstream along the Kitimat River at the potential surface water intake location.

Intake structure (**Schematic 3**) will be sited to draw water from the river in regions where the sediments concentration is low (e.g., at or near, the water surface, and at the outside of a bend in the river). It will be preferably placed where a minimum water depth more than 0.7 m is available (less than 0.7 m will likely require a weir to extract 1,500 m^3/hr). Concrete material will be used for the intake structure. Scour protection will be provided (e.g., riprap). Water entering the intake will flow through wedge wire screens. Intake design will consider protection for all types of fish in the river in order to prevent potential losses of fish due to impingement and entrainment upon the intake screens. Two pipes in parallel will carry water from the intake to the pump station. The pump station will be built on the river bank, for easy access and maintenance, to a minimum top elevation corresponding to the 100 year flood event level. It will house pumps, air compressor for backwashing the intake screen, electrical and control equipment.



Schematic 3 Water Intake Structure

As currently envisaged, water for process and utility use will be supplied from groundwater and/or surface water, into raw water ponds within the Refinery site. The design of the Refinery will incorporate the maximum practical capability to recycle, reuse waste and stormwater during operation. Opportunities for reducing water use, maximizing water recycling and thus reducing raw water intake, will continue to be evaluated and implemented as practical throughout the design and operating life of the Refinery. PFEC, with expertise from local First Nations, will continue to evaluate any appreciable effect on the water source and take action as required during further Project development and design/ engineering.

3.7.1 Hydrocarbons, Chemicals & Waste Management

A comprehensive waste management system will be developed with First Nations and used for the Project. Waste Management practices will be prepared so that:

- The most representative information is available on each form of waste; and
- Procedures and guidelines are current with legislation and corporate policy.

Waste generated will be managed to minimize environmental impacts by:

- Selecting and using materials effectively;
- Using, where practical, the principle of reduce, reuse and recycle for non-hazardous and hazardous materials;

- Informing employees, contractors and customers of the risks associated with managing waste; and
- Identifying third-party business opportunities, such as for recycling, to increase the effectiveness of waste management.

3.7.1.1 Wastewater Streams

The major types of wastewater streams from the Refinery operation, and the management and discharge of waste-water streams are as follows:

- **Potentially oily water and oily surface water runoff streams:** These streams will be sent to the water treatment plant, where they will be treated to remove suspended oil, and then treated to remove dissolved oil or other organics. Treated water may need to be discharged periodically(200,000 to 800,000 m^3/yr).

  The method for disposal may be deep well injection; however, PFEC will assess the feasibility of other options such as disposal into the marine environment within the Douglas Channel via a 6" pipe from the Refinery. The discharged water will be mostly saline water with Total Dissolved Solids (TDS) that may contain traces of other contaminants such as oil/grease, phenol, sulphides etc. Detailed speciation of the discharge water will be developed during subsequent stages of the design and PFEC will ensure that it meets regulatory criteria. Photograph 7 provides an approximate view of the possible discharge location on the Douglas Channel.

  Permit needs for deep-well injection or discharge into the marine environment will be discussed with and obtained from FLNRO, Fisheries and Oceans Canada (DFO) and Environment and Climate Change Canada (EC) if determined to be required. PFEC, with expertise from local First Nations, will continue to evaluate wastewater systems and take action as required during further Project development and design/ engineering.

- **High TDS streams:** These are streams from the water treatment unit, from the regeneration of ion-exchange beds, and blowdown water from cooling towers and boilers. Wastewater streams containing high dissolved solids are not easily treated because these ions are not separated by normal physical or chemical methods. PFEC will employ technologies to maximize recycling of water from these streams. Residual waste streams will be held in waste-water tanks or sumps prior to disposal. The methods for disposal are as described above.
- **Oils and high TDS streams:** This effluent stream is from the crude desalter. This stream will be pre-treated to remove oils and organics before being treated for high TDS as described above.
- **High suspended solids streams:** These are the streams from filter backwashes in the raw water treatment unit and demineralized water treatment units. These streams will be recycled back to the raw water treatment unit for solids removal.

- **Caustic soda effluent with hydrocarbon contaminant:** This effluent stream is from the hydroprocessing unit. This stream will be treated first to remove oils and organics. The caustic is then either neutralized to pH 7 to 9 by the addition of acid or caustic, or recycled back to the process units.
- **Water from gasifier:** During subsequent engineering phases, treatment required for wastewater from the gasifier will be evaluated to enable recycling of this wastewater.
- **Sour water streams:** These streams will be stripped of NH_3 and H_2S in the SWS units. Non-phenolic stripped water will be recycled to the process. Phenolic sour water will be used for desalters.
- Domestic wastewater and sewage stream: This stream is managed as described in Section 4.2.6.

The wastewater treatment system will be designed to remove contaminant material from the various waste streams generated and collected on the site. The treatment processes will be designed to maximize the potential for wastewater reuse within the complex. The specific requirements of the treating systems will be developed during detailed engineering as specific information on the volumes of water and nature of the contaminants becomes available from the licensors and process unit designs.

Photograph 7 View of possible discharge location within the Douglas Channel.

3.7.2 Summary of Emission, Discharges and Wastes

PFEC will develop environmental management plans for all Project phases for the handling, storage and monitoring of emissions, discharges and waste. During construction, general sources and locations of discharges, emissions and wastes will be from construction vehicles and equipment, work sites at the Refinery site, along the potential transportation module access road and at the potential river intake site. During operation, general sources and locations of discharges, emissions and wastes will be from refining process and biomass facility at the Refinery site. A comprehensive list of sources and locations of discharges, emissions and wastes will be developed as engineering design advances. These will be taken into consideration as part of the environmental assessment.

The types of emissions, discharges and waste that will likely be generated during the Project phases include the following:

Atmospheric Emissions:

- Carbon monoxide;
- Greenhouse Gases (carbon dioxide, methane, nitrous oxide, fluorinated gases)[5];
- Sulphur oxides;
- Nitrogen oxides;
- Particulate Matter (PM); and
- Fugitive hydrocarbons.
- **SO_X Emission:** The Refinery will use natural gas with a zero to negligible amount of sulphur as fuel (natural gas is typically sulphur-free). No liquid or solid fuel will be used as fuel in the refining processes. Produced gases from the Refinery will be cleaned with solvent for sulphur removal. Refinery residue will be partially oxidized in the gasifier wherein the sulphur compounds from the gases will be removed. In SRU, tail gases will be treated with proprietary TGTU. SO_X emission from the Refinery will be kept very low.
- **NO_X Emission:** A low NO_X combustion equipment/ system will be employed in the Refinery. During subsequent engineering development, NO_X emission from each combustion equipment will be assessed. If required, proven and established NO_X reduction technologies will be employed for large combustion equipment such as cracking furnaces, power station etc.
- During subsequent engineering, if either SO_X or NO_X remission is found high, then reduction technologies will be employed.

5 http://www3.epa.gov/climatechange/ghgemissions/gases.html

- **PM Emission:** Due to use of gaseous fuels in the Refinery, PM emission is expected to be very low. In the sulphur storage area (**Figure 5**), dust suppression techniques will be employed to minimize particulate emission.
- **Biomass combustion**: Some NOx and PM release is expected from the Biomass facility.

Liquid Waste:

- Sewage during construction;
- Waste-water streams during operation;
- Potentially oily water and oily surface water runoff streams;
- High TDS streams;
- Oils and high TDS streams;
- High suspended solids streams;
- Caustic soda effluent with hydrocarbon contaminant;
- Water from gasifier;
- Sour water streams; and
- Domestic waste water and sewage stream.

Solid Waste:

- Hydrocarbon contaminated materials, such as filter cartridges, etc.;
- Oily sludge;
- Used oil;
- Scrap metal;
- Pallets;
- Used pipe insulation;
- Used drums;
- Pop cans, bottles, plastic, paper, cardboard; and
- Spent catalyst.

4 PROJECT ACTIVITIES

The following section describes the Project's activities during construction, operation and decommissioning phases.

4.1 *Construction*

If welcomed by local First Nations and communities, and the required regulatory approvals and permits are received, activities during the construction phase would include:

- Access road construction from Kitimat to the Refinery for the purpose of transporting Refinery modules by heavy-haul truck;
- Modifications to existing roads, as needed, to support the size and weight of the Refinery modules;
- Modifications to the existing access road from Highway 37 to the Refinery;
- Connection with an existing the natural gas supply pipeline;
- Construction of a waste water line from the Refinery to Douglas Channel;
- Site preparation: clearing and grubbing vegetation; placement of appropriate fill material; grading and compacting; construction of suitable foundation; and the installation of erosion, sediment and storm water control;
- Worker accommodation construction and set-up;
- Preparation of lay down and staging areas;
- Set up of temporary auxiliary buildings such as temporary offices, maintenance buildings, equipment fuelling areas and permitted waste facilities;
- Marine transport of Refinery modules to an existing marine facility in Kitimat;
- Transport of Refinery modules along the access road;
- Installation of utilities (raw and potable water, power supply, waste water collection and treatment, storm water collection etc.);
- Construction of permanent Refinery infrastructure;
- Construction of the rail car loading/unloading facilities and interconnections;
- Installation of storage tanks for feed stock and product; and
- Construction of associated buildings.

All work would be conducted in accordance with a site-specific Construction Environmental Management Plan (CEMP). These documents will prescribe measures to store materials, refuel and

maintain equipment safely and in a manner, that does not pose a risk to the environment. The plan will also identify specific measures to be taken to minimize light, noise, emissions, congestion, and other potential issues resulting from access to and activities at the construction site.

4.2 *Operation*

The PFEC Refinery is planned to be in service by 2022. Operation and maintenance activities will occur in three shifts over a 24-hour period, 365 days a year. There will be preventive maintenance for some units during some days of the year. Critical support units (such as boiler, power generation etc.) will be operational year-around and in some cases multiple trains of those units will be provided to support the Refinery.

It is envisaged that administrative and management personnel will work 40 hours a week during standard day shifts and operating personnel will work eight (8) hours in three different shifts. Preliminary estimates for employment are a total of 1,000 direct employees while the maintenance work (buildings and turnarounds and minor projects in the process units), cleaning, landscaping will be subcontracted. The departments needed to operate the Refinery are:

- General Management;
- Operations;
- Maintenance;
- Technical;
- Environment, Health & Safety;
- Loss Prevention; and
- Administration and support services.

4.3 *Decommissioning*

The life of the Project is expected to be a minimum of 60 years. At the end of its life, the Project will be decommissioned pursuant to an approved decommissioning plan conducted in accordance with the applicable regulations at the time. Decommissioning activities would include, but are not limited to road deactivitation, dismantling and removal of all above-ground components and land reclamation.

4.4 *Physical Activities which are Incidental to the Project*

The following is a brief description of the physical activities that are incidental to the Project.

4.4.1 Transport of Refinery modules to the Refinery

The Refinery modules will be purchased from manufacturers in Asia and be shipped to the former Eurocan dock location in Kitimat. The marine access route within Canadian waters will likely be from the Triple Island Pilotage Station west of Prince Rupert and north of Hecate Strait as shown in **Figure 4**. The Pine Island Pilotage Station north of Vancouver Island in Gordon Channel is an alternate marine route option currently used by vessels calling on the Port of Kitimat[6].

The marine access route will be used only during the construction phase to serve the transport of Refinery modules from Asia to Kitimat. No new marine infrastructure will be built for this Project.

The 100 to 150 modules will arrive in pairs and once on land, the modules will be driven to the Site along a new and dedicated access road by heavy-haul transport truck at a speed of no more than 5 km/hr. A two-day trip is estimated for each pair of modules for up to 75 trips. PFEC will work with the manufacturer to ensure the safe transport of these modules, and will confer with the relevant government agencies to determine permitting requirements during transport. It is anticipated this activity of module transport would occur over four to six months during a period of low water flow to minimize the potential for impact to local watercourses and fish habitat.

The marine and land transport of the modules is assumed at this time to be wholly under the care and control of the manufacturer or a transport logistics company contracted by PFEC to ensure the safe delivery of the modules to the Refinery site. The activity is for the sole benefit of the Proponent; however, economic benefits extend to the organizations involved in the transportation logistics.

4.4.2 Transport of NEATBIT™ to the Refinery

The Project will utilize existing rail infrastructure to receive NEATBIT™ on dedicated unit trains. Three to four unit trains per day are anticipated. Each train will have approximately 120 rail cars, with the appropriate specifications to safely transport NEATBIT™. PFEC will take custody of the NEATBIT™ once it arrives at the rail yard. PFEC will work with CN to ensure the safe transport of the feedstock to minimize the incidence of spill into sensitive areas in compliance with Transport Canada railway safety legislation.

[6] http://www.bccoastpilots.com/bc-coast-pilots/bc-coastal-waterways/

4.4.3 Transport of Wood Waste Biomass to the Refinery

PFEC is proposing to utilize existing wood waste biomass as part of a cogeneration facility for the Refinery. The supply of biomass is expected to originate from pulp wood and hog fuel (tree bark and forest residue) from ongoing timber harvest operations and from wood waste, a product of the milling process. The Refinery will receive wood waste shipments via road and rail along the existing transportation corridors between Prince George and Prince Rupert. The responsibility for shipment to the Refinery would be within the care and control of the shipper.

PFEC will work concurrently with the EA process to obtain the relevant permits and approvals for the operation of an on site cogeneration facility.

