



ENVIRONMENTAL IMPACT STATEMENT EXECUTIVE SUMMARY

Amended: July 19, 2013



CLEAN
ENERGY PROJECT

BChydro 
FOR GENERATIONS

TABLE OF CONTENTS

Part 1: Overview of the Environmental Impact Statement

1. Introduction	1
2. The Cooperative Provincial and Federal Environmental Assessment Process	2
3. The Proponent	4
4. Rationale for the Project	5
5. Key Project Components and Activities	10
6. Consultation Summary	16
7. Project Benefits	20
8. Potential Effects of the Project	24
Environmental Assessment Methodology	24
Environmental Background	25
Valued Components	29
9. Aboriginal Groups and the Potential Impacts on their Rights and Interests	32
10. Mitigation Measures	33
11. Proponent's Conclusions	34
Significance of Potential Residual Effects of the Project	34
Significance of Potential Cumulative Effects	35
12. Conclusion of the Environmental Impact Statement	36
Part 2: Summary of Valued Components	39

EXECUTIVE SUMMARY

This Executive Summary highlights the findings and conclusions of the Environmental Impact Statement (EIS) for the Site C Project. The summary is in two parts: Part 1 includes an overview of the EIS and Part 2 provides a summary of the results of the assessment for each valued component.

The Executive Summary uses concise language to summarize complex subjects. Readers are referred to the full EIS for a complete understanding of these subjects. The EIS can be found at the Canadian Environmental

Assessment Agency (www.ceaa-acee.gc.ca) or at the British Columbia Environmental Assessment Office (www.eao.gov.bc.ca).

Note: This Executive Summary was amended on July 19, 2013, in accordance with direction given by the Canadian Environmental Assessment Agency and the B.C. Environmental Assessment Office. Amendments are indicated throughout the document by a ① symbol with an explanation of amendments listed in table format at the end of the Executive Summary.

ABOUT SITE C

The Site C Clean Energy Project would be a third dam and generating station on the Peace River in northeast B.C. The Project is being proposed by BC Hydro to provide up to 1,100 megawatts (MW) of capacity and about 5,100 gigawatt hours (GWh) of energy each year to the province's integrated electricity system.

Subject to approvals, the Project would be a source of clean, reliable and cost-effective electricity for BC Hydro's customers for more than 100 years.

Site C would provide clean, reliable power to BC Hydro's residential, commercial and industrial customers in B.C.

1. INTRODUCTION

British Columbia Hydro and Power Authority (BC Hydro) is proposing to construct and operate the Site C Clean Energy Project (the Project). An environmental assessment of the Project is being conducted pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and the *B.C. Environmental Assessment Act* (BCEAA).

The environmental assessment of the Project is being carried out in accordance with the *Agreement to Conduct a Cooperative Environmental Assessment, Including the Establishment of a Joint Review Panel, of the Site C Clean Energy Project* dated February 8, 2012, as amended in August 2012 (the B.C./Canada Agreement).

- ① On September 7, 2012, in accordance with CEAA 2012, BCEAA and the BC/Canada Agreement, the "Site C Clean Energy Project Environmental Impact Statement Guidelines" (the EIS Guidelines) were issued by the Minister of Environment of Canada and the Executive Director of the Environmental Assessment Office of British Columbia. These guidelines set out the requirements that must be met by BC Hydro in its Environmental Impact Statement.

The purpose of the EIS is to meet the requirements of the EIS Guidelines, including describing the rationale for the Project, identifying potential Project effects and benefits, and proposing measures to avoid or mitigate effects of the Project.

The complete information required by the EIS Guidelines is set out in the EIS in five volumes and their appendices:

- Volume 1 includes the Executive Summary and Introduction, and provides information about the Project and planning activities. This volume also provides the rationale for the Project, sets out the assessment process, and summarizes information distribution and consultation activities (Sections 1-9).
- Volume 2 includes a description of the effects assessment methodology, a description of the environmental background and potential changes, as well as the effects assessment for environmental valued components (Sections 10-15).
- Volumes 3 and 4 include the effects assessment for the economic, land and resource use, social, heritage and health valued components (Sections 16-33).
- Volume 5 provides information on asserted or established Aboriginal rights and Treaty rights, Aboriginal Interests and Information Requirements, a Summary of Environmental Management Plans, and other Federal information requirements (Sections 34-40). This volume also includes a complete list of proposed mitigation measures, a summary of potential residual effects of the Project, the significance of those potential residual effects, proposed follow-up programs, and BC Hydro's conclusion.

2. THE COOPERATIVE PROVINCIAL AND FEDERAL ENVIRONMENTAL ASSESSMENT PROCESS

The environmental assessment process began in August 2011 and is expected to take approximately three years.

In May 2011, BC Hydro submitted the “Project Description Report – Site C Clean Energy Project” (the Project Description Report) to the British Columbia Environmental Assessment Office (BCEAO) and the Canadian Environmental Assessment Agency (the CEA Agency). After an evaluation by the responsible authorities, it was determined that the Project is reviewable under the BCEAA and CEAA.

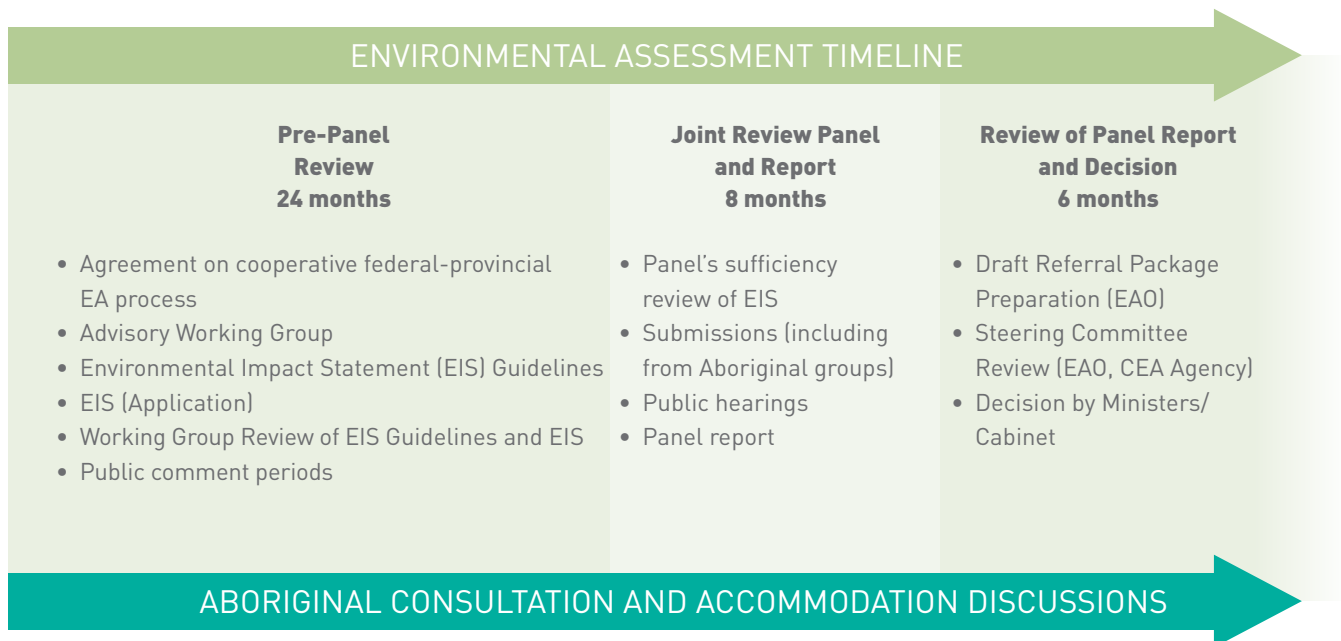
The Minister of Environment of Canada and the Minister of Environment of British Columbia agreed to a cooperative environmental assessment of the Project and entered into the B.C./Canada Agreement in February 2012.

- ② The agreement was amended in August 2012, following a public comment period and after the enactment of CEAA 2012. The B.C./Canada Agreement provides for three stages of assessment, the Pre-Panel Stage, the Joint Panel Review Stage, and the Post-Panel Stage. This agreement also provides guidance on expected timing for each review stage.

Under CEAA 2012 (and formerly under CEAA), the Minister of Environment of Canada or the federal responsible authority, and under BCEAA, the Minister of Environment of British Columbia or the Executive Director, each have the duty to 1) ensure that, where the environmental assessment of a project is required, an assessment is conducted, and 2) determine the scope of the assessment required to meet the statutory requirements and purposes of CEAA 2012 and of BCEAA, respectively.

The EIS Guidelines, which set out the requirements of the EIS, were finalized following a public comment period and a review by an Advisory Working Group. The Advisory Working Group includes representatives from federal and provincial agencies from British Columbia, Alberta and the Northwest Territories, Aboriginal groups, and local and regional governments.

Overview of Environmental Assessment Process and Timeline



Guiding Principles

- ③ The final EIS Guidelines issued on September 7, 2012 include the Guiding Principles below. The EIS Guidelines provide that an environmental assessment conducted in accordance with the B.C./Canada Agreement and the EIS Guidelines meet the objectives of these guiding principles.

1. Environmental Assessment

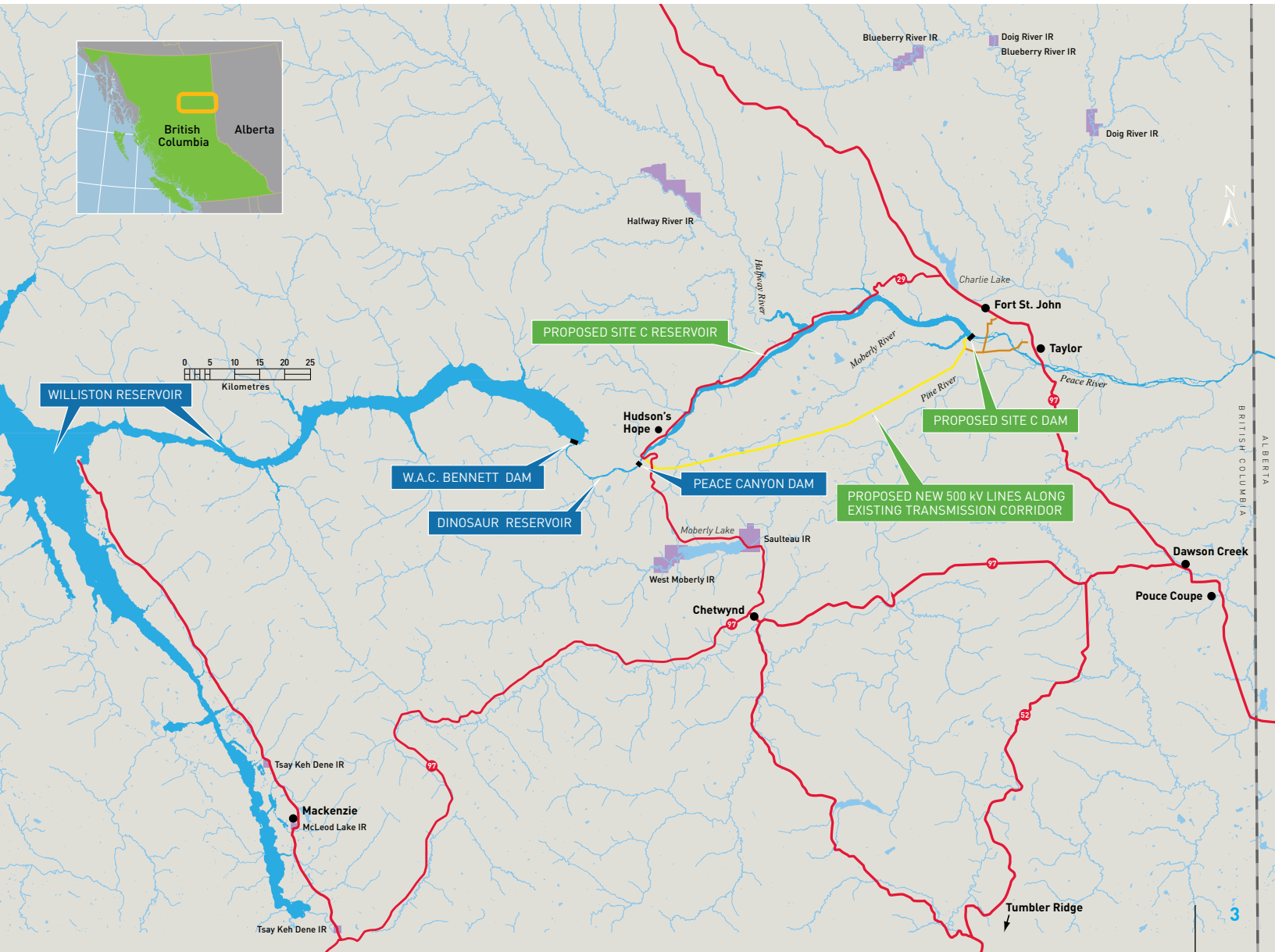
Environmental Assessment (EA) is a comprehensive process to identify and evaluate the potential effects of a proposed major project and ways to avoid or mitigate adverse effects.

2. Public Participation

The overall objective of public participation is best achieved when all parties have a clear understanding of the proposed project as early as possible in the review process. The public will be provided with opportunities to participate in the environmental assessment process.

3. Aboriginal Consultation

BCEAO and Canada are committed to working constructively with Aboriginal groups to ensure that the Crown fulfills its duties of consultation and accommodation. The proponent must ensure that it engages with Aboriginal groups that may be affected by the project, or that have asserted or established Aboriginal rights or treaty rights in the project area, as early as possible in the project planning process.



3. THE PROPONENT

BC Hydro serves 95 per cent of B.C.'s population, delivering electricity to approximately 1.9 million customers.

BC Hydro is a Crown corporation owned by the Province of British Columbia. BC Hydro's mandate is to generate, manufacture, conserve, purchase, and sell electricity to meet the needs of its customers. BC Hydro serves 95 per cent of B.C.'s population, delivering electricity safely and reliably to approximately 1.9 million customers.

As the largest electric utility in British Columbia, BC Hydro operates an integrated system with 31 hydroelectric facilities and three thermal generating plants, totalling approximately 12,000 MW of installed generating capacity. The hydroelectric facilities provide over 95 per cent of the total electricity generated and are located in the Peace, Columbia, and Coastal regions of B.C. BC Hydro's own generation is complemented by additional electricity purchased from independent power producers in the province to meet customers' annual needs.

BC Hydro delivers electricity to its customers through a network of over 75,000 km of transmission and distribution lines, approximately 300 substations, 900,000 utility poles, and 325,000 individual transformers. The system is connected to other transmission systems in British Columbia, Alberta, and Washington State, which improves the overall reliability of the system and provides opportunities for trade.

The legislation that enables BC Hydro to carry out its mandate is the *Hydro and Power Authority Act*. Under the *Utilities Commission Act*, the British Columbia Utilities Commission regulates public utilities, including BC Hydro.

In addition, the *BC Hydro Public Power Legacy and Heritage Contract Act* ensures public ownership in perpetuity of BC Hydro's transmission and distribution systems, all of BC Hydro's existing generation and storage assets, and any future increases to the capacity and energy capability of these facilities. The Site C Project, once built, would become a heritage asset. *The Clean Energy Act*, S.B.C., 2010, c. 22, updated several elements included in the 2007 *BC Energy Plan*, and provides statutory guidance for how BC Hydro is to meet the Province's energy objectives.

BC HYDRO GENERATION

HYDROELECTRIC

- | | | |
|----------------|-------------------|-------------------|
| 1 Aberfeldie | 11 Jordan River | 22 G.M. Shrum |
| 2 Alouette | 12 Kootenay Canal | 23 Shuswap |
| 3 Ash River | 13 Ladore | 24 Spillimacheen |
| 4 Bridge River | 14 La Joie | 25 Stave Falls |
| 5 Buntzen | 15 Mica | 26 Strathcona |
| 6 Cheakamus | 16 Peace Canyon | 27 Wahleach |
| 7 Clowhom | 17 Puntledge | 28 Walter Hardman |
| 8 Elko | 18 Revelstoke | 29 Whatshan |
| 9 Falls River | 19 Ruskin | 30 Waneta |
| 10 John Hart | 20 Seton | 31 Clayton Falls |
| | 21 Seven Mile | |

CONVENTIONAL NATURAL GAS

- A Burrard
- B Fort Nelson
- C Prince Rupert



4. RATIONALE FOR THE PROJECT

Purpose of the Project

The Project is being proposed to meet three purposes: (1) to cost-effectively meet BC Hydro's forecast need for energy and capacity, (2) to meet forecast need in alignment with the provincial policy objectives of the *Clean Energy Act*, and relevant B.C. Government policy statements, and (3) to cost-effectively maximize the development of the hydroelectric potential of the Site C Flood Reserve which was established in 1957.

Need for the Project

Forecasts show that customer demand for electricity is expected to increase by about 40 per cent over the next 20 years. The Project is required to meet this projected demand and would provide energy and dependable capacity for more than 100 years.

BC Hydro must plan in advance to meet its customers' residential, business and industrial requirements and to ensure that the electricity resources required are available when required. The Project, like other large hydroelectric projects, has a long lead time prior to the Project in-service date due to the lengthy construction period and the requirement for design work, stakeholder engagement, and regulatory review.

BC Hydro evaluates the following factors in its planning process:

- **Current and forecast BC Hydro customer electricity load:** Load is the amount of electricity required by a BC Hydro customer or group of customers. The residential, commercial and industrial sectors each consume approximately one-third of BC Hydro's total electricity sales. BC Hydro annually prepares 20-year load forecasts for both energy (GWh) and peak power (MW) demand. The energy forecast represents the forecast total annual electricity demand on the integrated system and the peak power forecast represents the one-hour maximum power demand on the integrated system.

- **Existing and committed resources:** Existing resources include BC Hydro's Heritage hydroelectric and thermal resources as well as independent power producers (IPPs) currently delivering electricity to BC Hydro. Committed resources are those projects that have received regulatory or BC Hydro Board approvals.
- **BC Hydro's Demand Side Management Target:** BC Hydro plans to meet the majority of the load growth over the next 20 years through conservation and efficiency initiatives – generally referred to as demand side management (DSM). The current DSM target of 7,800 GWh/yr and 1,400 MW is comprehensive and includes a broad range of changes to codes and standards, rate structures, and DSM programs that provide BC Hydro customers in all market segments with an opportunity to participate.
- **Uncertainties in load growth:** BC Hydro's electricity demand can fluctuate from year to year depending on weather conditions, economic activity, population growth and consumer habits, among other factors. The mid-load forecast used for planning purposes is constructed so that there is an equal probability that actual load could be higher or lower than the mid-load forecast. BC Hydro's load forecasting methodology has been the subject of independent review in a number of B.C. Utilities Commission (BCUC) regulatory proceedings, and the BCUC has accepted BC Hydro's load forecasting methodology.

The Site C Project is required to meet BC Hydro's long term customer demand for both energy and dependable capacity.



- Resource deliverability risk:** All new resources have some degree of delivery risk. There is the risk that contracted IPPs will not come into service. There is also the risk that existing Energy Purchase Agreements with IPPs will not be renewed upon expiry. In addition, some of the potential technologies under consideration in the EIS, such as pumped storage generation, have not been developed in B.C. and, therefore, the delivery of these resources is uncertain. Finally, BC Hydro’s DSM target is aggressive and entails delivery risk because it relies on customer behaviour changes which are more challenging in a low rate environment like British Columbia. This may cause the projected energy and capacity savings from the DSM target to fall short of target within the specified time frame.

- Potential load from liquefied natural gas facilities:** The export of liquefied natural gas (LNG) is an emerging sector in British Columbia’s economy. There are several potential LNG projects proposed or under discussion which would require some service from BC Hydro. The need for the Project is established using a load forecast that does not include any load associated with new LNG facilities because the requirements of the facilities have not yet been confirmed by proponents. However, additional demand from these facilities would increase the load forecast and could accelerate the need for new generation resources in B.C.

The tables below show the forecast energy and capacity deficits over the next 10 to 20 years. These deficits are shown both with and without the DSM target and the implementation of Revelstoke Unit 6 (a sixth generating unit being added to an existing BC Hydro facility, “Rev 6”). These tables also show the potential impact of both the low and high scenarios of potential non-compression load from new LNG facilities.

Energy Deficit (Surplus) in GWh				
Year	No DSM or Rev 6 No LNG Load	With DSM & Rev 6 No LNG Load	With DSM, Rev 6, and Low LNG Load	With DSM, Rev 6, and High LNG Load
2022	7,200	(1,000)	(100)	5,600
2026	10,000	1,000	1,600	7,300
2031	15,000	3,800	4,600	10,400

NOTE: 1. All values rounded to nearest hundred

Capacity Deficit (Surplus) in MW				
Year	No DSM or Rev 6 No LNG Load	With DSM & Rev 6 No LNG Load	With DSM, Rev 6, and Low LNG Load	With DSM, Rev 6, and High LNG Load
2022	1,650	(250)	(200)	500
2026	2,350	200	300	1,000
2031	3,200	950	1,000	1,700

NOTE: 1. All values rounded to nearest fifty

New Energy and Dependable Capacity Required

Based on the load resource balance analysis, new resources are required to meet the energy and dependable capacity needs of BC Hydro customers within the next 10 to 15 years, even when taking into account BC Hydro's DSM target and Revelstoke Unit 6, and excluding load from LNG facilities. The addition of non-compression LNG load served by BC Hydro, lower than expected DSM results, or higher than expected attrition of IPP contracts, would accelerate the need for new resources.

Alternatives to the Project

Government policy and legislation provide a framework within which BC Hydro develops resources and aligns planning for forecast demand. This policy sets aggressive conservation and DSM targets with enabling rate structures, encourages investments in existing heritage asset facilities, precludes development of nuclear power and limits thermal generation and GHG emissions.

BC Hydro's analysis of the potential alternatives to the Project is contained in two parts:

- An overview of the identification and review process for screening potential alternatives to the Project. The screening process identifies the resources that were screened out because they are either legislatively barred or not technically or economically feasible in B.C.
- An overview of the available alternatives and their attributes (Available Resources). The Available Resources are supply-side resources that, when used in various combinations, can meet the forecast need and include (1) clean or renewable IPPs, including wind, run of river hydro, biomass, pumped storage, and geothermal; (2) BC Hydro Resource Smart potential; and (3) clean or renewable IPPs and / or Resource Smart combined with some natural gas-fired generation. Natural gas-fired generation is constrained by the *Clean Energy Act* to generate at least 93 per cent of the electricity in British Columbia from clean or renewable resources.

In order to evaluate the Project compared to other resource options, BC Hydro developed several portfolios of Available Resources that would provide comparable energy and capacity to the Project. These portfolios of resources take into account the relevant policy context, including the legislative requirements of the *Clean Energy Act*. The portfolios were established using three sets of assumptions regarding Available Resources:

- **Site C Portfolios:** These portfolios include the Project, with the remaining energy and capacity gap being filled using clean or renewable generation resources.
- **Clean Generation Portfolios:** These portfolios were created using Available Resources that would be clean or renewable. In these portfolios, the energy and capacity that would be provided by the Project is replaced by a combination of energy resources (such as wind, run-of-river, and biomass resources) and capacity resources (pumped storage).
- **Clean + Thermal Generation Portfolios:** In these portfolios, the energy that Site C would provide is replaced by clean or renewable generation resources, while the capacity the Project would provide is replaced by thermal generation resources in the form of simple-cycle gas turbines (SCGTs) and pumped storage.

Comparison of Attributes

BC Hydro compared the financial, technical, environmental and economic development attributes between the portfolios with and without the Project. These attributes are high level and appropriate for use in comparing the resource options at a portfolio level, but are not suitable for direct numerical comparison.