4.4.4 Export of Refined Product from the Refinery

The export of products is planned via a tolled process, whereby purchasers or offtakers will be responsible for the transport of product from the Refinery. By extension, this activity would benefit the Proponent and purchasers. It will be the responsibility of offtakers to obtain the necessary permits and approvals to construct the necessary infrastructure to enable export. PFEC would expect that a separate EA process would be required for an export project, in addition to acquiring an export licence from the National Energy Board (NEB).

PFEC will engage third parties who have expressed interest in supporting the development of a marine export terminal to export refined products to Asian markets via Ocean Going Vessels of up to Panamax-size[7]. PFEC will only export refined products via any future marine terminal developed in conjunction with PFEC's values, which include recognition of First Nations rights, titles and interest to the marine terminal site, and our full commitment to support and develop only those projects that are welcomed by supportive host First Nations.

Early third party studies suggest a marine terminal could be situated along the Portland Inlet, in the event such a development were to secure the support of a host First Nation. If such a marine terminal were to be developed, we anticipate that two (one for gasoline and one for diesel) short (275 km) pipelines, developed in partnership with First Nations along the route, could be built to support the marine terminal's operations.

4.4.5 Supply of Electrical Power

Please refer to **Section 3.2** for options on the supply of electrical power to the proposed Refinery. Any connection to an external power grid, such as a BC Hydro transmission line or independent power producer would be coordinated between PFEC and the power supplier.

[7] Panamax-sized vessels have capacities of 50,000 to 80,000 dead weight tonnes (DWT) and can carry 350,000 to 500,000 Bbls (http://www.britannica.com/technology/tanker)

4.5 *Project Schedule*

The Project is proposed to start construction in 2018; however, this will be dependent on the successful completion of consultation and permitting, including a provincial EA Certificate and/or federal EA approval, as well as other regulatory authorizations, permits or approvals. The in service date is expected to be in 2022. The life of the Project is expected to be a minimum of 60 years, with operations continuing until decommissioning in 2082or later.

A proposed schedule for the EA process, construction, and commissioning of the Project is provided below (**Table 4-1**).

Table 4-1 Anticipated Project Schedule

Milestone	Date
Project Start	2014
Completion of Feasibility Study (Engineering)	February 2016
Submit EA Certificate Application (provincial) and/or Environmental Impact Statement (federal)	March 2017
Anticipated EA Approval	December 2017 to January 2018
Commence Construction (including Site Preparation)	Summer 2018
In Service Date	2022 to 2081
Decommissioning (Early Date)	2082 to 2083

5 FEDERAL INVOLVEMENT

The Project will be wholly located in BC and no federal land is expected to be used for the Project. No federal financial support is expected or proposed for the Project. Based on the input capacity of the Refinery and size of the rail yard, the Project is expected to be a "designated project" pursuant to **Sections 14(a), 14(e)** and **25(b)** of the *Regulations Designating Physical Activities*, and may require a federal EA for the construction, operation, decommissioning and abandonment of a new:

- **Section 14(a)** - oil refinery, including a heavy oil upgrader, with an input capacity of 10,000 m^3/day or more;
- **Section 14(e)** - petroleum storage facility with a storage capacity of 500 000 m^3 or more;
- **Section 25(b)** - railway yard with seven or more yard tracks or a total track length of 20 km or more.

The Project will not include the construction, operation, decommissioning or abandonment of a new:

- **Section 2(a)** - fossil fuel-fired electrical generating facility with a production capacity of 200 MW or more. PFEC plans to use clean energy sources to power the Refinery;
- **Section 6** - structure for the diversion of 10,000,000 m^3/yr or more of water from a natural water body into another natural water body;
- **Section 24(c)** - marine terminal designed to handle ships larger than 25,000 DWT. The Project use an existing marine facility in Kitimat;
- **Section 25 (a)** - railway line that requires a total of 32 km or more of new right of way; and
- **Section 25(c)** - all-season public highway that requires a total of 50 km or more of new right-of-way.

In addition to a federal EA Approval under CEAA 2012, other federal permits for the Project may be required from Fisheries and Oceans Canada (DFO) (*Fisheries Act* Authorization), and Environment and Climate Change Canada (EC) (*Species at Risk Act* Permit). A Transport Canada *Navigation Protection Act Permit* is not likely required. PFEC will work with CN Rail and transporters of the NEATBIT™ to ensure that the feedstock is transported safely on rail and in accordance with Transport Canada rail safety legislation.

6 SOCIO-ECONOMIC PROFILE

The following sections provide an overview of the socio-economic setting of the Project area (**Figure 3**)**.** A preliminary list of potential interactions between the Project components and socio-economic environment is provided in **Section 6.5**.

6.1 *Overview of First Nations near Project*

The following is a brief recognition and introduction of the First Nations who may be affected by the Project and associated activities. PFEC recognizes and works to uphold the United Nations Declaration of the Rights of Indigenous Peoples (UNDRI. As such, PFEC respects and recognizes the First Nations traditional territories, title and rights, that are within the Project Area, as shown in **Figure 7**. The EAO would confirm its requirements for consultation with First Nations and Aboriginal groups early in the provincial EA process.

6.1.1 Tsimshian Nation

There are seven Tsimshian First Nations: Gitga'at, Kitasoo/Xaixais, Kitselas, Lax Kw'alaams, Kitsumkalum, Kitkatla and Metlakatla and other groups, who have organized into collectives which reflect their understanding of Tsimshian law, custom and social organization.[8] Gitga'at, Kitasoo/Xaixais, Kitselas, Kitsumkalum and Metlakatla are members of the Tsimshian First Nations Treaty Society. The socio-economic profile recognizes that these nations have a relationship and need consideration both in the role as a larger nation as well as at the individual First Nation community level.

6.1.1.1 Kitselas First Nation

The Kitselas First Nation is one of the First Nations in the Tsimshian First Nations Treaty Society[9]. The Kitselas Nation government is an autonomous government that has responsibility for the Kitselas in a number of areas including treaty-making with BC and Canada. The Kitselas history speaks to a presence in the Kitselas Canyon and surrounding region for at least the past 5,000 years[10]. Kitselas First Nation is made up of 644 registered members who currently reside both on- and off-reserve (INAC, 2015). There are 301 members currently living on reserve.

8 http://www.bctreaty.net/soi/soitsimshian.php
9 http://www.kitselas.com/
10 http://www.kitselas.com/index.php/about-kitselas/history/

6.1.1.2 Haisla Nation

The Haisla, located in current-day Kitimat, BC have occupied lands for over 9,000 years, and for hundreds of years have occupied many village sites throughout their territory.[11] The Haisla Nation comprises two historic bands; the Kitamaat and Kitlope[12]. The Haisla have eight matrilineal clans, each with a resource area, winter village and chief. The matrilineal clans include Eagle, Beaver, Crow, Killer whale, Wolf, Frog, Raven and Salmon[13]. There are approximately 1,851 members with over half residing off-reserve as of September 2015. Approximately 700 members reside in Kitamaat Village located 10 km southwest of Kitimat at the head of the Douglas Channel.

6.1.1.3 Lax Kw'alaams Band

Lax Kw'alaams includes the "Nine Tribes" of the lower Skeena River[14]. These tribes are represented currently by the Allied Tsimshian Tribes, and are among a total of 14 tribes of the Tsimshian nation. Lax Kw'alaams includes Giluts'aaw, Ginandoiks, Ginaxangiik, Gispaxlo'ots, Gitando, Gitlaan, Gits'iis, Gitwilgyoots and Gitzaxlaal. There are 3,351 members of Lax Kw'alaams with 871 residing on reserves (INAC, 2013).

6.1.1.4 Metlakatla First Nation

The Metlakatla people have occupied an ancient site 5 km north of Prince Rupert for thousands of years[15]. As of November 2015, Metlkatla First Nation has 899 registered members with over 800 living away from reserve land.

6.1.1.5 Kitsumkalum First Nation

Kitsumkalum is a galt'ap and original Tribe of the Tsimshian Nation[16]. As of November 2015, Kitsumkalum First Nation has 745 members with 238 living on reserve. Kitsumkaylum 1 is the most populated reserve and is located on right bank of the Skeena River at mouth of the Kitsumkalum River about 5 km west of Terrace (INAC, 2015).

6.1.2 Métis Peoples

According to the 2006 Census, almost 400,000 people in Canada reported they were Métis[17]. The Métis people have established themselves with their own unique culture, traditions, language (Michif), way of life, collective consciousness and nationhood.

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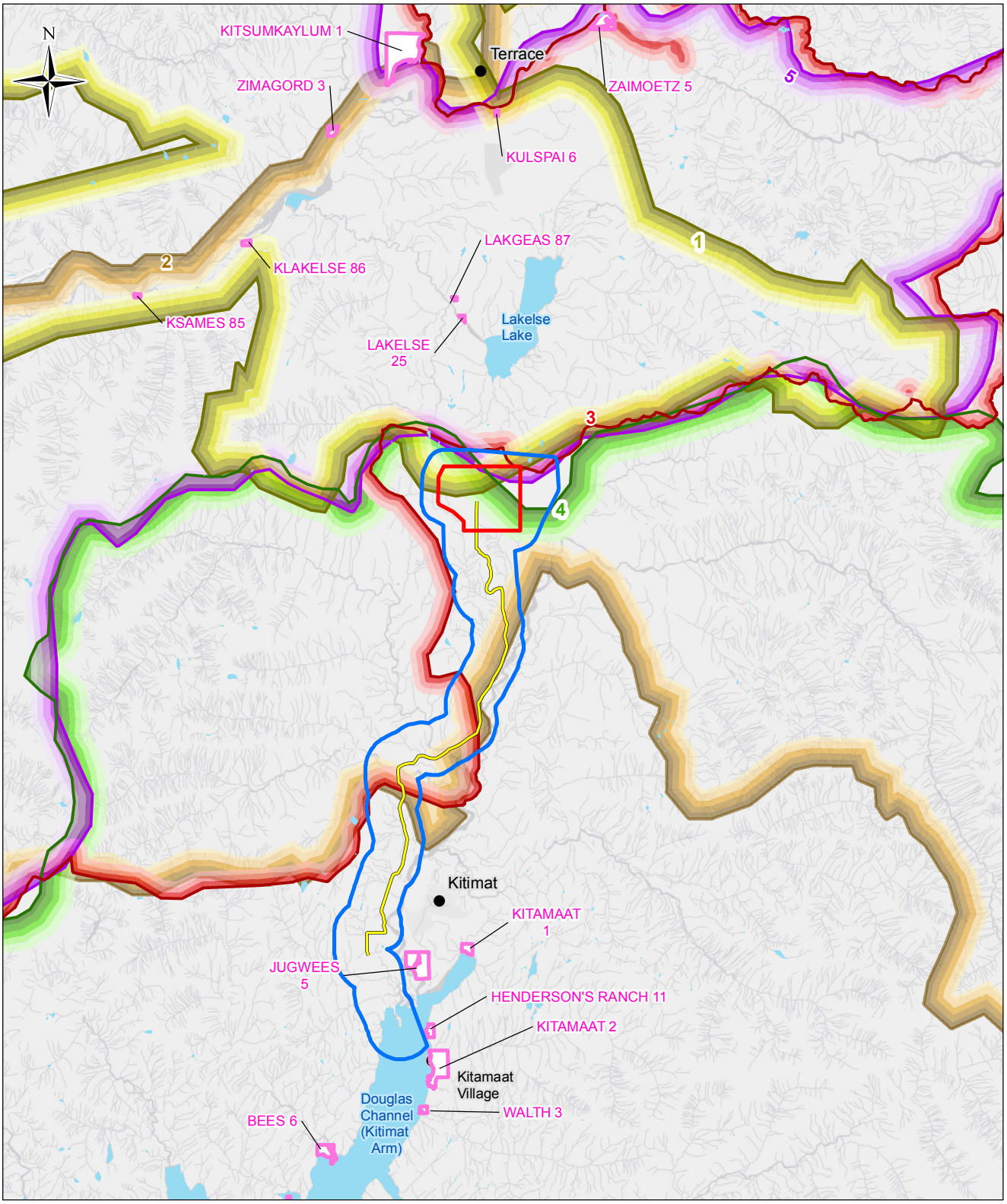
11 http://www.haisla.ca/community-2/history
12 http://haisla.ca
13 http://haisla.ca/community-2/about-the-haisla/
14 http://laxkwalaams.ca/who-we-are/test-topic/
15 http://www.metlakatla.ca/
16 http://www.kitsumkalum.bc.ca/aboutus.html
17 http://www.metisnation.ca/index.php/who-are-the-metis



Legend

- Refinery Location
- Project Area
- Potential Module Access Road
- 1 Kitsumkalum Territory
- 2 Kitselas Territory
- 3 Lax Kw'alaams Territory
- 4 Haisla Territory
- 5 Metlakatla Territory
- Indian Reserves
- Water Bodies

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Data downloaded from GeoBC in September and October of 2015.
2. Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
3.Traditional Territories boundaries have been digitized from First Nation Interests Map produced by the Government of British Columbia on Oct 23, 2012, ©2016

0 2.5 5 10 15 Km

PACIFIC FUTURE ENERGY
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Pacific Future Energy Refinery First Nations Territories

By: SS	Date: 2016/05/19	Scale: 1:350,000	Figure Number: 7	Rev.: 3
Chk'd: EM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-004	

MXD Path: \\Sll2606\projects\LOB\EIAM-BC\Current Projects\Pacific Future Energy\631180 Dubose Flats - PFEC Refinery\4.0 Execution\4.5 GIS and Drawings\GIS\Maps\MXD\Report Figures\631180-101-004-R3_TraditionalTerritories.mxd

6.2 *Overview of Other Communities near the Project Area*

The following is a brief overview of communities near the Project area. Within the Project area there are no known permanent or temporary residences. The nearest known permanent residence is at Lakelse Lake, located 8 km north on Highway 37.