- **Technical Attributes:** The portfolios used to compare alternatives to the Project were constructed in order to have similar overall technical attributes. Therefore, each portfolio was built to have approximately 5,100 GWh of average annual energy and 1,100 MW of dependable capacity.
- **Financial Attributes:** The analysis compared the present value of portfolio costs, and the adjusted unit energy cost (UEC) between portfolios with and without the Project. The portfolio UEC represents the present value of the amount ratepayers would pay per unit of energy delivered as shown in the table below. This is a proxy for the life-cycle financial benefits from the selection of the Site C portfolio over alternative resource options. The UEC analysis showed that the Site C portfolio provided material ratepayer savings compared to the Clean Generation portfolio and the Clean + Thermal Generation portfolio. The ability to gradually introduce thermal resources may reduce the cost of the Clean + Thermal portfolio to that of the Site C portfolio.
- **Environmental Attributes:** BC Hydro used planning-level information to compare portfolios with and without the Project based on their environmental attributes.

Because of the advanced level of project definition for the Project, the environmental attributes related to the Project footprint

have a higher level of accuracy as compared to the alternatives. The portfolios without the Project are populated with forecast “typical” projects with estimated footprints. In addition, for many resources such as natural gas and biomass, the attributes only include the result of the primary generation site and do not include the footprint for fuel extraction activities. The fuel footprint is included for run-of-river hydro and for the Project. As a result, the differences in environmental attributes between portfolios shown in this section compare a defined attribute for the Project to a representative estimate for alternative resources.

While the table (top of page 9) includes numerical values for the environmental attributes, the actual difference between portfolios would also depend on the mix of clean resources (wind, run of river and biomass) included in the portfolios of renewable resources used for comparison with the Project.

Based on these portfolio compositions, the comparison of environmental attributes shows that the Site C portfolio could have a larger land and freshwater footprint than other portfolios. However, the land and stream footprint of the Site C reservoir represent a conversion of habitat from terrestrial and river environments to a reservoir environment and not a loss of productive environment. This may not be the case with other portfolios of alternative resources. Portfolios including the Project would have lower GHG emissions during operations than both portfolios not including the Project. Portfolios including the Project would also have lower local air emissions than both portfolios not including the Project.

Financial Attribute Comparison			
	Site C Portfolio	Clean Alternatives Portfolio	Clean + Thermal Portfolio
Adjusted Unit Energy Cost <i>[\$/MWh, F2013 dollars]</i>	110	181	155

④

Environmental Attribute Comparison (Operations only)				
Environmental Attribute		Site C Portfolio	Clean Alternatives Portfolio	Clean + Thermal Portfolio
Land Footprint (ha)		5,660	2,230	2,430
Affected Stream Length (km)		125	15	15
Operational GHG Emissions (tonnes per year, 000s)		0	200	650
Local Air Emissions (tonnes/year, 000s)	Oxides of Nitrogen	0	0.5	0.6
	Carbon Monoxide	0	0.4	1.3

Site C provides the best combination of financial, technical, environmental and economic attributes to meet BC Hydro's need for energy and capacity.

* Planning-level analysis only includes GHG emissions due only to fuel combustion during operations. An analysis of the life-cycle GHG emissions from the Project is included in Volume 2 Section 15 of the EIS and summarized in the Project Benefits section of this Executive Summary.

Economic Development Attributes:

Portfolios with and without the Project were compared based on their economic development attributes, including jobs and gross domestic product (GDP).

Portfolios including the Project deliver additional economic development during construction as compared to portfolios without the Project. Jobs and GDP related to construction are higher for the Site C portfolio due to the high job intensity during the Project construction period. Jobs and GDP during operations are expected to be lower for the portfolio including the Project as a result of the Project's low operating costs.

Rationale for Project Selection

There is a need for new energy and capacity resources within the next 10 to 15 years to meet the electricity needs of BC Hydro's customers.

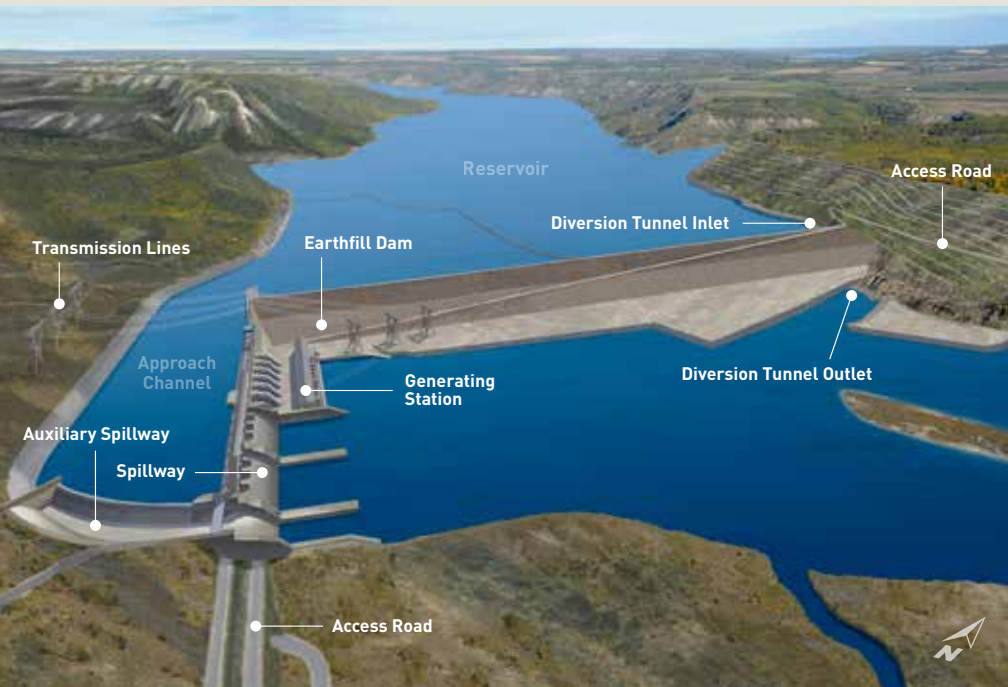
BC Hydro has an obligation to meet this customer demand, and has evaluated a range of different options to do so.

Based on the analysis of alternative resource options, the Project provides the best combination of financial, technical, environmental, and economic development attributes and is, therefore, the preferred option to meet the need for energy and capacity within BC Hydro's planning horizon.

Economic Development Attribute Comparison			
	Site C Portfolio	Clean Alternatives Portfolio	Clean + Thermal Portfolio
Construction Jobs* (total jobs)	44,250	33,230	28,520
Construction GDP (millions)	\$3,530	\$2,610	\$2,230
Operations Jobs* (jobs per year)	70	1,180	1,020

* The job estimates in this table used a high-level planning methodology to enable a comparison of jobs across portfolios. The EIS contains a more detailed jobs estimate for the Project.

5. KEY PROJECT COMPONENTS AND ACTIVITIES



Artist rendering of the proposed Site C dam and generating station (January 2013)

DAM

Type:	Earthfill dam
Height:	60 metres above riverbed
Length:	1,050 metres
Energy:	5,100 GWh/yr.
Capacity:	1,100 MW

RESERVOIR

Total Reservoir Surface Area:	Approximately 9,330 hectares
Total Flooded Land:	Approximately 5,550 hectares
Length:	83 kilometres
Width:	2-3 times the current river (on average)

The design of the proposed Project includes upgrades related to foundation stability, seismic protection, spillway safety and generating capacity.

The proposed Project is a third dam and hydroelectric generating station on the Peace River in northeast B.C. Key components and activities are described below.

A. DAM, GENERATING STATION, AND SPILLWAYS

The main components of the dam, generating station and spillways are:

- A left (north) bank stabilization: a large excavation to remove unstable materials from the bank above the earthfill dam and flatten the slope for long-term stability;
- Two diversion tunnels used for river diversion during construction;
- An earthfill dam across the river valley abutting onto bedrock on the north bank and a buttress of roller compacted concrete (RCC) on the south bank;
- An RCC buttress that would support the south wall of the valley and provide an abutment for the earthfill dam and the foundation for the generating station and spillways;
- A generating station, consisting of power intakes, penstocks (large pipes that convey the water from the intakes to the powerhouse) and six unit powerhouse;
- A spillway with seven gates and a free overflow auxiliary spillway to discharge inflows that exceed the capacity of the generating station;
- A lined approach channel to convey water from the reservoir to the power intakes and the spillways; and
- Three 500 kV transmission lines to conduct electricity from the generating station to a new substation near the dam site.



Technical Specifications and Due Diligence

The earthfill dam, RCC buttress, power intakes, spillway headworks and associated training walls would impound the reservoir. These structures would be designed and constructed to international and Canadian standards to withstand normal loads, including self-weight, reservoir and tailwater loads, internal water pressures due to seepage, ice, temperatures, and the interaction between the bedrock and the structures. In addition to normal loads, extreme scenarios were considered in the design and construction, including loads from events such as major floods and earthquakes. The Project design incorporates redundant systems that reduce risk and facilitate safe operation of the facility.

BC Hydro has studied how local conditions and natural hazards, such as severe and/or extreme weather conditions and external events, could adversely affect the Project. The assessment includes the following environmental factors: extreme weather events, sedimentation of the reservoir, seismic activity, wildfire, flooding, low flow or drought conditions, slope stability and mass wasting events, and climate change.

An understanding of the consequences of dam failure underlies several principles in the Canadian Dam Association (CDA) Dam Safety Guidelines and is used to establish two principle design criteria: the inflow design flood, and the earthquake design ground motion. BC Hydro has adopted the highest dam classification for the Project. This results in the most robust standard for the inflow design flood and earthquake design ground motion.

BC Hydro will develop emergency and operations plans for the Project that follow the CDA Dam Safety Guidelines and comply with BC Dam Safety Regulations.

Following industry practice for large scale hydroelectric projects, the Project has an established international Technical Advisory Board that has provided technical advice on the Project engineering and design. The members of the Site C Technical Advisory Board are globally recognized for their knowledge and experience with the design of hydroelectric projects around the world. The Technical Advisory Board meets to review key design milestones and will continue to provide input to the Project as it progresses through implementation and final design.

The Project would generate approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with about five per cent of the reservoir area.



Existing right-of-way between the Peace Canyon dam and Site C.

B. RESERVOIR

The Project would create an 83 km-long reservoir that would be on average two to three times the width of the current river. The reservoir would be a maximum of 55 m deep at the deepest section at the earthfill dam. The maximum normal operating range between the maximum normal reservoir level and the minimum normal reservoir level would be 1.8 m. However, most of the time, it is expected that the reservoir would be operated in the top 0.6 m of the range. The Site C reservoir would have one of the smallest fluctuations in the BC Hydro system.

C. SUBSTATION AND TRANSMISSION LINES TO PEACE CANYON DAM

The generating station would be connected to a new substation located to the southeast of the generating station. Two new 500 kV alternating current transmission lines would connect the new substation to the existing Peace Canyon substation, which is the point of interconnection of the Project to the bulk transmission system, a distance of approximately 77 km. These new lines would be located within and immediately adjacent to an existing right-of-way which is currently occupied by two existing 138 kV transmission lines, which run from the G.M. Shrum generating station at W.A.C. Bennett Dam to supply electricity to Fort St. John and Taylor.

The Site C substation would include 500 kV to 138 kV step-down transformers to provide service to Fort St. John, Taylor and the region, and allow for the removal of the existing 138 kV lines. This configuration will improve system reliability as the connection to the transmission system will be closer and would reduce transmission system energy losses.





Highway 29 crossing at Farrell Creek

D. HIGHWAY 29 REALIGNMENT

Highway 29 connects Hudson's Hope to Fort St. John and runs along the north side of the Peace River. It is a two-lane rural arterial undivided highway under the jurisdiction of the BC Ministry of Transportation and Infrastructure (BCMoTI). Creation of the reservoir will require realignment of approximately 30 km of existing highway at Lynx Creek, Dry Creek, Farrell Creek, Farrell Creek East, Halfway River and Cache Creek.

E. QUARRIED AND EXCAVATED CONSTRUCTION MATERIALS

A variety of quarried and excavated materials would be required for construction of the dam, generating station and spillways, Highway 29 realignments, access roads and the reservoir shoreline protection at the community of Hudson's Hope near the upstream end of the reservoir. These materials would be sourced from various locations in the Project vicinity. These materials would generally be transported from the sources to the construction sites by highway-rated trucks on public roads. Some quarried materials could be transported by rail to the dam site.

On-site materials refer to materials that would be sourced at the construction site, and come from excavations required for construction of Project components or from a location within the boundaries of the site. On-site materials will be used to the greatest extent possible.

Temporary camp accommodations and facilities for the construction phase are planned for the dam site.

F. WORKER ACCOMMODATION

BC Hydro is planning for provision of worker accommodation during construction. BC Hydro estimates it will generate approximately 10,000 person-years of direct employment during the construction period. The estimated average annual construction phase workforce on-site would be approximately 800 workers, with a peak of 1,700 (with contingency up to 2,100) workers in year five of construction. Approximately 90 per cent of the workforce would be required for construction activities at the dam site. About 10 per cent of the workforce would be required for off-site construction activities, including Highway 29 realignment, Hudson's Hope shoreline protection construction, road works, clearing, material transport, and transmission line construction.

Temporary camp accommodations and facilities for the construction phase are planned for the dam site, on both the north and south banks of the Peace River in close proximity to the work sites. Temporary accommodations would be removed at the end of the construction phase and sites would be reclaimed. Options to re-purpose some of the temporary camp facilities are also under consideration.

BC Hydro is also planning to build approximately 40 new permanent housing units for use by the construction workforce in the Fort St. John area, plus up to 10 new affordable housing units for use by the community in partnership with BC Housing. Following the construction period, all of the units would become part of the long-term housing stock in the area and be provided to the community for affordable housing.

Small temporary camps are planned for the reservoir clearing and road construction activities. One camp would be on the south bank in the vicinity of the access road construction near the upper Jackfish Lake Road area and the other in the vicinity of Hudson's Hope.



Jackfish Lake Road south of Fort St. John.

G. ROAD AND RAIL ACCESS

Temporary and permanent access roads would be required for the construction and operation of the Project, respectively. Where feasible, existing access roads would be used and upgraded as required. The design for new construction and upgrades to public roads would be in accordance with applicable British Columbian and Canadian guidelines, codes, supplements, and technical circulars.

An existing CN rail line passes close to the dam site on the south bank. The existing Septimus Siding near the dam site will be upgraded. It is anticipated that most of the bulk materials required for construction such as cement, fly ash and fuel will be transported to the site by rail.



Artist's conceptual rendering of worker accommodation.

H. CONSTRUCTION ACTIVITIES

Project activities include those activities required for construction and operation of the Project. This includes site preparation, clearing, transportation of materials, excavation, relocation of materials, placement of concrete, fabrication of penstocks, erection of buildings, the installation of mechanical and electrical equipment, reservoir preparation, road modifications, traffic management and decommissioning activities.

The construction of the dam, generating station and spillways would be carried out in four stages:

- Preliminary works
- River channelization
- River diversion
- Reservoir filling and commissioning

The preliminary works would include site preparation, construction of some temporary access roads, and construction and setup of the temporary facilities required for construction of the permanent works.

Cofferdams would be constructed on the north and south banks to confine the river to its main channel. Once the cofferdams have been completed, the water on the inside of the cofferdams would be pumped out to dewater or dry out the area where excavation and construction activities would take place. The cofferdams would isolate the work areas from the river. A temporary construction bridge would be constructed across the Peace River between the cofferdams. The diversion tunnels would be constructed on the north bank behind the cofferdams.

After completion of the diversion tunnels, the Peace River would be diverted through the tunnels, and the main river channel would be blocked off with cofferdams in order to isolate the area where the earthfill dam would be constructed across the Peace River. The temporary bridge would be removed after access is available across the earthfill dam.

Reservoir filling would take place near the end of construction.

ENVIRONMENTAL AND SAFETY MANAGEMENT PLANS

A framework for environmental and safety management has been developed for activities during construction and operation of the Project. The framework is consistent with existing BC Hydro policies and practices and is based on standard environmental and safety management principles. The purpose of environmental and safety management plans is to protect the health and safety of the public and workers, and to ensure that measures recommended to mitigate the potential adverse effects of the Project are implemented.

ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

BC Hydro has conducted a number of evaluations of alternate means to develop the hydroelectric potential of the Site C Flood Reserve. This work is consolidated in a comprehensive study, Review of Alternate Sites on the Peace River, which reviews previously identified alternates, and any new alternates, and compares them to the Project using a consistent evaluation process. The evaluation framework considered multiple project attributes including technical, financial, environmental and social for each alternative and compared them with the Project's attributes.

The conclusion of the alternates study is that the Project is the preferred means of cost-effectively maximizing the development of the hydroelectric potential of the Site C Flood Reserve.

The Project is the preferred means of cost-effectively maximizing the development of the hydroelectric potential of the Site C Flood Reserve.

6. CONSULTATION SUMMARY

BC Hydro began consultation with Aboriginal groups about the Site C Project in late 2007.

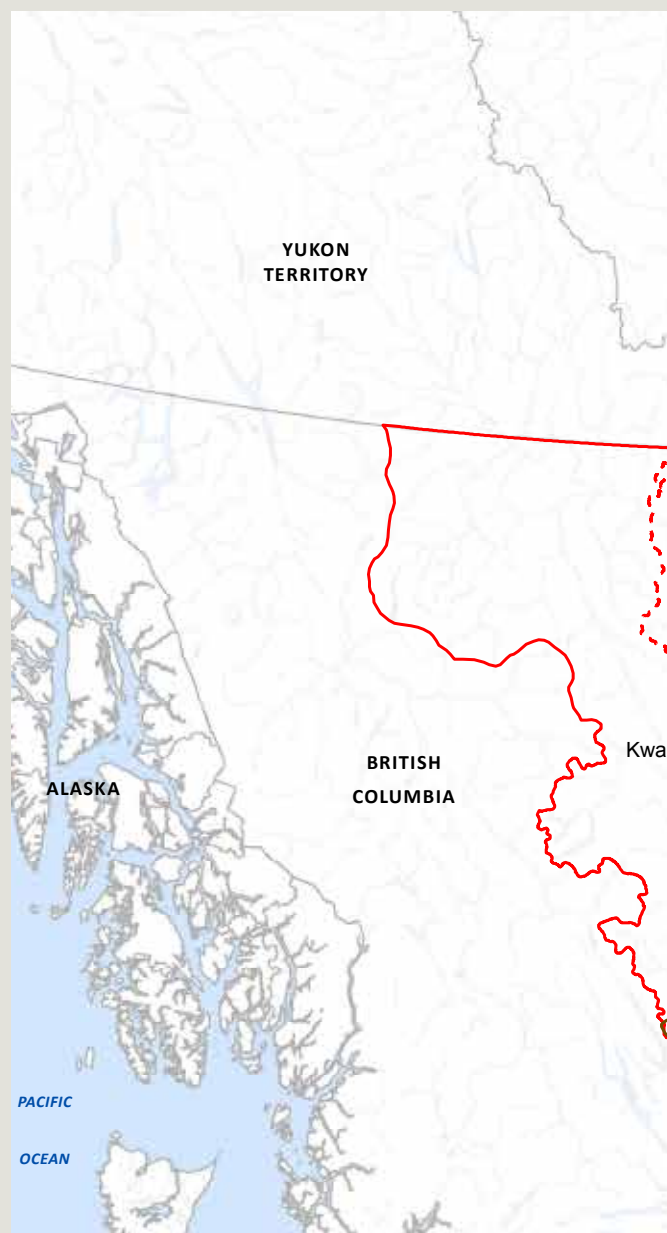


ABORIGINAL GROUP INFORMATION DISTRIBUTION AND CONSULTATION

BC Hydro began consultation with Aboriginal groups about the Project in late 2007, before any decision to advance the Project to an environmental assessment. BC Hydro has conducted consultation with Aboriginal groups regarding Project components and activities, the potential effects of the Project, and the potential changes to the environment resulting from the Project. BC Hydro has also supported consultation with Aboriginal groups as part of the environmental assessment process, including the review of the draft EIS Guidelines. Through the course of the consultation to date, Aboriginal groups have raised issues, concerns, and interests. BC Hydro has responded to Aboriginal groups as information was available, and has developed a process for addressing outstanding issues, concerns and interests. BC Hydro intends to continue to use this approach, should the Project proceed to construction and operation.

BC Hydro has consulted in greater depth with Treaty 8 First Nations that are in close proximity to the Project and whose members may experience effects from the Project. For the purposes of this EIS, Blueberry River First Nations, McLeod Lake Indian Band, Sauteau First Nations and the Treaty 8 Tribal Association (representing Doig River, Halfway River, Prophet River and West Moberly First Nations), are considered by BC Hydro to be “Project Area Aboriginal Groups”.

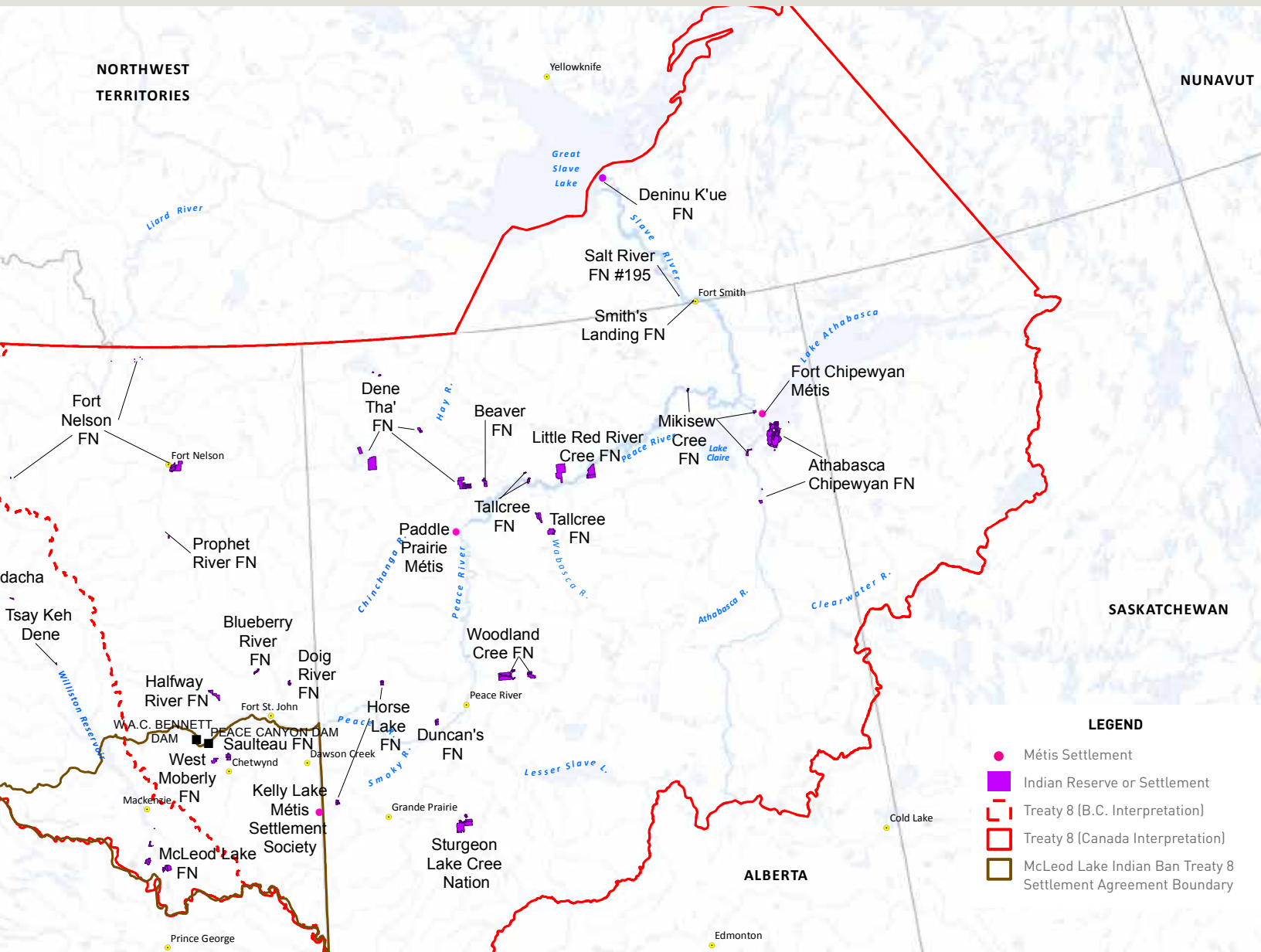
BC Hydro has also consulted with other Treaty 8 First Nations who are located in B.C. or downstream of the Project. This includes those Treaty 8 First Nations in Alberta, in proximity to the Peace River Watershed, and those in proximity to the Slave River through Alberta and into the Northwest Territories. Consultations with Aboriginal groups located away from the Project activity zone have focused on the potential downstream changes resulting from the Project. Consultation has also included the Tsay Keh Dene Band and Kwadacha First Nation to fulfill commitments in formal agreements with those First Nations.