6.2.1 City of Terrace and Area

The City of Terrace is considered the centre of Northwest BC and is situated along the Skeena River about 30 km north of the Refinery site. Terrace is home to approximately 11,500 local residents and covers an area of approximately 60 square kilometres (km^2). The Greater Terrace area, with a population of nearly 20,000, includes the unincorporated community of Thornhill (population of 4,000) and the neighbouring communities within Electoral Area C: New Remo, Old Remo, Brauns Island, North Terrace, Jack Pine Flats, Lakelese Lake and Copperside (Adams, 2015).

Highway 37 is the main route connecting the Greater Terrace area to Kitimat and Kitamaat Village. Terrace's economic advantage lies in its location, as it is strategically placed in a hub for highway, rail and air transportation routes. As a result, the City is the location for many of the region's business, retail, medical and government services.

6.2.2 District of Kitimat

The District of Kitimat is a coastal community located approximately 32 km to the south of the Project, covering an area of approximately 750 ha at the end of the Kitimat Arm off Douglas Channel. Kitimat and the neighbouring community of Kitamaat Village are located within the base of a Kitimat River valley containing areas of flat industrial land near high tide levels.

Kitimat is home to over 9,000 residents, the greatest proportion of the population between 45 and 65 years of age (2011 Census). The community has over 4,300 housing units, where three-quarters are owner-occupied. Kitimat had a labour force of 4,270 in 2011, where 28.2% were employed in manufacturing. Construction, retail trade, health care and social assistance were other primary employment sectors.

6.3 *Land and Water Use*

This section provides a brief description of the zoning of land and water that may be affected by the Project.

The Refinery is proposed on a provincial Crown map reserve zoned for industrial purposes and proposed Kitselas Treaty Settlement Lands. The legal description is *All that unalienated and unencumbered crown land in the vicinity of Lakelse River, Lakelse Lake, and Kitimat River*.

The Refinery location overlaps with proposed pipeline projects including the Enbridge Pipeline, Pacific Trails Pipeline (PTP) and the BC HydroTerrace to Kitimat Transmission Line (**Figure 8**)**.** Pacific Northern Gas is proposing to loop their existing pipeline from Summit Lake, BC to Kitimat. The existing pipeline is just east of the Project, along the west side of Highway 37.

A geothermal use permit is in place northeast of the Refinery abutting Dubose Flats. Other land use types surrounding the Refinery include waste disposal, sand and gravel (**Figure 9**).

The Refinery is also adjacent to the Terrace Community Forest (TCF) (**Figure 9**). The TCF is a community-managed forest (by the City of Terrace) for the benefit of the local community. The TCF tenure was issued by the provincial government in 2007 with an allowable annual timber cut of up to 30,000 m^3/yr located in two large parcels as well as a number of small parcels surrounding Terrace.

There are 42 tenures within the Project area with nine different purpose types which include the following:

- Commercial Recreation;
- Environment, Conservation & Recreation;
- First Nations proposed Treaty Area;
- Industrial – Heavy and light industrial, miscellaneous;
- Institutional – Local/Regional Park;
- Quarrying;
- Transportation;
- Utility; and
- Waterpower – Investigative phase.

Of these 42 tenures, there are 11 which intersect the Refinery site. These 11 tenures have five types of land use: Industrial (miscellaneous); Transportaion (roadway); proposed Treaty Area; Utility (power line), and Environment, Conservation & Recreation.

In general, the Project area is known for year-round recreation with easy access via several Forestry Service Roads (FSRs). Included are several kilometers of hiking trails, snowmobiling trails, and Forest recreation areas and campsites around the Clearwater and Onion Lakes. Through a tenure lease with FLNRO, the Ski Valley Nordics operate the Onion Lake cross-country ski trails, which span around both the Clearwater and Onion Lakes.

There are five (5) provincial parks within a 15 km distance from the Refinery location including Hai Lake – Mount Herman Park, Lakelse Lake Wetlands Park, Lakelse Lake Park, Halbellah Creek Wetlands Park and Kitimat River Park, with the latter two located in the proposed transportation corridor (**Figure 9**). There are no Migratory Bird Sanctuaries (MBS) or National Parks within the Project area, nor is there overlap with federal land, including First Nations reserve land.

6.4 *Heritage Resources*

The archaeological values near the proposed Refinery are considered to be of "moderate potential" in the area around Cecil Creek and high potential around Chist Creek. Portions of the proposed transportation corridor may also have areas of "high potential", in particular where clear-span crossings, or works near watercourses are required during construction.

An Archaeological Overview Assessment (AOA) completed by Bastion Group Heritage Consultants in 2007 for the PTP project used the following criteria to develop a scheme for archaeological potential. Portions of PTP AOA overlap with the PFEC Project area. According to Bastion Group (2007), these criteria tend to be indicators for moderate or high archaeological potential:

- Presence/absence of terrace landforms adjacent to or in close proximity to a stream, lakeshore, wetland or other water body;
- Presence/absence of hilltops or knoll features (often associated with lithic scatter sites);
- Presence/absence and proximity to known fish-bearing streams, game trails, game crossings or documented First Nations settlements or documented natural resource exploitation areas;
- Proximity to previously documented archaeological resources or traditional use sites;
- Major river and stream crossings - especially if associated with salmon bearing streams;
- Cave and rock features such as rock shelters and steep cliffs (sometimes found to contain rock art sites, human burial remains or evidence of occupation); and
- Areas of mature first-growth timber, considered to have a potential for containing culturally modified trees (CMTs).

As shown in **Figure 7**, the Project area is within the traditional territory of five First Nation groups: Kitselas First Nation, Haisla Nation, Lax Kw'alaams Band, Metlakatla First Nation and Kitsumkalum First Nation. Engagement and consultation with these Nations has been preliminary; PFEC recognizes that the Project and its activities will affect lands and resources currently used by First Nations for traditional purposes. In an effort to minimize the Project's effects on heritage-related values, PFEC will engage affected First Nations gathering information on traditional land and resource use and Traditional Ecological Knowledge (TEK) through consultation. AOA and Traditional Use Studies will also be undertaken for the Project. The results of these studies will be integrated into the EA.

6.5 *Summary of Potential Project Interactions with Socio-Economic Values*

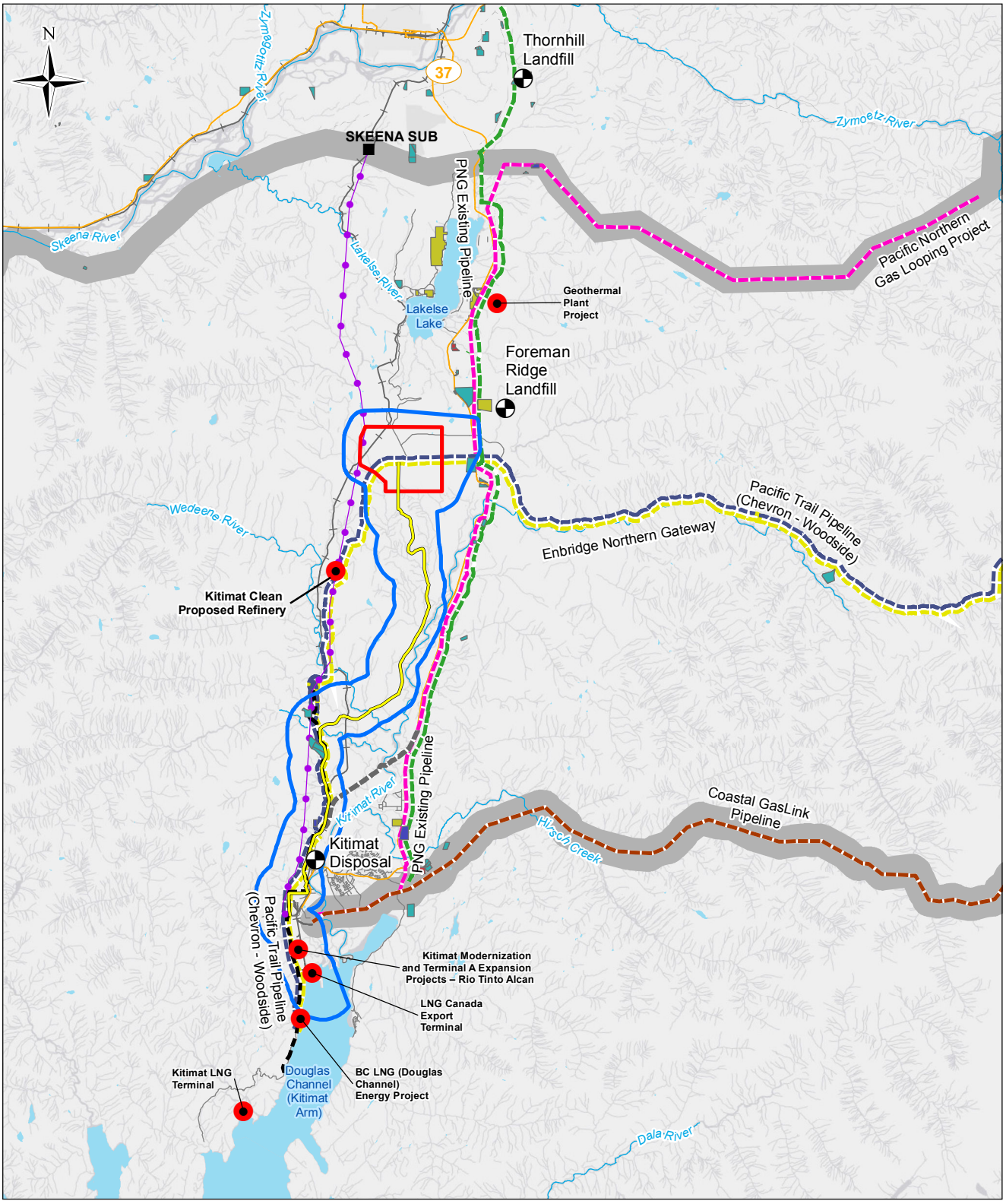
Taking into consideration the brief socio-economic profile described above, PFEC has identified a number of potential interactions between the Project components with social-, economic-, health- and heritage-related values, which are likely of relevance to the Project area and general region. These interactions are categorized by Project phase (C – Construction, O – Operation, D – Decommissioning and Reclamation, A – All phases) and are presented in **Table 6-1**.

Table 6-1 Preliminary Identification of Potential Project Component – Socio-Economic Interactions

Project Components		Socio-economic Environment							
		Economy	Community services	Land and Resource Use	Traditional Land and Resource Use	Archaeology	Human Health	Visual Aesthetic	Traffic (road, rail, marine)
Refinery Infrastructure	Bitumen oil refinery (built from 100 to 150 pre-fabricated modules, each weighing between 2,500 and 5,000 MT)	A	A	A	A	A	A	O	A
	Rail yard (unloading and loading) with seven tracks (total length of 20.9 km), capable of receiving up to four unit trains per day (120 rail cars each)	A	A		A	A	A		A
	Upgraded road to the site from Highway 37	CO			A	A	A		A
	Tie-in to an existing natural gas pipeline	C			C	C	A		CD
	On site storage for feedstock and refined products with a total capacity of greater than 500,000 m3	C		C	C	C	C		CD
	Administrative building to hold 100 persons (approximately 3 floors, each 1,000 m^2);	C		C	C	C	C		A
	Four explosion-proof control rooms (approx. 800 m^2 each) for process unit groups: • Distillate Hydrotreater, Gas Oil Hydrocracker/ Hydrotreater, Hydrogen Production Unit, SWSs, ARU and SRU; • Distillation units, Isomerization Unit, and Catalytic Reforming Unit; • Residue Conversion Unit and Gasifier Unit; and • Oil Movement.	C		C	C	C	C		CD
	Building for laboratory analysis (approximately 500 m^2)	C		C	C	C	C		CD
	Control Room for Power Generation, Raw Water Treatment and Wastewater Treatment (approximately 800 m^2)	C		C	C	C	C		CD
	Shop for turbines for the power generation (approximately 2,000 m^2)	C		C	C	C	C		CD

Project Components		Socio-economic Environment							
		Economy	Community services	Land and Resource Use	Traditional Land and Resource Use	Archaeology	Human Health	Visual Aesthetic	Traffic (road, rail, marine)
	Shop for spare parts and Personal Protective Equipment (PPE) (approximately 2,000 m^2).	C		C	C	C	C		CD
	Shop for catalyst and chemicals (approximately 2,000 m^2)	C		C	C	C	C		CD
	Building for Electrical, Instrumentation and Maintenance (approximately 1,200 m^2)	C		C	C	C	C		CD
	Building for firefighting equipment and first aid (approximately 1,500 m^2)	C		C	C	C	C		CD
Refinery Utilities Infrastructure	Electrical power infrastructure (steam-turbine and gas-turbine generator)	C	C	A	C	C	A		CD
	Electrical power infrastructure: Biomass facility (supply from pulp wood and hog fuel)	A		A	C	C	A		CD
	Emergency power (combination of standby fuel gas- or natural-gas-driven generators for critical loads)								
	Raw water system (surface and/or groundwater)	CO		CO	C	C	CO		CD
	Boiler Feed Water (BFW) and steam	CO							CD
	Sanitary and potable water system	CO	O						CD
	Domestic sewage system	CO	O						CD
	Surface water management system (runoff ponds)	CO		C	C	C	CO		CD
	Fuel gas and natural gas (supplied from off site)	CO		O			O		CD
	Instrument and Utility Air System	CO							CD
	Fire, gas and smoke detection System	CO							CD
	Fire water system (oxygen and nitrogen)	CO		C	C	C	A		CD
	Hydrocarbon drain system (Closer Drain System and Open Drain/Oily Water Sewer (OWS) Drain System)	CO		C	C	C	A		CD
	Relief and flare	C		C	C	C		CO	CD
	Waste Management System	A	A		C	C	C		A
	A 6” water pipeline from the Refinery to Kitimat for the discharge of treated wastewater from the Refinery.	C	O	A	C	C	O	C	CD

Project Components		Socio-economic Environment							
		Economy	Community services	Land and Resource Use	Traditional Land and Resource Use	Archaeology	Human Health	Visual Aesthetic	Traffic (road, rail, marine)
Potential Surface Water Intake Structure	Intake structure on Kitimat River (no diversion, min. river depth of 0.7m at point of intake, concrete structure, scour protection and wedge weir screen, protection of fish through screen)	C		A	C	C		CO	CD
	Access road from Refinery to intake structure	C		A	C	C		CO	A
	Dual pipes from structure to the pump station	C		A	C	C		C	C
Construction-related Refinery Infrastructure	Trailers, fabrication shops, and material storage shop	C							C
	Existing off-loading dock (former Eurocan dock) in Kitimat to receive Refinery modules during construction								C
	Potential Refinery Module Access Road (40 km long by 50 m wide) with a clear-span crossing on Wedeene River and Little Wedeene River	A	A	C	C	C	A	CO	C
	Workforce housing accommodations	A	A	C	C	C	A		C



Legend

- Refinery Location
- Project Area
- Landfill
- Projects
- Proposed Module Access Road
- Other Pipeline Projects
- PNG Existing Pipeline
- Pacific Trail Pipeline
- Enbridge Northern Gateway
- Coastal GasLink Pipeline
- Pacific Northern Gas Looping Project Pipeline
- Kitimat Clean Proposed Pipeline
- Proposed TKTP Transmission Line

Quarrying

- Rip Rap
- Rock for Crushing
- Sand and Gravel
- Waste Disposal Site
- O&G Utilities Tenures
- Highways
- Other Roads
- Rail Tracks
- Watercourses
- Water Bodies

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1. Data downloaded from GeoBC in September and October of 2015.
3.Landfills were mapped based on The Regional District of Kitimat-Stikine website and GoogleEarth
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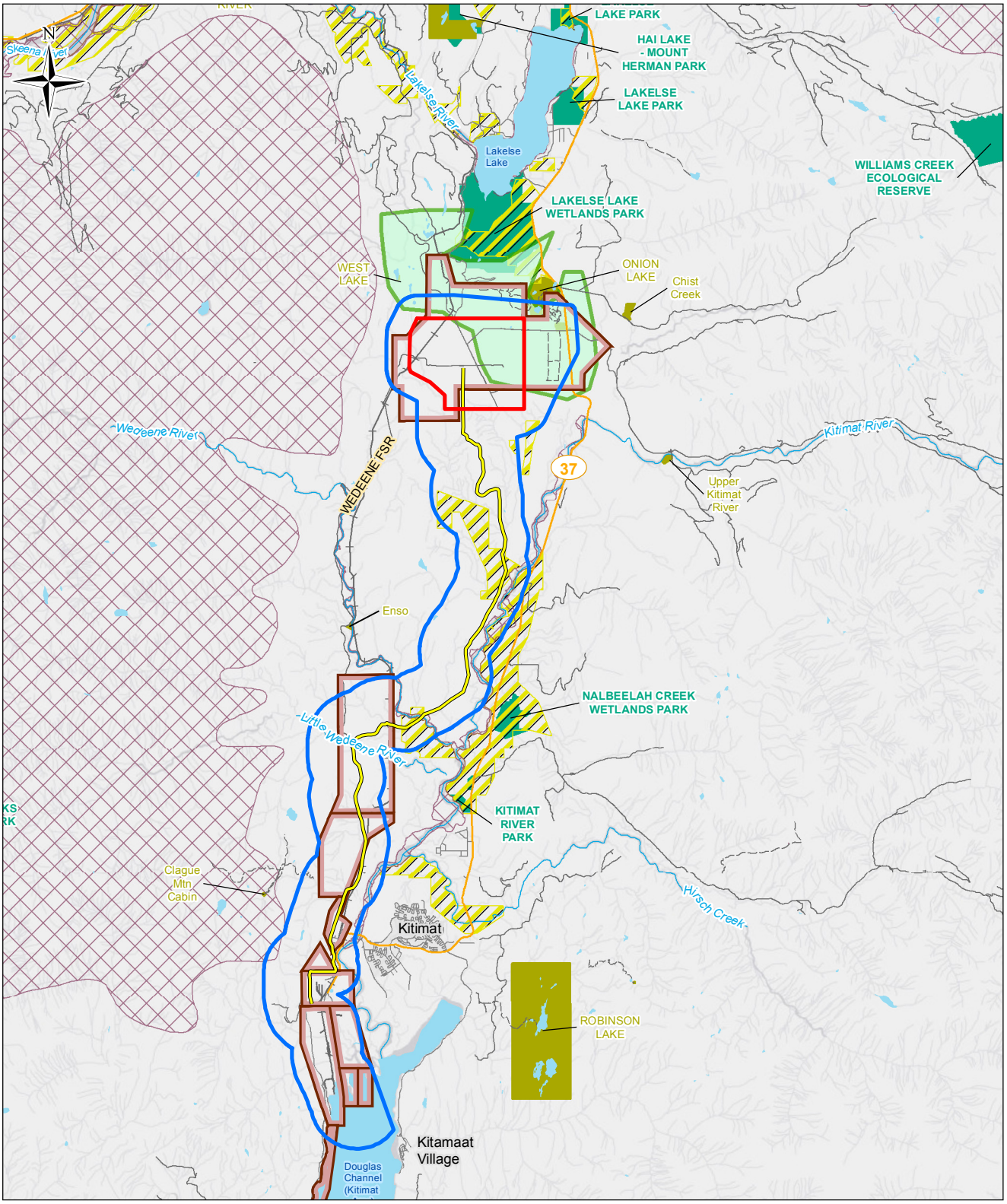
Pacific Future Energy Refinery Current and Proposed Projects near the PFEC Refinery

By: ECH	Date: 2016/06/10	Scale: 1:350,000	Figure Number: 8	Rev.: 2
Chk'd: EM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-010	

MXD Path: \\Sll2606\projects\LOB\EIAM-BC\Current Projects\Pacific Future Energy\631180 Dubose Flats - PFEC Refinery\4.0 Execution\4.5 GIS and Drawings\GIS\Maps\MXD\Report Figures\631180-101-010-R2_Projects.mxd



Legend

- Refinery Location
- Project Area
- Potential Module Access Road
- Terrace Community Forest
- Commercial Recreation Sites
- Proposed Industrial Development Areas
- Agricultural Land Reserve
- Recreation Areas
- Parks and Protected Areas
- Highways
- Other Roads
- Forestry Roads
- Recreation Trails
- Rail Tracks
- Watercourses
- Water Bodies

Notes:
1. Intended for Illustration purposes only.
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References:
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Pacific Future Energy Refinery Land and Resource Use

By: SS	Date: 2016/05/09	Scale: 1:250,000	Figure Number: 9	Rev.: 2
Chk'd: SM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-005	

MXD Path: \\Sll2606\projects\LOB\EIAM-BC\Current Projects\Pacific Future Energy\631180 Dubose Flats - PFEC Refinery\4.0 Execution\4.5 GIS and Drawings\GIS\Maps\MXD\Report Figures\631180-101-005-R2_Land_And_Resource_Use.mxd

7 ENVIRONMENTAL PROFILE

This section provides a brief assessment of the environmental interactions of the Project. An overview of the following is provided:

- A description of the physical and biological setting, including the physical and biological components in the area that may be adversely affected by the project (e.g., air, fish, terrain, vegetation, water, wildlife, including migratory birds, and known habitat use).
- A description of any changes that may be caused as a result of carrying out the designated project to:
  - fish and fish habitat, as defined in the *Fisheries Act*;
  - marine plants, as defined in the *Fisheries Act*; and
  - migratory birds, as defined in the *Migratory Birds Convention Act*, 1994.
- A description of any changes to the environment that may occur, as a result of carrying out the designated project, on federal lands, in a province other than the province in which the project is proposed to be carried out, or outside of Canada.
- A description of the effects on Aboriginal peoples of any changes to the environment that may be caused as a result of carrying out the designated project, including effects on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

7.1 *Physical and Biological Resources*

The Project area is situated within the Coastal Mountain Resource District (FLNRO, 2013), Kalum Timber Supply Area (MoF, 1998) and RDKS. The proposed Refinery is on provincial crown land locally known as Dubose or Onion Lake Flats. Much of the area is part of the TCF (McElhanney, 2015a). Based on historical records provided by RDKS (RDKS, 1998), almost all of the timber resource within the Site and surrounding area was logged prior to 1980.

The Project area is located within the Kalum LRMP boundary. Legal old-growth management areas (OGMAs) have been delineated around Clearwater Lakes, on Iron Mountain, in the Wedeene and Little Wedeene drainages, and along the Kitimat River (iMapBC, 2015). The Project area overlaps four landscape units: Hot Springs and Kitimat (low biodiversity emphasis option), and Wedeene and Hirsch (intermediate biodiversity option).

7.1.1 Hydrology and Groundwater

In general, the proposed Refinery is situated on a natural plateau bench approximately 1,000 ha in plan area. The overall Project dimensions range between about 10 km wide east-west by 5 km long north-south with topographic elevations ranging between about El. 210 metres (m) and 190 m (north to south). The Project is contained by steep mountain valley slopes to the east and west (McElhanney, 2015a). The existing plateau bench ground surface slopes down towards the south at less than 1%, and beyond the bench area, the ground slopes down to the north towards Lakelse Lake and the south towards Kitimat at slopes ranging between 5 – 20%. The area for the potential access road corridor extends for a distance of approximately 30 km from Kitimat to the Refinery.

Geological Survey of Canada Map 1136A Geology Terrace, BC (published 1964) indicates the Project is underlain by Quaternary (Pleistocene and Recent) deposits of sand, gravel, clay and alluvium. The online BC Water Resources Atlas (http://maps.gov.bc.ca/ess/sv/wrbc/) indicates that the Project is underlain by two aquifers: a larger aquifer of moderate productivity in unconsolidated deposits and a smaller aquifer of higher productivity. As many as five wells are completed in the moderate productivity aquifer while four wells are completed in the higher productivity aquifer. The wells are indicated to be used for commercial and industrial purposes.

The Refinery, proposed in the southwest corner of Dubose Flats, is in Kitimat River watershed, which flows south into Douglas Channel. The Kitimat River is approximately 4.5 km southeast of the Refinery. While the Refinery has no overlap with local watercourses, there are three major tributaries near the site. These include Clearwater Creek, which is within the Lakelse River watershed (flows north to the Skeena River), Cecil and Chist Creeks (Kitimat River watershed). In addition to the tributaries, a number of small lakes and wetlands are present near the Refinery, such as Clearwater Lake and Onion Lake.

The Project will require approximately 48,000 m^3/d of source water for the refining process. PFEC has begun investigating options for the water source, with groundwater being the preferred option. Once a Temporary Use Permit (TUP) is in place, PFEC will undertake groundwater investigations to determine the feasibility of using groundwater as the preferred water source. As an alternative, PFEC will consider a surface water source such as the Kitimat River, located 4.5 km southeast of the Refinery, for Project needs during operation. As part of the EIA, PFEC will study the potential impacts of water extraction to the aquifers noted above, hydraulic connection to local surface watercourses (if any), as well as the Kitimat River. First Nations will be involved in hydrogeological and hydrological field studies.

7.1.2 Bedrock and Surficial Geology

The bedrock geology in the vicinity of the Project area consists of Lower and Middle Jurassic aged Hazelton Group bedrock consisting of andesite, breccias, tuff, greywacke and argillite and Upper Cretaceous or Later Coast Intrusions consisting of hornblende diorite, quartz diorite and migmatite. At the southeast edge of the proposed transportation corridor, Triassic aged limestone,

boulder conglomerate, greywacke, banded volcanic sandstone and chert are exposed (GSC Map 1136A). The valley is controlled by bedrock faults, which cause movement over time, resulting in hot spring activity along the boundary fault at Lakelse Lake. Surrounding the Site, historical glacial melt has resulted in the near-level glaciofluvial plateau bench and marine deltaic sediments, as spotted by numerous circular or kettle depressions such as Onion Lake or Clearwater Lakes. Along the southern extent of the plateau, the exposed glaciomarine sediments show evidence of slope instability and appear to be readily erodible along the Kitimat River and drainage channels (McElhanney, 2015a).

As part of the EIA, PFEC will undertake geotechnical studies with First Nations to identify and assess potential geohazards associated with constructing a refinery, module road and other ancillary facilities for this Project.