Consultation has also been carried out with four Métis groups located in Alberta and the Northwest Territories. In addition, the CEA Agency directed BC Hydro to consult with two Métis organizations in B.C.

BC Hydro has negotiated consultation agreements that provide funding to facilitate Aboriginal participation in the consultation process. As of the end of November 2012, and dating back to 2008, BC Hydro has provided approximately \$8.5 million in capacity funding to Aboriginal groups to engage on the Project, including \$1.3 million to support traditional land use studies.

BC Hydro has tracked the issues, concerns and interests identified by Aboriginal groups through the consultation process in a comprehensive log and data base. A summary of these issues, concerns and interests and BC Hydro's corresponding consideration and response, as well as where the issue is addressed in the EIS, is provided in an issues tracking table in the EIS. The issues identified by Aboriginal groups also informed the selection of valued components and were considered in the development of each of the effects assessment chapters.



The Project team led or participated in more than 500 consultation meetings, presentations, local government meetings, community events or open houses.

PUBLIC INFORMATION DISTRIBUTION AND CONSULTATION

Comprehensive consultation with the public – including local and regional governments, communities, stakeholders, property owners and the general public – has taken place since 2007. This consultation includes BC Hydro-led consultation, as well as agency-led public comment periods as part of the environmental assessment process.

Since 2007, the Project team led or participated in more than 500 consultation meetings, presentations, local government meetings, community events or open houses. BC Hydro has also responded to approximately 3,000 inquiries received via email, in-person at the consultation offices, or through written submissions, which are in addition to information requests made as part of the environmental assessment process.

BC Hydro has documented all of its consultation activities, most of which are posted to the Project website at www.bchydro.com/sitec, including discussion guides, feedback forms, and Project information updates. A key component of the consultation process has been the independent reporting of the meeting notes and preparation of consultation summary reports.



Broad public notification and advertising was undertaken to advise the public of consultation opportunities. This notification included thousands of emails, print and radio advertising, household mailers and information to BC Hydro customers through bill inserts. Further, province-wide public opinion research results from July 2012 demonstrate public support for the Project with 77 per cent of those surveyed saying that they would be comfortable with Site C, provided it underwent an extensive and independent environmental assessment that is approved at the end of the process.

The EIS includes detailed issue tracking tables that summarize the issues, concerns and interests raised by the public since 2007 and describe how BC Hydro has considered and responded to the issues raised by the public and how this input has informed Project planning.



AGENCY INFORMATION DISTRIBUTION AND CONSULTATION

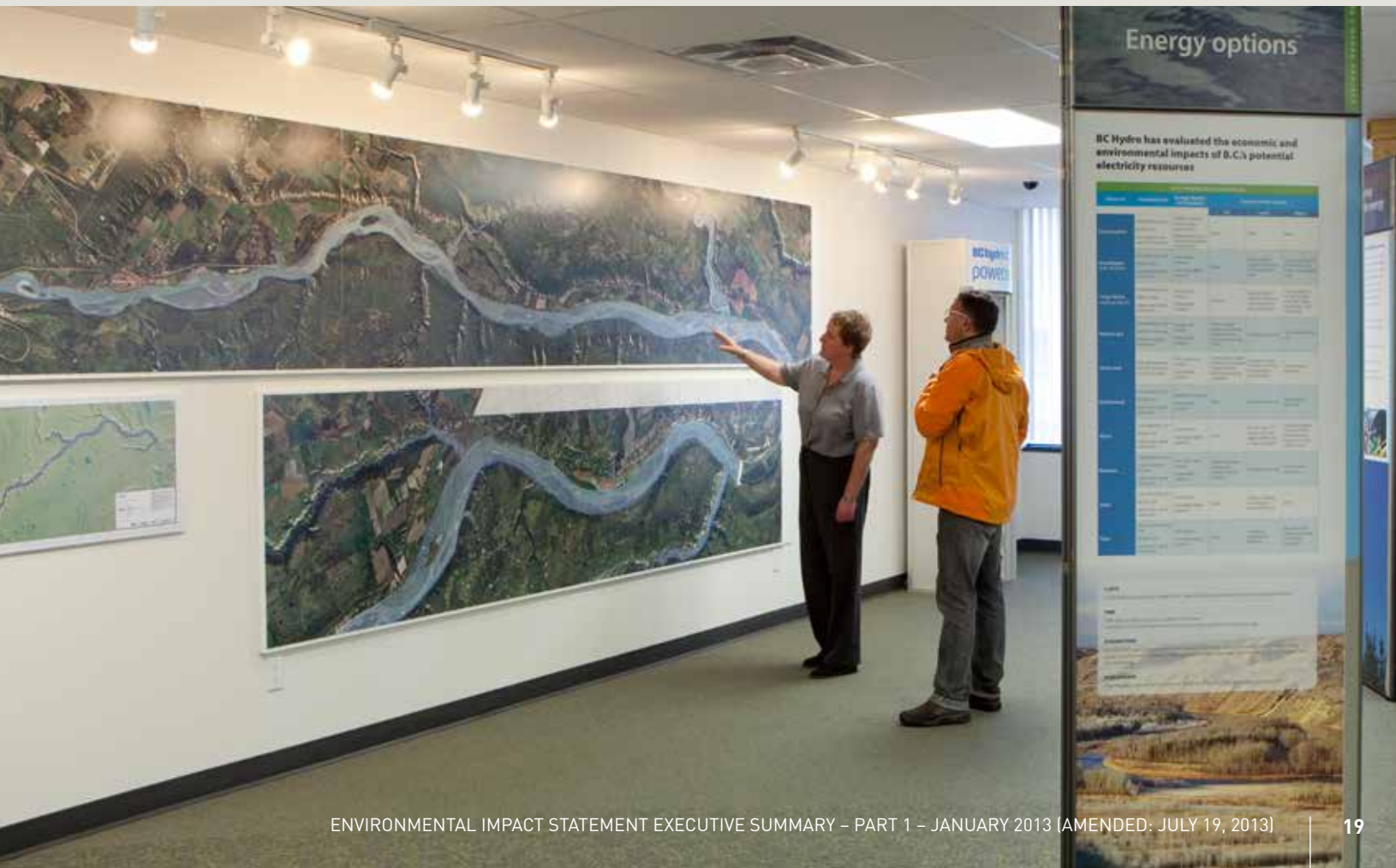
BCEAO and the CEA Agency also conduct consultation throughout the environmental assessment process. Summary information outlining the engagement with federal and provincial agencies is presented in the EIS, including a summary of issues, concerns and interests raised during agency-led consultations.

BC Hydro submitted draft EIS Guidelines to the Advisory Working Group for review in January 2012. During the review period, the Advisory Working Group provided 26 submissions totaling 1,007 comments, suggestions, and requests to the CEA Agency and BCEAO. BC Hydro responded to these information requests, and its response package included a revised draft of the EIS Guidelines, reflecting review comments provided by the Working Group and BC Hydro's responses.

The Federal Authorities and BCEAO reviewed and considered the documents in the response package and issued a third draft of the EIS Guidelines for public review and comment on April 10, 2012. During the public review process, BC Hydro responded to a further 912 submissions which included 1,388 specific comments or questions. The CEA Agency and BCEAO considered BC Hydro's responses, public comments, and advice from the Advisory Working Group prior to issuing the final EIS Guidelines on September 7, 2012.

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Once the EIS is filed, the regulators will facilitate a review and comment period with the Advisory Working Group and the public, following the provisions in the B.C./Canada Agreement.



7. PROJECT BENEFITS

Construction and operation of the Project would generate economic benefits at the local, provincial, and federal level.

The Project would provide important benefits to British Columbia and Canada. Key benefits described below include providing energy, dependable capacity and flexibility, regional economic development, job creation and increased government revenues, as well as benefits for communities and First Nations.

Economic Development Benefits: Construction and operation of the Project would generate economic benefits at the local, provincial, and federal level due to the purchase of goods and services for construction, operations and sustaining capital investment. These purchases would result in an increase in output from supplier industries, GDP, and household income. Economic development during the construction period is expected to add \$3.2 billion to the provincial GDP.

West Pine and Wuthrich quarries would be expanded and Portage Mountain quarry development will be specifically developed for the Project and available for production after the Project is constructed. A surplus of 2.9 million cubic metres of quarried rock would be available for use by B.C. Ministry of Transportation and Infrastructure and others in the region.

Economic Development Benefits from Site C		
	Total Increase During Construction (\$ millions)	Total Increase During Operations (\$ millions per year)
Regional		
GDP	130	0.4
Output	320	1.1
Household Income	80	0.3
Provincial (including Regional)		
GDP	3,230	7.0
Output	3,020	13.5
Household Income	2,230	4.9
Federal		
Imports from Other Provinces	580	1.8

Employment Benefits: Construction of the Project would create approximately 10,000 direct construction jobs, and approximately 33,000 total jobs through all stages of development and construction. In addition, the Project is expected to provide 25 permanent direct full-time positions during operations, with additional employment resulting from

spending on environmental monitoring, purchases from supplier industries, and sustaining capital activities for the facility. The table below shows the expected employment benefits during both the construction and operations periods.

Construction of the Project would create approximately 10,000 direct construction jobs.

Estimated Employment Provided by Site C			
	Direct Jobs	Indirect and Induced Jobs	Total Employment
Development and Construction Phase (person years)			
Development Phase	2,200	1,500	3,700
Construction Phase	10,200	19,100	29,300
Total Jobs Prior to In-Service Date	12,400	20,600	33,000
Operations Phase (average person-years per year)			
Operations and Maintenance	25	65	90
Sustaining Capital (levelized)	35	40	75
Total Employment After In-Service Date	60	105	160



The Project would be a clean, renewable and reliable power resource that would provide cost-effective long-term energy and dependable capacity to ratepayers.

Economic Benefits to Aboriginal Groups and Local Communities:

Aboriginal groups and local communities would benefit from the economic development and employment provided by the Project. BC Hydro is working to encourage Aboriginal and local participation through investments in training and education and promotion of job opportunities within the local community.

Benefit Agreements

Aboriginal groups and local communities would benefit from additional economic and social initiatives that are documented in the EIS and described in Part 2 of this summary. BC Hydro is committed to continuing to negotiate a benefits agreement with Peace region communities and impact benefits agreements with some Aboriginal groups.

Benefits to Ratepayers: The Project would be a clean, renewable and reliable power resource that would provide cost-effective long-term energy and dependable capacity to ratepayers. The Project would produce an average of 5,100 GWh per year and 1,100 MW of dependable capacity at a lower cost than portfolios of other resource options, for the asset life of more than 100 years.

The Project would help reduce uncertainty in customer rates, as the Project’s operating costs would be stable and predictable and because the majority of costs are incurred during construction and development.

The Project has a dependable capacity of 1,100 MW, which is flexible and can vary its generation within a short period of time to match instantaneous demands of BC Hydro customers and the system as a whole. This flexibility allows the Project to facilitate the integration of additional wind generation into the system while maintaining system reliability by providing power that can quickly respond to variations.

Benefits to Taxpayers: The Project would provide benefits to taxpayers in the form of additional revenues to federal, provincial, and local levels of government. Construction of Site C would result in a total of \$486 million for all three levels of government through taxation revenues generated by the Project. Once operational, the Project would contribute \$43 million annually to provincial and local governments through grants-in-lieu of taxes, school taxes, and water rental fees, in addition to a return on equity and contribution to dividend to the Province each year (\$220 million in the first year of operations).

Summary of Government Revenues (selected years) (F2012 \$millions)						
	Construction Period Total	Operations Period				
		Year 1	Year 5	Year 10	Year 25	Year 50
Local Revenues	40	2	2	2	2	2
Provincial Revenues	176	260	230	200	135	75
Federal Revenues	270	<1	<1	<1	<1	<1



Environmental, Social, and Sustainability Benefits:

The Project provides sustainable development benefits by optimizing the use of existing hydroelectric facilities delivering approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with only five per cent of the reservoir area.

The Project provides other environmental and social benefits. Some examples include:

- The Project would have among the lowest emissions of Greenhouse Gas (GHG) per unit of energy produced over the Project life compared to other forms of electricity generation. The table below illustrates that emissions from the Project would be comparable to other renewable sources such as wind and run-of-river hydro.

- There would be long-term benefits from road and highway infrastructure improvements completed as part of the Project. On some routes – such as Highway 29 North, Jackfish Lake Road and Old Fort Road – implementation of mitigation measures and construction of road improvements would improve road safety.

The Project would have among the lowest emissions of Greenhouse Gas (GHG) per unit of energy produced compared to other forms of electricity generation.

Comparison of GHG Emissions intensity	
Generating Facility Type	Average (g CO ₂ e/kWh)
Site C Clean Energy Project	10.5
Canadian Boreal Hydroelectric	36
Tropical Hydroelectric	2,150
Model Coal	1,000
Integrated Gasification Combined Cycle (Coal)	798
Diesel	717
Natural Gas Combined Cycle	545
Solar Photovoltaic	58
Wind Turbines	14

6

- The new proposed substation would provide improved system reliability for BC Hydro customers in the Project area by being more closely connected to the transmission system.
- The Project would create a 9,300 hectare reservoir, which would result in a 230 per cent increase (3.3 fold) in fish habitat area compared to the current river environment. This increase in fish habitat area and the change from a river to a reservoir environment would be accompanied by an increase in certain areas of aquatic productivity.
- Fishing opportunities during operations are expected to increase over baseline conditions as the Site C reservoir would support increased boating and angling use, and would continue to support sport fish.
- Water-based recreation is expected to increase in the reservoir after construction compared to the base-case as a result of greater potential access by a variety of boats.

In summary, the Project would provide a wide range of benefits. Businesses and workers who are involved with the construction and/or operations of the Project would receive benefits through employment and economic development. BC Hydro customers would receive benefits through the cost-effective energy and capacity generated by the Project, and through the low risk of future increases in the Project cost of energy. All British Columbians and Canadians would receive benefits through increased government revenues both during the construction and operations phases of the projects. Finally, the Project would contribute to sustainable development through its optimization of existing BC Hydro hydroelectric facilities on the Peace River, and through its low greenhouse gas emissions intensity.

8. POTENTIAL EFFECTS OF THE PROJECT



ENVIRONMENTAL ASSESSMENT METHODOLOGY

BC Hydro conducted a comprehensive study of baseline conditions and background information to prepare for the effects assessment of the Project. Multi-year planning and technical studies were conducted and the findings are included in a large number of technical data reports that are appended to the EIS. This work was completed as a preliminary step in the effects assessment process. With this information, it was possible to identify and assess the potential effects of the Project on valued components (VCs).

Valued components are aspects of the Project's biophysical and human setting that are considered important by Aboriginal groups, the public, the scientific community, and government agencies. For the purpose of formal effects assessment in British Columbia, VCs are categorized under five "pillars": 1) environmental, 2) economic, 3) social, 4) heritage, and 5) health, which are referred to in the BCEAA. The term "valued components" in the EIS incorporates and is consistent with the federal government's terminology of "valued ecosystem components".

VCs were identified in a three-step process. In the first step, candidate valued components were identified based on the interests and concerns raised by government agencies, Aboriginal groups, and the public, and input provided by the CEA Agency and BCEAO during consultation. In the second step, the list of candidate VCs was screened to determine whether there would be a potential interaction between the Project and the VC. If a potential

interaction was identified it was carried forward to the third step. The third step was to determine whether the effects on a candidate VC could be effectively assessed under a separate, related, or more appropriate VC. If this was not the case, that candidate VC was identified as a VC for the effects assessment.

Spatial boundaries for each VC delineate areas within which the potential effects of the Project on VCs have been assessed. Scientific justification for the selection of relevant spatial boundaries is included for each VC. Temporal boundaries have also been set for the assessment of potential effects on each VC and span construction and operations.

The baseline conditions for each VC are described in the EIS and include the relevant legal framework, how information from the public and Aboriginal traditional knowledge has been considered where provided, the information sources and methods used to collect baseline data, and a description of baseline conditions.

For each VC, the assessment of the potential effects for each of the Project components and activities during construction and operations is based on a comparison of the biophysical and human environments between the predicted future conditions with the Project and the predicted future conditions without the Project. Potential adverse effects on the VC are described in the EIS along with technically and economically feasible mitigation measures, their potential effectiveness, as well as specific follow-up and related commitments for implementation.

If there is a residual effect on a VC, the effect is evaluated for significance. Residual effects are characterized using criteria related to direction, magnitude, geographic extent, duration, frequency, reversibility, context, level of confidence and probability in accordance with the EIS Guidelines.

A summary of the VCs, potential Project effects, key proposed mitigation measures and residual effects can be found in Part 2 of this Executive Summary. Complete details of the assessment and mitigation measures are included in Volumes 2, 3 and 4 of the EIS.

ENVIRONMENTAL BACKGROUND

The Project would introduce changes to the physical environment and these predicted changes to land, water and air were taken into account in the assessment of the potential effects on the VC, where relevant. For example, changes in sediment levels in surface water have been taken into account in assessing the potential effects on fish and fish habitat as well as on human health. The technical investigation of the potential changes to the physical environment is described in the environmental background section and supported by an extensive volume of technical data reports.

Geology, Terrain & Soils includes the physiographic and topographic setting and the stability of the terrain. The evaluation includes a description of bedrock and surficial geology, key landforms, seismic conditions and geotechnical and geochemical processes.

Predicted changes to erosion and slope stability as a result of the creation and operation of the proposed reservoir are described and reservoir impact lines delineating zones of potential flood, erosion, landslide, and landslide-generated wave hazards are provided in the EIS.



Land Status, Tenure and Project

Requirements includes the identification of land ownership and provides a summary of associated land tenure of private, BC Hydro owned and Crown land. The EIS includes a discussion of potential changes to tenured areas, as well as the requirements to acquire or obtain new rights over private or government owned property to construct and operate the Project.

Surface Water Regime describes the surface hydrological conditions and features (reservoirs, rivers, tributaries) and flows. Hydraulic models were used to predict the potential changes in the hydrological regime (reservoir levels, seasonal flow patterns and water level) from Peace Canyon Dam to Peace Point, Alberta and the main drainage tributaries to the proposed reservoir (Lynx Creek, Farrell Creek, Halfway River, Moberly River).

The normal operating range would provide an active storage volume of 165 million cubic metres. The average residence time of the water in the Site C reservoir would be 22 days. Due to the limited active storage volume of the Site C reservoir, the Project has limited ability to influence the flow regime. Hydraulic modelling studies predict that changes due to the Project would be negligible beyond the Town of Peace River, AB.



Water Quality describes the water quality conditions from the forebay of Williston reservoir through the Dinosaur reservoir and the Peace River valley along the Peace River, to upstream of the confluence with the Alces River, including Peace River tributaries in this area. Water quality parameters, including nutrient and metals concentrations, suspended sediment levels, dissolved gas pressure levels, pH, alkalinity, and temperature, were measured and concentrations are summarized and compared to B.C. and Canadian Water quality guidelines. Without the Project, some of these parameters currently exceed guidelines under baseline conditions.

Groundwater Regime identifies the location of water wells, springs, infrastructure and land use that could be influenced by changes to the groundwater regime from Peace Canyon dam to the proposed Site C dam. The analysis includes changes to slope stability, land or resource use, subsurface geology, aquifers and water table positions, as well as potential changes to groundwater chemistry due to the release of non-natural sources (potential contamination) or natural sources (geologic materials).

Studies indicate that the Project would not lead to changes in groundwater quality; however, there would be changes to groundwater levels in proximity of the proposed Site C reservoir.

Thermal and Ice Regime describes water temperature and ice regimes of the Peace River in the proposed reservoir and downstream to Fort Vermillion, Alberta. Changes to reservoir water temperature and ice regimes were predicted based on a three-dimensional numerical model. Potential changes to downstream water temperatures utilized a two-dimensional cross-sectionally averaged hydrodynamic and water quality model. Existing and post-construction ice conditions were studied using a one-dimensional numerical ice simulation model.

Results from these studies were used to identify potential changes to the timing of ice cover formation and breakup, extent of ice cover, ice thickness and conditions that affect river transportation. The studies suggest that the Project would lead to a reduction in the maximum upstream extent of the ice cover.

Fluvial Geomorphology & Sediment Transport includes studies of changes to suspended sediment characteristics and transport rates, bed material characteristics and bedload transport rates, patterns and rates of channel erosion and deposition in the Peace River and tributaries from Peace Canyon dam downstream to Peace Point, Alberta. Predictive modelling was used to describe changes to suspended sediment dynamics (inflow, deposition and outflow) in the proposed reservoir, as well as suspended sediment concentrations and tributary sediment mixing, bed material mobilization, channel erosion and deposition downstream of the Site C dam.

The studies predict that the proposed reservoir would trap a portion of the sediment delivered from tributaries, while the remainder (mostly clay) would be transported out of the reservoir and down the Peace River. There would be an overall reduction in the suspended sediment load downstream due to the creation of the reservoir.

Methylmercury describes how under natural conditions, mercury (Hg) occurs in low concentrations in all environmental media, including water, soil, sediment, plants and in all terrestrial and aquatic animals. Over time, inorganic Hg is captured from the atmosphere by the leaves and needles of plants, which fall to the ground, accumulate, and are sequestered and concentrated into terrestrial soils. When soils are flooded, degradation of the organic material creates favorable conditions for sulfate-reducing bacteria that transform or “methylate” some of the inorganic Hg into organic mercury, primarily methylmercury (MeHg). MeHg concentrations are higher in large-bodied, longer-lived animals, especially those at the top of the food chain such as predatory fish.

A range of methods was used to predict the Hg and MeHg concentrations in water and biota (invertebrates, fish) over the life of the Site C reservoir and downstream to Many Islands, Alberta. The analysis concluded that there may be an increase in MeHg concentrations in fish in the reservoir for a period of time before returning to pre-Project levels, which are relatively low compared to other Canadian lakes and reservoirs.

Microclimate includes climate data analysis for temperature, precipitation, wind speed, relative and absolute humidity and fog. The study area includes the Peace River valley and North Peace Regional airport (Fort St. John airport). Results of the climate monitoring network in the Peace River valley and the Weather Research and Forecast model were used to predict changes to micro-climate parameters, including precipitation levels, fog, wind speed and direction, air temperature, barometric pressure, humidity, solar radiation, and heat flux.

The results of these studies suggest that there may be modest increases in annual fog hours in the study area. In addition, there may be a slight increase in temperature in the winter and a slight decrease in the summer adjacent to the reservoir. Within 1 km of the reservoir, the annual average temperature is expected to increase by less than 1 degree.



Air Quality discusses existing conditions and predicted Project-related changes to air quality, including ambient levels and air quality emissions during construction activities and operations in an area that encompasses the Project activity zone. The analysis included current ambient levels of nitrogen oxides, sulphur dioxide, particulate matter and other possible contaminants and emissions (ozone), as well as an emissions inventory for vehicles and equipment, clearing and burning, extraction and handling of materials and fugitive emissions.

The studies indicate that there may be temporary increases in ambient particulate levels in the vicinity of the dam construction site during construction. Ambient air criteria for all other parameters would meet current provincial and federal guidelines for air quality.