7.1.3 Climate and Air Quality

The Project area between the proposed Refinery and Kitimat is influenced by Pacific air streams, resulting in small seasonal temperature differences compared with communities further inland (Stantec, 2013). The TERRACE A weather station indicates temperatures hover around freezing in the winter, with a mean minimum of -5.4˚C, and rarely exceed 20˚C in the summer (Hectares BC, 2015); however, extreme temperatures have been recorded at -26.7°C in December and 37.3°C in July (EC 2015). The Annual Heat: Moisture Index is 10.3, and the Hargreaves Climatic Moisture Deficit is 132 mm. Mean annual precipitation in the Site is approximately 1,609 millimetres (mm) (Hectares BC, 2015). Daily precipitation maxima generally occur in October, December and January, and are in the range of 111 mm to 115 mm**.** The average estimated wind speed in the area is 11 km/h, with an annual maximum of 44 km/h. Prevalent winds are from the south from March to October; and north from November to February (EC 2015).

Air quality at the Refinery has been influenced by existing and past industrial development. There are currently six active air quality monitoring stations near Kitimat and one near Terrace (BC Gov., 2015). Overall air quality can be considered ‘good’ (i.e., low health risk) based on the data over the past several years.

At the present, the main concern for air quality around the proposed Refinery is from dust due to the significant number of FSR roads in the surrounding region (McElhanney, 2015b). In addition to the potential cumulative effects on the Kitimat airshed from other nearby projects. In 2013, ESSA and BC Ministry of Environment (MoE) conducted an airshed study of the Kitimat Valley including Rio Tinto Alcan's (RTA) existing and planned infrastructure, four proposed Liquefied Natural Gas (LNG) facilities, a proposed oil refinery, gas turbine powered electrical generation facilities, as well as related marine transportation sources. The 2013 assessment area covered 6,772 km^2. PFEC's Refinery is within the assessment area.

PFEC's goal is to develop a Refinery with NZNC emissions, and is employing innovations and proven technologies to achieve this goal. As specified in **Section 4.1.3**, PFEC's carbon management strategy is to significantly reduce CO_2 emissions from the refining process thereby minimizing the Project's contribution to global greenhouse gas emissions. The Refinery footprint and potential access road alignment will not overlap with federal land; however, PFEC will assess the potential effects of the Project on air quality within the Kitimat airshed where federal land is present (**Figure 7**).

Once a LOO is in place, PFEC plans to install a meteorological tower within the 1,000 ha site to collect baseline data on the local airshed to assess the potential combined effects of the Project and other projects (**Section 5.2**) from industrial air emissions on the environment and human health. First Nations will be involved in these studies.

7.1.4 Vegetation and Ecosystems

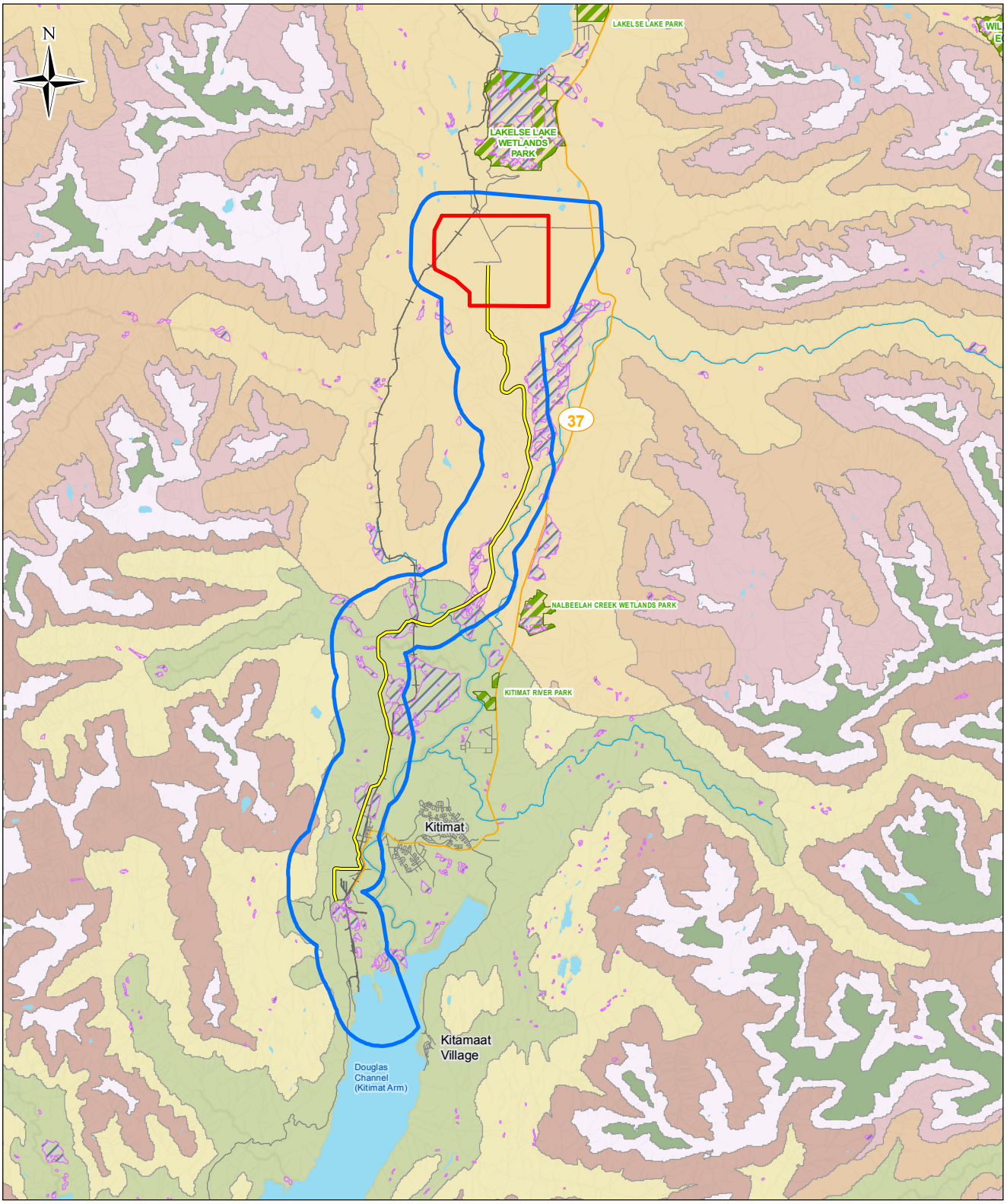
The majority of the Project area is in the submontane variant of the Coastal Western Hemlock wet submaritime subzone (CWHws1) in the Nass Mountains Ecosection (iMapBC, 2015). The CWHws1 has moist summers with significant dry spells, and relatively heavy snowfall (Banner *et al*., 1993). Original forests in the region were typically composed of western hemlock (*Tsuga heterophylla*), amabilis fir (*Abies amabilis*), western redcedar (*Thuja plicata*) and Sitka spruce (*Picea sitchensis*) (McElhanney, 2015b).

The southern portion of the Project area near Kitimat is located within the submontane variant of the CWH very wet maritime subzone (CWHvm1). The climate of the CWHvm1 is wet, humid and maritime with a long growing season and comparatively little snow during the winter (Banner *et al.,* 1993). Dominant tree species include western hemlock, western redcedar, Sitka spruce and amabilis fir. Before development, the majority of the valley was in a mature or old growth structural stage with wind and fire being the most dominant natural disturbances (McElhanney, 2015b).

The Project area is a mosaic of coniferous and mixed forest, riparian and shrubby habitat, with fen and bog ecosystems in low-lying areas. A total of 20 ecological communities at risk have the potential to occur within CWHws1 and CWHvm1. Five have Red-listed status and 15 are Blue-listed in BC.

The BC Conservation Data Centre (CDC) reports three rare plant occurrence records within the Kitimat River valley between Kitimat and Lakelse Lake. These include two vascular plants that are provincially Blue-listed and a lichen that is federally protected under Schedule 1 of *Species at Risk Act* (SARA) as a species of Special Concern.

Figure 10 provides an overview of vegetation resources within the Project area.



Legend

- Refinery Location
- Project Area
- Potential Module Access Road
- Parks And Protected Areas
- Wetlands

BGC Zone Code

- CMAun
- CWHvm1
- CWHvm2
- CWHws1
- CWHws2
- MHmm1
- MHmm2
- MHmmp
- Highways
- Other Roads
- Rail Tracks
- Watercourses
- Water Bodies

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
3. Site location is approximate.

References:
1.1. Data downloaded from GeoBC in September and October of 2015.
2.Sources: Esri, DeLorme, USGS, NPS Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
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Pacific Future Energy Refinery Vegetation Resources

By: ECH	Date: 2016/05/09	Scale: 1:250,000	Figure Number:10 Rev.: 2
Chk'd: EM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-007

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7.1.5 Wildlife Resources

Habitat within the Project area supports a variety of wildlife groups including herptiles (amphibians and reptiles), birds and mammals. In addition, portions of the transportation corridor overlap provincial Wildlife Habitat Areas (WHA) and Ungulate Winter Range (UWR). **Figure 11** provides an overview of wildlife resources within the Project area.

Nine species of herptiles are known to occur within the vicinity of the Project area. Western toad (*Anaxyrus boreas*) and coastal tailed frog (*Ascaphus truei*) are also confirmed present. Both of these amphibians are blue-listed in BC and Special Concern under SARA (Schedule 1). A WHA for coastal tailed frog (6-067) has been established on a tributary to the Little Wedeene River (**Figure 11**), west of the potential access road corridor. Other known occurrences of tailed frogs exist for various watercourses west and east of the proposed Refinery, including Coldwater Creek, Wedeene River, Bowbyes Creek, Hirsch Creek, Chist Creek, Schulbuckhand Creek and the headwaters of the Kitimat River (iMapBC, 2015).

Avian habitat in the vicinity of the Project includes upland coniferous forests of various ages, riparian areas, wetlands and waterbodies. Waterfowl and shorebirds breed north of the Project at the Lakelse Lake and Nalbeelah Creek wetlands. Several species of raptors (e.g., eagles, hawks, falcons, and owls) occur within the Project area.

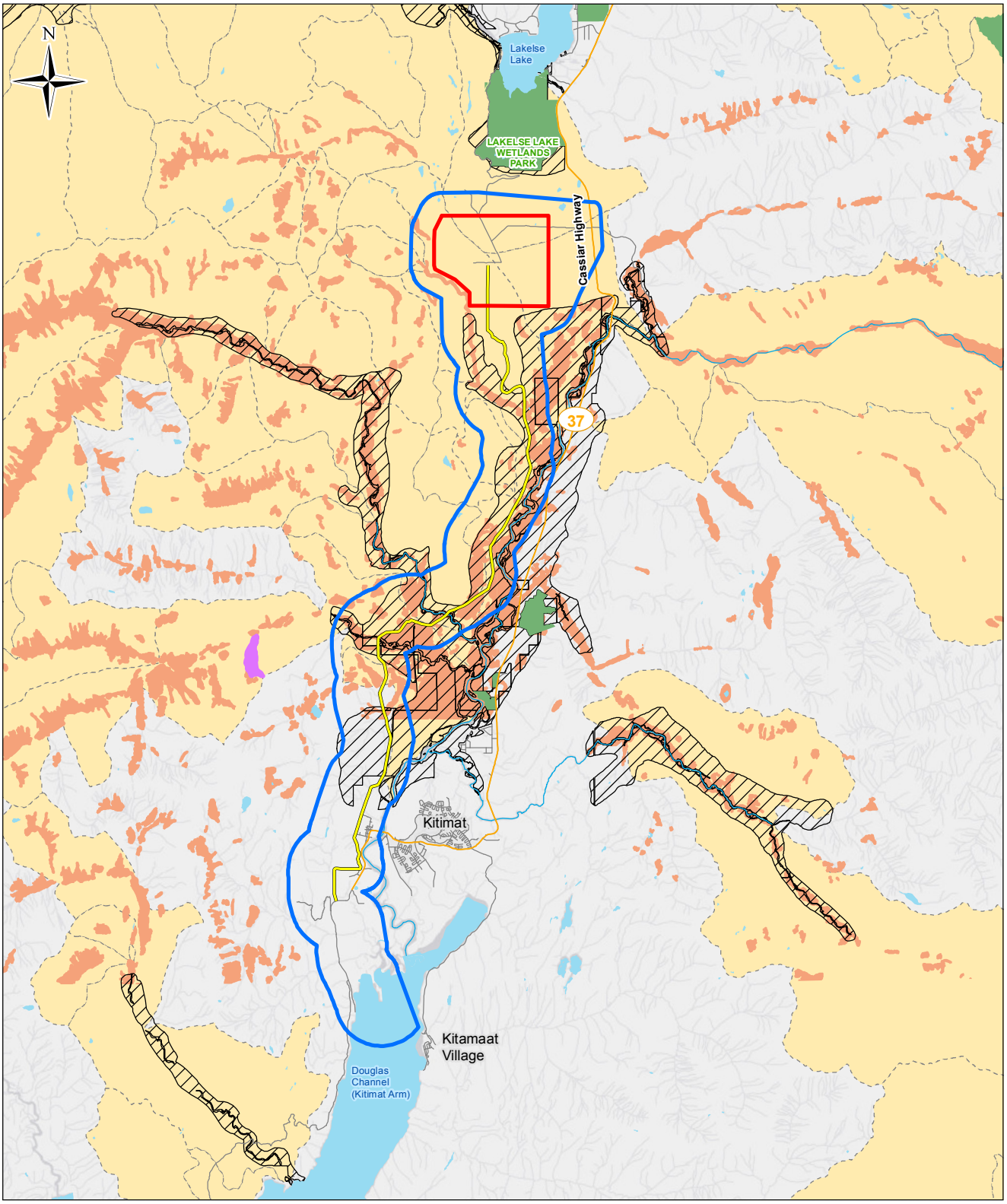
McElhanney (2015b) identified over 40 species of songbirds at Dubose Flats. According to Bird Studies Canada (2015), approximately 291 species of birds have been sighted in the Kitimat-Stikine region, which extends west to Haida Gwaii and north of Iskut. Most of these species are considered migratory under the *Migratory Bird Convention Act* (MBCA). The Project area is within the geographic range of 12 at-risk birds including 10 SARA Schedule 1 species (CDC, 2015; McElhanney, 2015b). There are no MBS in the vicinity of the Project. The closest MBS is the Nechako River MBS, approximately 500 km to the east in Vanderhoof, BC.

Several species of mammals have known presence within the Project area. At least four species of mustelids have been documented within or near the Project. Rodents and insectivores are expected to be present, as well as snowshoe hare (*Lepus americanus*). Mule deer (*Odocoileus hemionus*) and moose (*Alces americanus*) are ungulates common to the region. Winter forage is readily available for these species, where shrubby browse habitat is abundant. The Project area overlaps with moose winter range (u-6-009) south of the Refinery in the Kitimat River valley and along larger tributaries (iMapBC, 2015).

Large predators with known presence include cougar (*Puma concolor*), grizzly bear (*Ursos arctos*) and black bear (*U. americanus*). Low-lying habitats of the Kitimat River valley, Cecil Creek and Little Wedeene River provide high-value grizzly bear habitat, portions of which have been proposed to be designated as WHAs by FLNRO.

Three of the mammal species are considered species at risk: grizzly bear, wolverine (*Gulo gulo*) and fisher (*Pekania pennanti*) are provincially Blue-listed, and are also listed as Identified Wildlife under provisions of the *Forest and Range Practices Act* (FRPA). They are not SARA-listed.

PFEC has begun field studies, with involvement from First Nations, to assess the potential Project impacts on wildlife, vegetation and ecosystems. Through co-creation with First Nations, PFEC will work towards ensuring a sustainable environment in the region.



Legend

- Refinery Location
- Project Area
- Potential Module Access Road
- Parks And Protected Areas
- Wildlife Habitat Area - Legal - Coastal Tailed Frog
- Ungulate Winter Range - Moose
- Proposed Wildlife Habitat Area - Grizzly Bear
- Grizzly Bear Identified Watersheds
- Highways
- Other Roads
- Watercourses
- Waterbodies

Notes:
1. Intended for Illustration purposes only.
2. Original in colour.
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References:
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Pacific Future Energy Refinery Wildlife Resources

By: ECH	Date: 2016/05/09	Scale: 1:250,000	Figure Number: 11	Rev.: 2
Chk'd: EM	Coord. Sys.: NAD 1983 UTM Zone 9N		Reference No.: 631180-101-008	

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7.1.6 Aquatic Resources

The proposed Refinery is located within the southern portion of the Kitsumkalum-Kitimat Trough at the height of land that divides two distinct watersheds: Lakelse River and Kitimat River. The Lakelse watershed lies in the northern portion of Dubose Flats and flows northward into the Skeena River, whereas the Kitimat watershed lies on the southern portion and flows south into the Douglas Channel. Three major tributaries have been identified near the Site: Clearwater Creek (Lakelse River watershed), Cecil and Chist creeks (Kitimat River watershed). In addition to the tributaries, a number of small lakes and wetlands are present (i.e., Clearwater Lake, Onion Lake).

The potential access road is situated entirely within the Kitimat watershed and extends from the Refinery to Kitimat. There are a number of high-fisheries value watercourses within the access road corridor that include the Kitimat River, Wedeene River, Little Wedeene River, Nalbeelah Creek, Humphrys Creek, Moore and Anderson creeks. A complex myriad of wetlands and small lakes have also been identified.

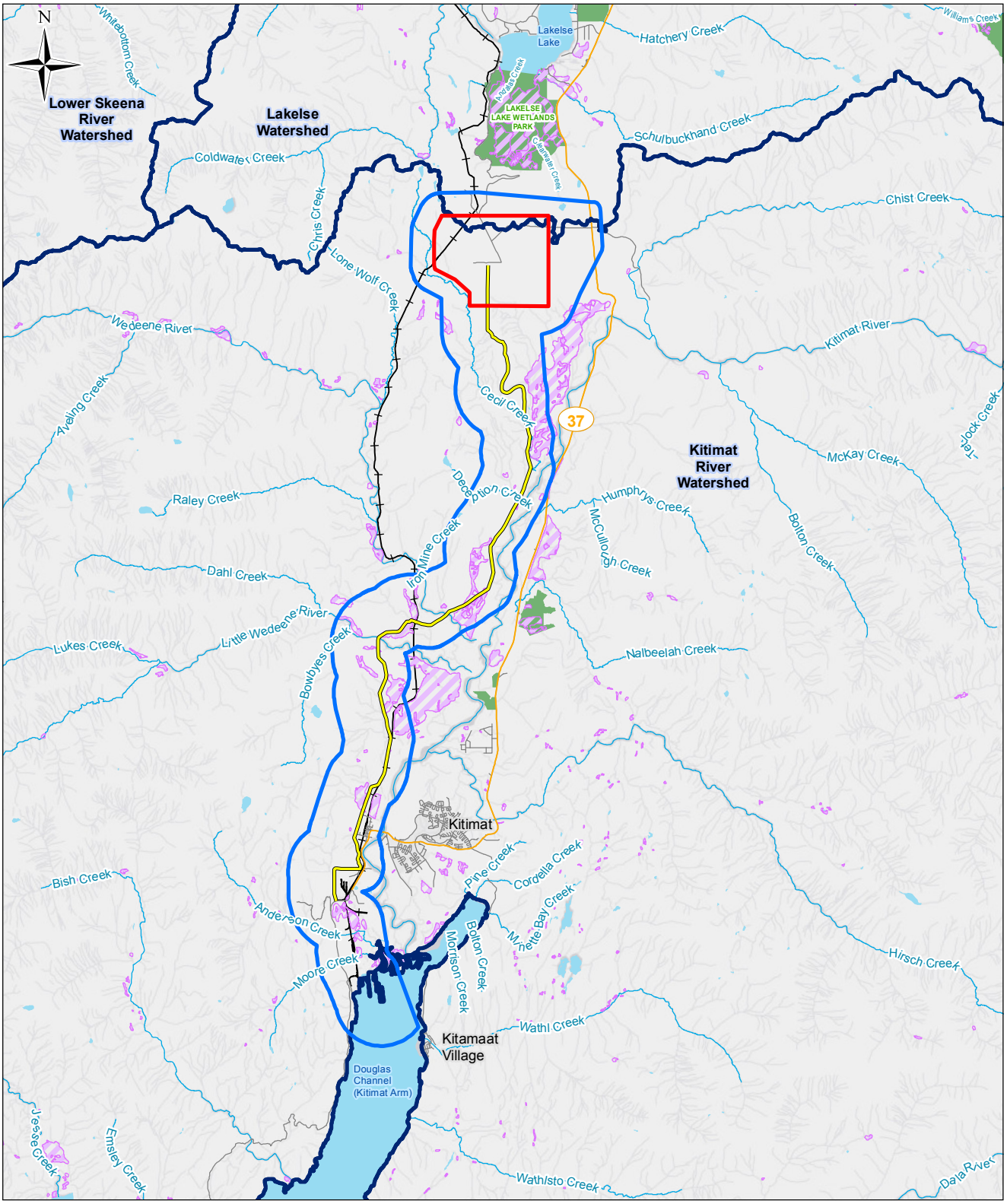
Both Lakelse River and Kitimat River watersheds are well documented and provide important habitat for an array of recreational, commercial and traditionally important fish species including Coho Salmon (*Oncorhynchus kisutch*), Pink Salmon (*O. gorbuscha*), Chinook Salmon (*O. tshawytscha*), Chum Salmon (*O. keta*) and Sockeye Salmon (*O. nerka*), as well as Dolly Varden Trout (*Salvelinus malma*), Bull Trout (*Salvelinus confluentus*), Coastal Cutthroat Trout (*O. Clarkii clarkii*), and Rainbow Trout/Steelhead (*O. mykiss*). Eulachon (*Thaleichthys pacificus*) have also been documented in the Kitimat River; however, very little is known and runs are not regular (Stantec, 2013).

Of the fish species documented within the Lakelse and Kitimat watersheds, none are designated under SARA or red-listed in BC. However, three species (i.e., Coastal Cutthroat Trout, Bull Trout, and Eulachon) are blue-listed. Eulachon have been historically documented in the Kitimat River, but the population has yet to recover from a drastic decline in the 1990's (Stantec, 2013). Although the status of Kitimat Eulachon has not been formerly assessed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC), given that populations have declined over 90% in the past 15 years, COSEWIC has recommended an "Endangered" status (COSEWIC, 2011).

As part of the EA, PFEC will complete fish studies, with the involvement of First Nations, to assess the potential impacts on fish and fish habitat (including impacts on water quality such as acidification) during the construction and operation. During construction, fisheries values may be impacted during the installation of bridge crossings at Wedeene and Little Wedeene Rivers for the potential access road (**Figure 12**). Other crossings may be needed, but have not been identified at this stage. During operation, impacts to fisheries values could occur from groundwater or surface water extraction for the refining process. For example, fish habitat can be altered as a result to changes to instream flow. The Project also anticipates some treated water release to Douglas Channel; the potential effects of which will be assessed. Habitat loss from module road infrastructure is also a potential effect on fish habitat that will be considered in the assessment. PFEC will work with First Nations to develop a plan

for monitoring fish species, which may be of primary importance to the local communities. PFEC commits to ensuring the layout and operability of the Project respects First Nations culture, traditions and natural resources.

Figure 12 provides an overview of aquatic resources features, including all waterbodies in the vicinity of the Project.



Legend

- Refinery Location
- Project Area
- Potential Module Access Road
- Parks And Protected Areas
- Watershed Boundary
- Wetlands
- Highways
- Other Roads
- Rail Tracks
- Watercourses
- Water Bodies

Notes:
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Pacific Future Energy Refinery Aquatic Resources

By: ECH	Date: 2016/05/09	Scale: 1:250,000	Figure Number: 12	Rev.: 2
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7.2 *Summary of Potential Project Interactions with Biophysical Values*

Taking into consideration the brief environmental profile described above, PFEC has identified a number of potential interactions between the Project components (identified in **Table 4-1**) with environment-related values (geophysical, hydrological, hydrogeological, atmospheric, vegetation and wildlife, fish and aquatic) which are likely of relevance to the Project area and general region. These interactions are categorized by Project phase (C – Construction, O – Operation, D – Decommissioning and Reclamation, A – All phases) and are presented in **Table 7-4**.

Table 7-1 Preliminary Identification of Potential Project Component – Biophysical Interactions

Project Components		Biophysical Environment													
		Terrain Stability	Soils	Hydrology	Hydrogeology	Carbon Emissions	Air Quality	Noise	Fish	Water Quality (Ground, Surface, Marine)	Marine (Habitat and Species)	Rare Plants	Rare and Sensitive Ecosystems	Birds	Herptiles	Mammals
Refinery Infrastructure	Bitumen oil refinery (built from 100 to 150 pre-fabricated modules, each weighing between 2,500 and 5,000 MT)	CO	A	A	A	A	A	A	A	A	C	C	C	A	A	A
	Rail yard (unloading and loading) with seven tracks (total length of 20.9 km), capable of receiving up to four unit trains per day (120 rail cars each)	CO	A			A	A	A		A		C	C	A	A	A
	Upgraded road to the site from Highway 37	C	C				C	C				C	C	CO	CO	CO
	Tie-in to an existing natural gas pipeline	C	A		C	C	C	C				C	C	C	C	C
	On site storage for feedstock and refined products with a total capacity of greater than 500,000 m^3	CO	A		O	CO	A	CD		A		C	C	C	C	C
	Administrative building to hold 100 persons (approximately 3 floors, each 1,000 m^2);	C	C		A		CD	C				C	C	C	C	C
	Four explosion-proof control rooms (approx. 800 m^2 each) for process unit groups:	C	C			C	C					C	C	C	C	C

Project Components	Biophysical Environment														
	Terrain Stability	Soils	Hydrology	Hydrogeology	Carbon Emissions	Air Quality	Noise	Fish	Water Quality (Ground, Surface, Marine)	Marine (Habitat and Species)	Rare Plants	Rare and Sensitive Ecosystems	Birds	Herptiles	Mammals
• Distillate Hydrotreater, Gas Oil Hydrocracker/ Hydrotreater, Hydrogen Production Unit, SWSs, ARU and SRU; • Distillation units, Isomerization Unit, and Catalytic Reforming Unit; • Residue Conversion Unit and Gasifier Unit; and • Oil Movement.															
Building for laboratory analysis (approximately 500 m^2);	C	C			C	C	C				C	C	C	C	C
Control Room for Power Generation, Raw Water Treatment and Wastewater Treatment (approximately 800 m^2);	C	C			C	C	C				C	C	C	C	C
Shop for turbines for the power generation (approximately 2,000 m^2)	C	C			C	C	C				C	C	C	C	C
Shop for spare parts and Personal Protective Equipment (PPE) (approximately 2,000 m^2)	C	C			C	C	C				C	C	C	C	C
Shop for catalyst and chemicals (approximately 2,000 m^2)	C	C			C	C	C				C	C	C	C	C
Building for Electrical, Instrumentation and Maintenance (approximately 1,200 m^2)	C	C			C	C	C				C	C	C	C	C
Building for firefighting equipment and first aid	C	C			C	C	C				C	C	C	C	C