Noise and Vibration discusses existing conditions and predicted Project-related changes to noise and vibration at certain locations used by people and wildlife near the Project activity zone. Noise levels were modelled for construction and operations scenarios, including topographic, temperature and wind effects on noise propagation of transportation and equipment generated sound emissions. The EIS also describes blasting vibration and “sound-induced” or airborne vibration. The analysis of noise from construction activities indicates that noise guidelines may be exceeded in some locations.

Electric and Magnetic Field (EMF) are found wherever electricity is generated, delivered, or used, including power transmission and distribution lines, wiring in homes, workplace equipment, electrical appliances, power tools, and electric motors. Transmission lines produce both electric and magnetic fields. Electric and magnetic fields were calculated for the two new 500 kV lines which will replace the existing 138 kV lines. Electric fields are influenced by line voltage, tower head dimensions and configuration and the height of the conductors above ground. Magnetic fields are influenced by the line current, the phase-to-phase spacing, tower head configuration and height of the conductors above ground.

The relationship between technical study topics and VCs is summarized in the following table.

Technical Study	Valued Component
Geology, Terrain & Soil	Agriculture; Community Infrastructure and Services; Forestry; Greenhouse Gases; Heritage; Navigation; Outdoor Recreation and Tourism; Vegetation and Ecological Communities; Visual Resources; Wildlife Resources; Fish and Fish Habitat; Current Use of Lands and Resources for Traditional Purposes; Oil, Gas and Energy; Harvest of Fish and Wildlife Resources
Surface Water Regime	Community Infrastructure and Services; Fish and Fish Habitat; Harvest of Fish and Wildlife Resources; Navigation; Outdoor Recreation and Tourism; Transportation; Current Use of Lands and Resources for Traditional Purposes; Wildlife Resources
Water Quality	Fish and Fish Habitat; Human Health
Groundwater Regime	Agriculture; Community Infrastructure and Services; Human Health
Thermal and Ice Regime	Fish and Fish Habitat; Navigation; Outdoor Recreation and Tourism; Transportation; Wildlife Resources; Current Use of Lands and Resources for Traditional Purposes
Fluvial Geomorphology and Sediment Transport	Community Infrastructure and Services; Fish and Fish Habitat; Navigation; Vegetation and Ecological Communities; Wildlife Resources; Oil, Gas & Energy; Human Health (water quality)
Methyl Mercury	Human Health; Fish and Fish Habitat
Micro-Climature	Agriculture; Navigation; Transportation
Air Quality	Greenhouse Gases; Human Health
Noise and Vibration	Fish and Fish Habitat; Human Health; Wildlife Resources
Electric and Magnetic Fields	Human Health

VALUED COMPONENTS

Based on the effects assessment methodology described above, the 22 VCs defined in the EIS Guidelines were assessed by BC Hydro. The results of the assessment are contained in Sections 12 through 33 in the EIS and are summarized in Part 2 of this Executive Summary. A description of each of the valued components is included below.

Fish and Fish Habitat

The potential for construction and operation of the Project to adversely affect Fish and Fish habitat has been assessed. Three categories of potential effects were assessed in the EIS: changes to fish habitat, changes to fish health and fish survival, and changes to fish movement.

Vegetation and Ecological Communities

The potential for the Project to adversely affect vegetation and ecological communities by altering or fragmenting the habitat, including wetlands, terrestrial ecosystems, rare and sensitive ecological communities, and rare vascular and non-vascular plants, was assessed.

Wildlife Resources

The Wildlife Resources VC includes the following key species groups: butterflies and dragonflies, amphibians and reptiles, migratory birds, non-migratory gamebirds, raptors, bats, furbearers, ungulates, and large carnivores.

For each of the key indicator groups, the potential for the Project to result in (1) habitat alteration and fragmentation, (2) disturbance and displacement, and (3) direct and indirect mortality, has been assessed.

Greenhouse Gases

Greenhouse gas (GHG) emissions accumulate in the atmosphere and are believed to be a major factor in producing the greenhouse effect that may affect climate. There is a potential for Project activities to result in the release of these types of GHG emissions.

Local Government Revenue

The potential for the Project to affect local government revenues and expenditures has been assessed. Changes in local government revenues and expenditures are valued by local residents because they receive services from, and pay property taxes to, local governments. Federal and provincial governments would also receive revenues in the form of income taxes, consumption taxes, or royalties.

Labour Market

The Project requires workers with specific skills and occupational training. The labour supply may be drawn from residents living close by the Project, as well as throughout B.C., Canada, or internationally. Labour demand corresponds to the number of positions of the requisite skills at the required time to construct and operate the Project, plus demand by supplier (i.e., indirect) and consumer (i.e., induced) industries supported by Project expenditures.

Regional Economic Development

Regional economic development is the change in areas of the economy, such as business competitiveness that contribute to a region's overall economy and standard of living. Expenditures made by the Project would accrue to individuals, businesses, and communities in the region, and thereby contribute to the development of the regional economy. Regional economic development key indicators addressed in the assessment were the regional business and contracting profile, capabilities, and capacity, including Aboriginal companies.

Current Use of Lands and Resources for Traditional Purposes

The Project has the potential to change land, water, or resources, or access to lands, water or resources, used by Aboriginal groups for traditional purposes. The key indicators for this VC are current use of lands and resources for hunting, fishing and trapping activities, including the location of the activity, the species targeted, access to the activity, the traditional uses of harvested animals, and the current use of lands and resources for activities other than hunting, fishing and trapping by Aboriginal groups. The assessment considers the nature, location and traditional use purpose.

8

Agriculture

Agriculture is an important component of the economy in the Peace region. The effect of the Project on the VC of agriculture is assessed considering the interactions between the Project and the four key aspects of agricultural land base, farm operations, the agricultural economy, and food production and consumption.

Forestry

The potential for the Project to affect forestry was assessed considering the Project interactions with the forest land base, with Crown forest land management, and with the forest industry.

Oil, Gas and Energy

The Project would physically overlap areas where oil and gas exploration and development occurs. The potential for the Project to affect oil, gas, and energy was assessed considering the Project's interactions with the land base and with the oil, gas, and energy industry activity.

Minerals and Aggregate

The Project's use of land would overlap with areas where potential exists for mineral and aggregate production, or where there are existing quarries or pits. The potential for the Project to affect minerals and aggregate has been assessed in consideration of the changes to land use, resource use, and access. The Project's use of local aggregate for construction activities, and any new or improved access to aggregate sources created by the Project were also assessed.

Harvest of Fish and Wildlife Resources

The Peace River and areas adjacent to it are used for the harvest of fish and wildlife resources. The potential for the Project to affect harvest of fish and wildlife resources was assessed by considering Project changes to the use of and access to hunting, fishing, trapline, and guide outfitter areas, tenures areas, or the availability of harvested species based on the results of the assessment of the potential for the Project to affect fish and fish habitat, and wildlife resources.

Outdoor Recreation and Tourism

The Project has the potential to affect recreation and tourism infrastructure, and may result in changes in outdoor recreation use levels and regional tourism visitor levels. The Project effects on Outdoor Recreation and Tourism are assessed by considering the Project interactions with outdoor recreation and tourism features, amenities, sites, activities, visitor levels and use levels.

Navigation

The potential for the Project to affect water-based navigation (navigation) and air navigation (aviation) has been assessed by predicting the Project-caused changes to navigability and navigation use of water bodies, to aviation routes or visibility, or to operation of the ferry and ice bridge crossings of the Peace River at Shaftesbury and Tompkins Landing in Alberta.

Visual Resources

As the Project would introduce permanent, visible features to the landscape, visual resources would be affected within and around the Project activity zone. The key indicators for Visual Resources are the visibility of Project components from selected sites and viewpoints in the Project area, and predicted scenic values.

Population and Demographics

The Project demand for skilled labour during construction would exceed the local labour supply, resulting in an in-migration of workers and a resultant change in local population and demographics. Population change is a determinant of other potential changes to housing and on community infrastructure and services. The key indicators for population and demographics are number of persons (gender, age profile, labour force participation), households, and demographic characteristics, including marital status and dependents.

Housing

The Project demand for labour during construction would result in an in-migration of workers and a resultant change in local population, and would become a driver of change in the demand for local area housing. The assessment of effects on housing takes into account the Project plans to provide worker accommodation, and the current capacity of the local housing market to receive increased demand, using indicators of housing availability, cost and future supply.

Community Infrastructure and Services

Population change and changes to the physical land base as a result of the Project would affect infrastructure and services that communities in proximity to the Project provide to residents. The Project effects on the community infrastructure and services valued component were assessed by taking into consideration changes in the demand for, or the provision of, community, emergency, education and health, and social services, and specific displacement of, or effects to, infrastructure, such as sewer and water systems.

Transportation

Transportation infrastructure pertains to the system of roadway, rail, and air modes of travel. The effects on transportation have been assessed considering the Project's use of existing roads and railways and development of new roads to move people, equipment, goods, and materials to and from construction and operational sites, potentially creating traffic delays and affecting road safety.

Heritage Resources

The potential to adversely affect heritage resources has been assessed by taking into account the potential for the Project to result in disturbance to heritage sites, features, artifacts, human remains, fossils, or character, by changing access to sites, and in consideration of issues raised by Aboriginal groups. These key indicators provide physical evidence of ancient flora and fauna or cultural materials including, but not limited to, remains of ancient campsites, burials, subsistence procurement sites, and historic structures.

Human Health

The potential for human health effects as a result of the Project have been assessed by considering changes in air quality, water quality, noise and vibration, electric and magnetic fields, and methylmercury levels in fish.

9. ABORIGINAL GROUPS AND THE POTENTIAL IMPACTS ON THEIR RIGHTS AND INTERESTS

BC Hydro will continue to consult with Aboriginal groups in order to identify and consider outstanding issues throughout the environmental assessment process.

As set out in the EIS Guidelines, BC Hydro focussed its consultation efforts on 29 Aboriginal groups, including Treaty 8 First Nations and Métis groups in British Columbia, Alberta and the Northwest Territories, as well as two non-treaty First Nations in B.C. The EIS contains an assessment of the potential adverse impacts of the Project on the exercise of asserted or established Aboriginal rights and treaty rights of the identified Aboriginal groups. This assessment includes BC Hydro's understanding of each Aboriginal group's asserted or established Aboriginal rights and treaty rights, and how the exercise of those rights may be affected by the Project. This information is derived from the effects assessment carried out for the Current Use of Lands and Resources for Traditional Purposes VC. The EIS presents measures to mitigate or accommodate potential adverse impacts of the Project on the exercise of the identified asserted or established Aboriginal rights and treaty rights.

The EIS also includes summaries of background information for each Aboriginal group, including maps of their traditional territories where they have been made available to BC Hydro. Aboriginal land and resource use summaries have been prepared for each Aboriginal group, involving a review of information made available by Aboriginal groups through traditional land use studies, as well as other publicly available information, to inform BC Hydro's understanding of past, current and reasonably anticipated future use of lands and resources by the 29 Aboriginal groups. Summary information is also included respecting elements included in Impact Benefit Agreements that have been offered or tabled with those First Nations which may be adversely affected or impacted by the Project, and where BC Hydro considers that accommodation beyond the mitigations described in the EIS is warranted.

BC Hydro's record of consultation is extensive. The issues and interests raised by Aboriginal groups are described fully in the EIS in an issues tracking table, and are considered in the effects assessments for each applicable VC. BC Hydro is also working to build capacity among Aboriginal people who may benefit from opportunities that may arise as a result of the Project.

Consultation with Aboriginal groups respecting potential impacts of the Project on the exercise of asserted or established Aboriginal and treaty rights is ongoing. In some cases, Aboriginal groups have raised issues, concerns or interests that at the time of the filing of the EIS and in the view of BC Hydro, have not been fully addressed.

BC Hydro will continue to consult with Aboriginal groups in order to identify and consider outstanding issues throughout the environmental assessment process, and additional information made available to BC Hydro by Aboriginal groups will be considered prior to submission of the EIS to the Joint Review Panel. If the Project receives approval, consultation with potentially-affected Aboriginal groups will continue through construction and operations.

10. MITIGATION MEASURES

BC Hydro has proposed comprehensive mitigation measures to avoid or mitigate potential adverse Project effects. A detailed list and description of proposed mitigation measures are included in the EIS and are in Part 2 of this Executive Summary.