Project Components		Biophysical Environment													
		Terrain Stability	Soils	Hydrology	Hydrogeology	Carbon Emissions	Air Quality	Noise	Fish	Water Quality (Ground, Surface, Marine)	Marine (Habitat and Species)	Rare Plants	Rare and Sensitive Ecosystems	Birds	Herptiles	Mammals
	(approximately 1,500 m^2)															

Project Components		Biophysical Environment														
		Terrain Stability	Soils	Hydrology	Hydrogeology	Carbon Emissions	Air Quality	Noise	Fish	Water Quality (Ground, Surface, Marine)	Marine (Habitat and Species)	Rare Plants	Rare and Sensitive Ecosystems	Birds	Herptiles	Mammals
Refinery Utilities Infrastructure	Electrical power infrastructure (steam-turbine and gas-turbine generator)	C	CO	O	O	A	A	A				C	C	A	A	A
	Electrical power infrastructure: Biomass facility (supply from pulp wood and hog fuel)	C	A			A	A	A				C	C	A	A	A
	Emergency power (combination of standby fuel gas- or natural-gas-driven generators for critical loads)	C	A				C	C				C	C	C	C	C
	Raw water system (surface and/or groundwater)	C	A	A	A	C	C	C	A	A		C	C	C	C	C
	Boiler Feed Water (BFW) and steam	C	C				C	C				C	C	C	C	C
	Sanitary and potable water system	C	C	CO			C	C				C	C	C	C	C
	Domestic sewage system	C	A		O		A	C	O			C	C	C	C	C
	Surface water management system (runoff ponds)	C	A				C	C	O	O		C	C	C	C	C
	Fuel gas and natural gas (supplied from off site)	C	OD				O		O	O				O	O	O
	Instrument and Utility Air System	C	C				C	C				C	C	C	C	C
	Fire, gas and smoke detection System	C	C				C	C				C	C	C	C	C
	Fire water system (oxygen and nitrogen)	C	C				C	C	OD	OD	C	C	A	A	A	A
	Hydrocarbon drain system (Closer Drain System and Open Drain/Oily Water Sewer (OWS) Drain System)	C	C				C	C	OD	OD	C	C	A	A	A	A
	Relief and flare	C	C			CO	CO	C				C	C	CO	C	C
	Waste Management System	C	OD			CO	CO	CO				C	C	A	A	A
	A 6” water pipeline from the Refinery to Kitimat for the discharge of	C	A		A	C	C	C	A	A	A	C	C	C	C	C

Project Components		Biophysical Environment														
		Terrain Stability	Soils	Hydrology	Hydrogeology	Carbon Emissions	Air Quality	Noise	Fish	Water Quality (Ground, Surface, Marine)	Marine (Habitat and Species)	Rare Plants	Rare and Sensitive Ecosystems	Birds	Herptiles	Mammals
	treated wastewater from the Refinery.															
Potential Surface Water Intake Structure	Intake structure on Kitimat River (no diversion, min. river depth of 0.7m at point of intake, concrete structure, scour protection and wedge weir screen, protection of fish through screen)	C	CD	O	O	C	C	C	A	A		C	C	C	C	C
	Access road from Refinery to intake structure	C	CD			C	C	C				C	C	A	A	A
	Dual pipes from structure to the pump station	C	A	O	O			C	C	C		C	C	C	C	C
Construction-related Refinery Infrastructure	Trailers, fabrication shops, and material storage shop	C	C		C	C	C	C				C	C	C	C	C
	Existing off-loading dock (former Eurocan dock) in Kitimat to receive Refinery modules during construction															
	Potential Refinery Module Access Road (40 km long by 50 m wide) with a clear-span crossing on Wedeene River and Little Wedeene River	C	A	C	C	A	A	A	A	A		C	C	A	A	A
	Workforce housing accommodations	C	A		A	A	A	A		A		C	C	A	A	A

8 ANTICIPATED SCOPE OF THE PROJECT AND ENVIRONMENTAL ASSESSMENT

PFEC understands that EA regulators will determine the need for an EA based on the Project Description, and in turn will determine the scope of the Project based on the physical works and activities described within the Project Description. Those physical works and activities identified within the scope of the Project are subject to EA review.

In compiling socio-economic and biophysical information to prepare this Project Description, and taking into consideration the EA requirements outlined in CEAA 2012 and BCEAA, and in recognition of First Nations title and rights, and considerations outlined in the BC First Nations Energy and Mining Council environmental assessment toolkit[18], PFEC anticipates the EA will assess the potential effects of the Project on the following:

- **Fish and Fish Habitat**: Changes to or loss of fish and fish habitat, as defined by the Fisheries Act. Project interactions with fish and fish habitat may occur during the construction of the potential access road, which will require clear span crossings on two salmon-bearing rivers as shown in Figure 12 (Wedeene and Little Wedeene Rivers). Changes to local water availability or quality as a result of water intake activities from groundwater and/or surface water sources (from aquifers with possible hydraulic connection to local fish-bearing water bodies, or from the Kitimat River) for the refining process may also impact local fish resources (species and habitat). Other potential effects leading to the loss of or change to fish and fish habitat include the discharge of treated wastewater into the marine environment and acidification of water bodies as a result of CO_2 emissions from the Project. The accidental release of untreated wastewater or deleterious substances from runoff and retention ponds at the Refinery (**Figure 5**) to nearby waterbodies such as Cecil Creek, would also result in impacts to fish or fish habitat;
- **Aquatic species**: Change to a fish or marine plant as defined in SARA (and the Fisheries Act). Project interactions with aquatic species may occur from the release of treated wastewater to the Douglas Channel. Wastewater from the Refinery will be treated on site and tested to ensure water quality and temperature meet regulated requirements for release into the marine environment;
- **Wetlands:** Change to a wetland ecosystem. There are several wetland ecosystems in the Project area, which have the potential to be directly affected by the construction of the module road and intake structure. Such effects include reduced functionality due to habitat loss or fragmentation. Accidental spills of deleterious material or sedimentation could also impact overlapping wetlands during construction and road operation. Wetlands in the vicinity of the proposed intake structure or watercourse crossings may be affected by changes to waterflow (drawdown or flooding);

[18] http://fnemc.ca/?portfolio=environmental-assessment-toolkit

- **Migratory Birds**: The Project area is an mix of upland forest, riparian and wetland ecosystems which are suitable for a diversity of migratory and resident avian species. Changes to migratory birds, as defined in the Migratory Birds Convention Act, 1994. Project interactions, such as loss or disturbance (noise, visual) of breeding habitat, with migratory birds may occur as a result of clearing and grubbing activities during construction of the Refinery, associated infrastructure and access road. Operational activities (noise and visual disturbance, gas flaring and venting) may deter the bird use of habitat in the vicinity for nesting or foraging; however, other suitable bird habitat is still available within the region. Bird mortality from collision with Refinery infrastructure will also be considered as a potential effect in the EIA. The closest MBS is nearly 500 km east in Vanderhoof, BC;
- **Federal and Other Lands**: No environmental effects are anticipated on federal lands, in a province other than the province in which the Project is proposed to be carried out, or outside of Canada. The Refinery footprint and potential access road alignment will not overlap with federal land; however, PFEC will assess the potential effects of the Project on air quality within the Kitimat airshed where federal land is present (**Figure 7**). Furthermore, PFEC is committed to reducing greenhouse gas emissions from the Project through the means described in **Section 3.1.3** (Carbon Management). There are several First Nations reserves near the Project area; however, there is no overlap of reserve lands. Refer to **Figure 7** for the relative distance of reserves to the Project footprint; and
- **Effects of Environmental Changes on First Nations and Aboriginal Peoples**: Change to the social and economic structure, individual and community health, loss or degradation of heritage resources, traditional and cultural activities. Engagement and consultation with local First Nations and Aboriginal peoples described in **Section 9.1** will help to inform how the Project may affect community, current use of lands and resources for traditional purposes and impacts to health (country foods). As shown in **Figure 7**, there are five First Nations traditional territories within PFEC's Project area, which suggests there will likely be effects of environmental changes on First Nations. These include Kitselas First Nation, Haisla Nation, Lax Kw'alaams Band, Metlakatla First Nation and Kistumkalum First Nation. The Project is also within Métis Nation BC's (MNBC) Northwest governance region, and that of the BC Métis Federation (BCMF). Some of potential effects on these First Nations and Aboriginal groups include:
  - Socioeconomic:
    - Potential economic benefits for First Nations and Aboriginal peoples such as through short term and long term employment;
    - Reduced availability and access to community and emergency services on the local community; and
    - Effects from potentially increased traffic on Highway 37, CN Rail and to the Kitimat harbour.

- Human health:
  - Degradation of air quality and noise effects through construction of facilities, road building, facility operation and flare and vent systems;
  - Increased light emission from the Refinery and reduced visual aesthetics of the landscape; and
  - Increased safety hazards from Refinery operations.
- Heritage resources:
  - Damage to archaeological, spiritual and heritage sites through earthwork activities such as site preparation and road building; and
  - Loss or modification of Culturally Modified Trees (CMTs) and access to traditional use area.
- Traditional and cultural activities:
  - Changes to traditional harvesting activities through effects to terrestrial resources as the result of land clearing:
    - Loss of ecosystem community diversity; i.e., wetlands and riparian systems;
    - Loss of species diversity; i.e., listed species, traditional use plants;
    - Changes in habitat availability; i.e., habitat loss, degradation and fragmentation;
    - Reduced habitat use from sensory disturbance as the result of project construction and operation; and
    - Direct wildlife mortality as the result of increased project activity interaction.

These potential changes to the environment, as a result of carrying out the designated project are not expected to affect federal lands in other provinces, territories, or outside of Canada.

A cumulative effects assessment (CEA) will be completed for the Project and will take into consideration other past, present and reasonably foreseeable future projects and activities, which have the potential to interact with the Refinery and its components. PFEC will compile an inclusive list of projects and reports for the CEA, and may include the following:

- ESSA and BC MoE Kitimat Airshed Emissions Effects Assessment (2013);
- BC Hydro Terrace to Kitimat Transmission Project (proposed in-service date is 2018/2019);
- TransCanada Pipelines Limited Coastal GasLink Pipeline Project (proposed construction start in 2016);
- Pacific Northern Gas natural pipeline (in operation);

- Pacific Northern Gas Looping Project (proposed);
- AltaGas DC LNG Lease LP Douglas Channel LNG Project (proposed);
- Enbridge Northern Gateway Project (proposed);
- Chevron and Woodside Canada Kitimat LNG Terminal Project (pre-construction);
- Chevron and Woodside Canada Pacific Trail Pipeline Project (pre-construction);
- LNG Canada Export Terminal Project (proposed);
- RTA marine terminal and Kitimat smelter (in operation);
- RTA Terminal A Extension and Modernization Project (proposed expansion and upgrades);
- Geothermal Power Plant (proposed);
- Kitimat Clean Refinery (proposed); and
- RDKS Forceman Ridge Landfill and the Thornhill Transfer Station (in pre-construction).

9 PROPONENT ENGAGEMENT AND CONSULTATION WITH FIRST NATIONS AND ABORIGINAL GROUPS

PFEC has adopted a 'First Nations First' approach that is a governing pillar of the entire company. PFEC also is operating within the context of upholding the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). This means that the approach is fully integrated throughout all aspects of the project and includes PFEC's role in the development of relationships with First Nations, which includes meaningful consultation and accommodation of First Nations that have title and rights in our Project area. While there are legal and regulatory requirements that will be upheld, PFEC understands these as minimum requirements and strives for meaningful partnerships and relationships that result in a co-created approach.

We recognize First Nations as first-order governments, with title and rights. Our fundamental objective in engaging with First Nations is to recognize, respect, and reconcile title and rights with our Project's objectives. PFEC will be an advocate and a participant in ensuring that the consultation and accommodation processes, partnerships, and relationship-building associated with our Project work to achieve reconciliation, allowing for the full recognition and respect of First Nations title and rights and treaty rights.

PFEC began engaging with First Nations at the earliest stage of our Project's concept. This will allow opportunity for First Nations full participation and co-creation into our Project's design, and early recognition of concerns, so that they can be addressed together.

PFEC will seek the approval of First Nations through a process that is mutually designed and agreed to. PFEC's overall intent is to ensure that the approval process meets the legal standard in terms of consultation and accommodation for the First nations that will be involved. PFEC anticipates that this process will work in conjunction with, and will coincide with, the processes set out under the provisions of BCEAA and CEAA 2012.

PFEC's engagement strategy with First Nations is based on our foundational principal that First Nations are a first order of government and that we will proceed with our Project if we are welcomed and supported by the First Nations who are the title-holders and affected by this Project. This engagement process will require that PFEC understand that the success of our Project is based on the full adoption that our approach is 'First Nations First'.

In addition to our 'First Nations First' approach, PFEC is also in full support for the UNDRIP. This is reflected in PFEC's commitment to directly engage Indigenous communities, including their families and citizens. This requires going beyond simply upholding current legal requirements, to establishing meaningful relationships and in some cases, partnerships with the First Nation governing bodies and their business and administrative bodies.

This approach is reflective of PFEC's business principles as they relate to First Nation interests; namely:

- First Nations as Governments not stakeholders; with the necessary approach and consideration given;
- Alignment of PFEC's Corporate Vision, mandate and approach with First Nations interests; and
- Support of First Nation institutional development at a local, regional and provincial level.

PFEC has commenced to develop relations and early engagement with all First Nations identified below. Concurrently, PFEC has initiated and invited preliminary consultation with the Kitselas Government and Haisla Nation and will continue to engage all affected Nations throughout the Project's development.

9.1 *Overview of First Nations near the Project*

The Project is within the traditional territories of the Haisla, Kitselas, Lax Kw'alaams, Metlakatla and Kitsumkalum. The Project also has impacts for the other Tsimshian First Nations and Tsimshian peoples as a whole. PFEC recognizes that all engagement activities must respect, recognize and be implemented with the understanding both of the individual communities' title and rights, and the larger collective governance structure of the Tsimshian First Nations.

The Project is also within the Northwest BC governing region of Métis Nation British Columbia (MNBC 2016), including the British Columbia Métis Federation (BCMF).

9.2 *Engagement with First Nations and Aboriginal Groups to Date*

PFEC has begun early engagement efforts with local First Nations. Our objective is to engage at an early stage and work towards an initial understanding that can describe how a working relationship will be developed to begin to share information and gain a greater understanding of each other.

Initial work undertaken by PFEC has been to gain an initial understanding of each potentially affected First Nation governing structure and processes, as well as their traditional territory and where it coincides with our Project area.

9.2.1 Kitselas Nation

Following a number of meetings and discussions, PFEC signed a Memorandum of Understanding (MoU) with the Kitselas Government on September 1, 2015. The MoU acknowledges the Kitselas territory and First Nations rights and creates a framework to enable discussions, community engagement and communication between the parties.

The MoU speaks to the intent of the parties to enter into further agreements up to, and including an Impact Management and Benefits Agreement (IMBA) that coincides with Project development. PFEC understands that while direct relationships must be built with each community, this must be done in the context and with further engagement activities within the broader understanding and recognition of the Tsimshian Nation as a collective whole.

PFEC most recently met with Kitselas Lands and Resources Department on May 26, 2016 to present the Project Description and have an open dialogue about the EA process, current activities and project-related concerns.

9.2.2 Haisla Nation

PFEC formally introduced the Project to the Haisla Nation in October 2015 via formal correspondence to the Haisla Chief and Council. The objective is to extend the relationship beyond the consultative level and enter into a mutual understanding, under a MoU, which will prescribe how each party will engage in Project discussions, both within the EA process and outside.

Our goal is to develop an engagement process that is unique to our relationship with the Haisla, founded on trust, so that we can co-create a process to explore the potential development of our Project.

Planned activities moving forward include exploring opportunities related to commercial and economic benefits, participation and review of the Project Description as the initial step in the EA process and scoping the EA and identification of valued components. There will also be opportunities to participate in field studies throughout Project development in areas of interest to the Haisla.

9.2.3 Lax Kw'alaams Band

PFEC introduced the Project to Lax Kw'alaams Band in November 2015 via formal correspondence to Chief and Council who were appointed in late November. This initial introduction was at a high level regarding the key aspects of our Project, with an invite for a face-to-face formal introduction to our Project as it is currently developed. Our objective, as with other First Nations, is to engage at an early stage and work towards an initial understanding that can describe how a working relationship will be developed to begin to share information and gain a greater understanding of each other.

Our goal is to develop an engagement process that is unique to our relationship with the Lax Kw'alaams Band, founded on trust, so that we can co-create a process to explore the potential development of our Project.

Initial work undertaken by PFEC has been to gain an initial understanding of Lax Kw'alaams Band governing structure and processes, as well as their traditional territory and where it coincides with our Project area.

PFEC understands that while direct relationships must be built with each community, this must be done in the context and with further engagement activities within the broader understanding and recognition of the Tsimshian Nation as a collective whole.

9.2.4 Metlakatla First Nation

PFEC introduced the Project to the Metlakatla First Nation in November 2015 via formal correspondence to Chief and Council. This initial introduction was at a high level regarding the key aspects of our Project, with an invite for a face-to-face formal introduction to our Project as it is currently developed. PFEC most recently met with Metlakatla council on May 26, 2016 to introduce the PFEC team and to have an open dialogue about the Project. Topics included, among others, the Environmental Assessment process in BC, best practices during sensitive biological time periods and protection of water resources. Hard copies of the Project Description were presented, including a hard copy with cover letter for Chief Councillor Harold Leighton, who was unable to attend.

Our objective, as with other First Nations, is to engage at an early stage and work towards an initial understanding that can describe how a working relationship will be developed to begin to share information and gain a greater understanding of each other.

Further, our goal is to develop an engagement process that is unique to our relationship with the Metlakatla First Nation, founded on trust, so that we can co-create a process to explore the potential development of our Project.

Initial work undertaken by PFEC has been to gain an initial understanding of the Metlakatla First Nation governing structure and processes, as well as their traditional territory and where it coincides with our Project area.

PFEC understands that while direct relationships must be built with each community, this must be done in the context and with further engagement activities within the broader understanding and recognition of the Tsimshian Nation as a collective whole.

9.2.5 Kitsumkalum First Nation

PFEC is at the very early stages of introducing the Project to the Kitsumkalum First Nation. Formal correspondence was sent in November 2015 to Chief and Council. This initial introduction was at a high level, and without prejudice, regarding the key aspects of our Project, with an invite for a face-to-face formal introduction to our Project as it is currently developed. PFEC most recently met with Chief and Council on May 27, 2016 to introduce the PFEC team and have an open dialogue about the Project. Chief shared a brief history on Kitsumkalum people, culture and traditions. PFEC listened to meeting attendees concerns regarding the compartmentalization of the BC EA process, rail transportation and safety. Hard copies of the Project Description were presented at the meeting.

Our objective, as with other First Nations, is to engage at the front end, the earliest stage, and work towards an initial understanding that can describe how a meaningful working relationship will be developed to begin to share information and gain a greater understanding of each other.

Further, our goal is to develop an engagement process that is unique to our relationship with the Kitsumkalum First Nation, founded on trust, so that we can co-create a process to explore the potential development of our Project.

Initial work undertaken by PFEC to gain an initial understanding of the Kitsumkalum First Nation; this includes a review of the recently executed Agreement in Principle (AIP) with BC and Canada (August 2015).

PFEC understands that while direct relationships must be built with each community, this must be done in the context and with further engagement activities within the broader understanding and recognition of the Tsimshian Nation as a collective whole.

9.2.6 Métis Peoples

The MNBC was identified as a potential interested Aboriginal group in February 2016. PFEC will initiate communications with MNBC early in 2016. Additionally, in 2016, PFEC will initiate communications with the BCMF.

9.3 *Key Comments and Concerns from First Nations to Date*

At this very early stage, PFEC has received only preliminary feedback from First Nations as we are just beginning the conversations. In keeping with our all-encompassing First Nations First approach, our focus is on building meaningful and respectful relationships based on title and rights; seeking an effective working relationship where we can begin, and continue to share and shape information together. We will thus work towards addressing feedback and specific issues as they arise. Key comments and concerns heard from First Nations to date include:

- Ensuring that First Nations have the opportunity to review project-related documents prior to government
- Lack of knowledge on the operation of a bitumen refinery;
- Rail transportation safety and increase in rail traffic;
- Impacts to local water and fish resources, including acidification;
- Impacts to aboriginal rights;
- Extent of tree clearing; and
- Change to accessibility to areas currently used for traditional purposes.

10 CONSULTATION WITH THE PUBLIC AND OTHER PARTIES

This section provides a brief overview of PFEC's plan for consultation with the public and other parties. This section also describes consultations that have occurred with jurisdictions that have environmental assessment or regulatory decisions to make with respect to the Project.

10.1 *Public Consultation*

PFEC's plans for public consultation can be broadly divided into three categories:

- Public opinion research;
- Direct community engagement; and
- Social/media engagement.

Each element will be used to continually refine our approach not only in addressing public concerns but also in adapting our Project plans to acknowledge and, where possible, mitigate those concerns as well.

10.1.1 Public Opinion Research

PFEC has already undertaken initial quantitative and qualitative public opinion research so that we understand where the public's concerns - particularly in the proposed Project area - are focused. PFEC has already used the results of this work in shaping our commitment to a NZNC emissions standard, for example.

In public-opinion research conducted to date, results found that a majority of British Columbians expressed an opinion supporting the building an oil refinery on BC's North Coast. This support grows to higher levels in the Kitimat/Terrace area, with approximately two-thirds of those expressing an opinion supporting building an oil refinery in their area.

Key reasons for supporting a refinery included the belief that refining oil in Canada means that more value is added and Canadians get more benefit in terms of price, jobs and tax revenues; and that It is better to build a refinery in Canada because of our high environmental and labour standards; and that building a refinery allows Canada to take environmental responsibility for the full processing of bitumen from Canada.

PFEC will continue to undertake public opinion research at regular intervals in order to gauge any changes in public mood or the appearance of any new concerns in a timely fashion.

10.1.2 Direct Community Engagement

PFEC's expectation is that we will host and/or participate in a number of meetings in the communities potentially affected by the Project, such as Terrace and Kitimat. Some meetings will be with local community organizations and/or governments, others will be open public meetings hosted by PFEC. The direct community engagement will be done in coordination and with integrated understanding of First Nations engagement.

We expect that the frequency of meetings will ebb and flow based on the amount of information about the Project in the public domain. For example, PFEC will proactively host meetings in the affected communities to answer questions on the Project Description during the federally-legislated 20-day public comment period, in addition to any open houses hosted by the EAO to support public comment periods during the provincial EA process.

PFEC is also planning to open a Project office in Terrace, which will be open during regular office hours, staffed by local Project personnel, to answer questions and engage with the community.

10.1.3 Social/Media Engagement

PFEC believes that social and mainstream media are invaluable tools in communicating about our Project, as well as understanding the concerns of the public in real time. We have a strong team focused on both social and mainstream media and expect to become increasingly active as the Project develops.

Additionally, we will use both social and mainstream media to enhance public awareness around particular, significant milestones in the Project's life. For example, during the 20-day public comment period for the Project Description, PFEC expects there will be much more discussion on social media platforms about the Project's pros and cons. The PFEC team will actively engage in those discussions to ensure the public has ready access to reliable information.

10.1.4 Issues or Concerns Raised

Key concerns identified in the public-opinion research centred around crude oil and bitumen and its effect on the aquatic environment in the case of an ocean spill. Our Project works to address these concerns because of the reduced risk that refined products pose. There was also concern expressed about a refinery's effects on a local airshed, which we address with our NZNC emissions design (see **Section 3.1.3**).

10.2 *Municipal, Regional, Provincial and Federal Government Consultation*

PFEC has met with FLNRO, EAO, the Agency and the BC Oil and Gas Commission (OGC) this past year to introduce the PFEC team, the proposed Project and to seek guidance on the anticipated regulatory processes to support advancement of the Project. A summary of each meeting is described below:

- February 2015. Meeting with EAO and OGC to introduce the PFEC team and describe the Project. EAO described the provincial EA process and suggested a follow-up meeting prior to PD submission;
- February 2015. Introductory meeting with the Agency to describe the Project and gain an understanding of the federal EA process. CEAA also suggested a follow-up meeting prior to the PD submission;
- September 2015. Meeting with FLNRO to discuss provincial tenure application requirements;
- November 2015. Follow-up meeting with EAO. Project updates were discussed, anticipated timelines for Project Description submission as well as additional guidance on Project Description preparation;
- November 2015. As above, with the Agency;
- December 2015 and February 2016. PFEC and SNC-Lavalin met with EAO and the Agency for feedback on a draft version of the Project Description;
- February 2016. PFEC and SNC-Lavalin met with OGC to introduce the Project and seek guidance on the anticipated regulatory process and permits relevant for Project development; and
- May 2016. PFEC and SNC-Lavalin met with EAO and the Agency separately to provide a Project development update, which included an introduction of PFEC's First Nations First approach.

As EA planning proceeds, PFEC fully expects to engage other authorizing agencies to discuss information requirements to support their permit or approval processes.

10.3 *Engagement and Consultation Plans and Communications Tracking*

PFEC is in the process of developing plans for engagement and consultation with First Nations and with the Public (including other government entities). The plans will also include tools for tracking and documenting issues and concerns raised during Project development. PFEC aims to build the relationships and partnerships necessary to co-create these tools with the First Nations communities to ensure they are reflective and responsive to the communities. PFEC's First Nations First approach recognizes that the process and the tools for how engagement and consultation and communications are recorded is situated in a larger relationship context. All processes and tools are considered and developed in the context of the spirit and intent of the relationships with the First Nations, and

Aboriginal groups. The issues identified through ongoing community engagement will be critical inputs to the overall EA process, particularly in the early stages of issues scoping, valued component selection and drafting the Application Information Requirements (AIR).