Mitigation Incorporated in the Project Design

In addition to the mitigation measures described in Part 2, BC Hydro has made changes to the historic project design. The following table summarize some of the design changes that have been incorporated to date to avoid or reduce potential effects of the Project.

Two further changes were made to the design of the Project after the commencement of the effects assessment. Both of these changes would reduce the potential effects of the Project, however, to be conservative, the assessment was undertaken with the larger footprint.

- The transmission line right-of-way requirements were reduced by changing the design and the sequencing of construction of the two 500 kV transmission lines so that the two existing 138 kV transmission lines could be removed, reducing the footprint.
- The capacity of the diversion works was increased by increasing the diameter of the diversion tunnels, reducing the fluctuation of the head pond during diversion.

BC Hydro has proposed comprehensive mitigation measures to avoid or mitigate potential adverse project effects.

Project Component	Valued Component	Effects Avoided or Mitigated	Avoidance or Mitigation Measure
Dam, generating station and spillways	Wildlife Resources	Loss of wildlife habitat	Maximize relocation of surplus excavated material upstream of dam Reduce footprint and disruption of wetland habitat and clearing by relocating worker accommodation Minimize footprint on big island downstream of dam
	Fish and Fish Habitat	Dissolved gas supersaturation	Modify spillway design to minimize dissolved gas
Reservoir	Community Infrastructure and Services	Erosion of slopes at Hudson's Hope	Extended shoreline protection
Highway 29 realignments	Community Infrastructure and Services	Potential erosion by reservoir	Realign Highway 29 at Dry Creek and Farrell Creek East
	Agriculture	Loss of agricultural land	Select alignment at Lynx Creek that includes a portion of Millar Road
Quarried and excavated construction materials	Wildlife Resources	Loss of bat hibernacula	Eliminate Tea Creek from consideration as a source of temporary riprap
	Human Health	Reducing heavy truck traffic on public roads – lower risk to human safety, less noise and dust	Select a conveyor for transporting construction material from 85th Avenue Industrial Lands to the dam site area
	Wildlife Resources	Disturbance to caribou	Place restrictions on blasting at West Pine quarry to no greater than historical levels during January 16 to March 31 and from May 15 to June 14 of each year
	Transportation	Traffic congestion in Hudson's Hope and on Highway 29	Source permanent riprap for dam, generating station, and spillways from West Pine Quarry as opposed to Portage Mountain Quarry
	Minerals and Aggregates	Use of aggregate in project area	Source aggregate for Highway 29 realignment from areas that would be inundated

11. PROPONENT'S CONCLUSIONS

The purpose of the environmental assessment is to assess the potential residual adverse effects of the Project and determine whether each of those effects is significant when it is considered alone and when it is considered as a cumulative effect that is in combination with the residual effects of other projects and activities. This section of the Executive Summary includes the proponent's conclusions about the significance of potential residual adverse effects and cumulative effects of the Project.

SIGNIFICANCE OF POTENTIAL RESIDUAL EFFECTS

The conclusion of the substantial work undertaken to date indicates that the effects of the Project can largely be mitigated through careful project planning, comprehensive mitigation programs and ongoing monitoring during construction and operations. As a result, the Project is unlikely to result in a significant adverse effect on most of the VCs. However, a determination of significance has been made for the following VCs:

Fish and Fish Habitat

The transformation of a river ecosystem to a reservoir would create a new and productive aquatic ecosystem. This new aquatic ecosystem is expected to support a community of equal or greater productivity than the existing riverine environment. However, the composition of fish species would change. Overall, this would increase the productive capacity of fish and fish habitat in the reservoir. With this change, three distinct sub-groups of species, the migratory Arctic grayling in the Moberly River, the migratory bull trout that spawn in the Halfway River and mountain whitefish that rely on Peace River habitat, may be lost. However, these species would continue to be present in Peace River tributaries and downstream of the Site C dam, and may persist in the reservoir. As a result of the potential loss of these distinct sub-groups of fish, a finding of significance has been made.

Wildlife Resources

Habitat for certain migratory birds (Canada, Cape May and Bay-breasted Warblers, Yellow Rail and Nelson's Sparrow) would be affected by the creation of the reservoir. Because these select migratory birds are considered species at risk, a determination of significance has been made. None of the other species of wildlife assessed are expected to be significantly affected by the Project as proposed mitigation would be effective or the populations are not at risk.

Vegetation and Ecological Communities

The creation of the reservoir and other Project activities would alter and fragment some unique terrestrial ecosystems that include a marl fen, tufa seeps, and old and mature riparian and floodplain forests. In addition, some occurrences of rare vascular and non-vascular plants would be lost. 9

As a result of potential alteration and fragmentation of unique terrestrial ecosystems and loss of rare plant species, a determination of significance has been made. 10

Current Use of Lands and Resources for Traditional Purposes

The creation of the reservoir would result in the loss of some important multi-use, cultural areas and valued landscapes, including sites at Attachie, Bear Flats and Farrell Creek. As a result, a determination of significance has been made for the effect on the use of these areas by members of the Treaty 8 Tribal Association, Saluteau First Nations and Blueberry River First Nations. In addition, the effect on other cultural and traditional uses would be significant for McLeod Lake Indian Band at the confluence of the Peace River with the Halfway River. The effect on hunting, trapping and fishing opportunities and practices would not be significant. 11

BC Hydro will continue to explore additional potential mitigation opportunities for these specific VCs.

SIGNIFICANCE OF POTENTIAL CUMULATIVE EFFECTS

The EIS provides an assessment of the cumulative effects that may result from the Project in combination with other projects or activities that have been, or will be carried out. The assessment was conducted to determine whether potential residual adverse effects of the Project on a VC would have a spatial and temporal overlap with the potential residual effects of another project or activity conducted within the Regional Assessment Area (RAA) on the same VC.

In order to conduct the assessment of the potential cumulative effects of the Project on a VC, three cases were developed: a baseline case, a future case without the Project, and a future case with the Project. The first two cases were used to demonstrate the status of the VC taking into account the effects of projects and activities that have been and will be carried out. The case with the Project was then used to determine the extent to which those effects would combine with the potential residual adverse effects of the Project. In consideration of possible regional approaches to mitigation, the potential residual cumulative effects of the Project were then assessed and the significance determined.

The future cases were developed taking into account registered and active projects on the BCEAO and CEA Agency websites, and projects and activities identified by reviewing registered oil and gas applications, registered water license applications, Land Act tenure applications, harvest plans, official community plans and large waste discharges into the Peace River from Peace Canyon Dam to Vermillion Chutes, Alberta. All of those projects and activities have been included on the "Project Inclusion List".

The anticipated residual effects to Vegetation and Ecological Communities from other future projects and activities combined are considered significant, even without the Project. This is because the potential residual effects of other projects and activities that include road construction, forestry and land clearing activities, cannot be fully mitigated and the future loss of rare plants and rare and sensitive ecosystems due to these other projects have the potential to further elevate provincial or federal listings. The cumulative effect with the Project is also considered significant.

The anticipated residual effects to Wildlife Resources from other future projects and activities combined are considered significant, even without the Project. The footprints of other projects and activities within the regional assessment area would result in the loss and fragmentation of habitat for wildlife. The Project would potentially result in the alteration and fragmentation of habitat, disturbance or displacement, and mortality for certain key indicator species or species groups. The cumulative effect with the Project is also considered significant.

Increasing GHG emissions from the many sources globally and the resulting increase in GHG concentrations in the atmosphere, and the consequent changes to the global climate, are currently believed to be a significant cumulative environmental effect, even without the Project. While the Project's contribution to a net change in global GHG emissions is relatively small and the environmental effect of the Project related GHG emissions on global climate is not measurable, the cumulative effect with the Project is also considered significant.

12. CONCLUSION OF THE EIS

The Project will support the integration of additional intermittent renewables in to BC Hydro's system as part of a clean energy strategy.

BC Hydro is proposing to construct the Site C Clean Energy Project, including a dam and hydroelectric generating station on the Peace River in northeast British Columbia. The Project would provide clean, reliable, renewable power for more than 100 years.

The environmental assessment of the Project is being carried out in accordance with CEAA 2012, BCEAA and the B.C./Canada Agreement. The EIS has been prepared in accordance with the EIS Guidelines and meets the objectives of the guiding principles set out in those guidelines. The EIS demonstrates that 1) a comprehensive environmental assessment has been conducted, 2) the public have been provided a clear understanding of the Site C Project as early as possible in the review process and have been provided with opportunities to participate in the environmental assessment process, and 3) BC Hydro has engaged with Aboriginal groups as early as possible in the project planning process.

BC Hydro began consulting with Aboriginal groups in late 2007, well before a decision to advance the Project to the environmental assessment process. While consultations are ongoing, BC Hydro has a comprehensive record of issues and interests raised by Aboriginal groups, which have been taken into account in the assessment. BC Hydro also began consulting with communities in late 2007, and has led or participated in more than 500 public consultation meetings, presentations, local government meetings, community events and open houses. Input from these consultations informed Project planning and design, as well as the proposed mitigation measures.

The assessment was conducted to assess the potential effects of the Project on 22 valued components related to the environment, economy, social, heritage and health. The Project will potentially result in changes that may impact these valued components, and, therefore, a comprehensive set of mitigation measures have been proposed based on leading scientific and engineering techniques and with input from Aboriginal groups and communities.

The conclusion of the substantial work undertaken to date indicates that the effects of the Project can largely be mitigated through careful project planning, comprehensive mitigation programs and ongoing monitoring during construction and operations. In addition, the Project delivers substantial benefits to customers, Aboriginal groups, communities, British Columbia and Canada.

BC Hydro serves approximately 1.9 million residential, commercial, and industrial customers, which represent 95 per cent of the electricity users in the Province. Over the next 10 to 15 years, demand for electricity is expected to grow by up to 40 per cent, and BC Hydro has a legislated obligation to ensure a secure supply of power to meet this need.

Based on BC Hydro's long-term planning process and analysis of alternative resources to meet need, the Site C Project has been identified as the preferred resource option to meet both long-term energy and capacity requirements. As hydroelectric projects are complex, they require a long lead time to plan, design, and to complete the rigorous environmental assessment process. In addition, they take many years to construct. For these reasons, BC Hydro believes the Project should proceed now to ensure that the energy and dependable capacity from the Project is available to meet forecast customer demand.

The Project would provide ratepayer, taxpayer, employment, economic development and community benefits. The construction of the Project would create approximately 10,000 direct construction jobs and approximately 33,000 total jobs through all stages of development. It would also provide substantial economic benefits, including a contribution of \$3.2 billion to the provincial GDP during construction.

BC Hydro is committed to providing lasting benefits and opportunities to Aboriginal groups and communities through the construction and operation of the Project. Examples of regional benefits would include employment and contracting opportunities, improvements to infrastructure, road upgrades, new outdoor recreation opportunities and additional affordable housing units.

As a clean, renewable resource, the Project would deliver electricity with very low GHG emissions per unit of energy produced. Emissions would be comparable to other renewable sources such as wind and run-of-river hydro. As such, the Project will support both provincial and federal GHG reduction strategies. In addition, the dependable capacity provided by the Project will facilitate the integration of additional renewables into BC Hydro's system, supporting the Province's clean energy strategy.

BC Hydro concludes that while the Project has the potential to result in some significant residual effects, they are justified by (1) the public interest served by delivering long term, reliable electricity to meet growing demand (2) the employment, economic development, ratepayer, taxpayer, and community benefits that would result (3) the ability of the Project to meet this need for electricity with lower GHG impact than other resource options and (4) because the Project would take advantage of water already stored in the upstream reservoirs to generate over 35 per cent of the energy generated by BC Hydro's largest facility with only 5 per cent of the reservoir area. Further, BC Hydro is continuing to consult with Aboriginal groups and to seek accommodations where appropriate.

As a cost-effective, renewable energy project, Site C would provide clean, reliable electricity and dependable capacity for BC Hydro customers for generations to come.

As a cost-effective, renewable energy project, Site C would provide clean, reliable electricity and dependable capacity for BC Hydro customers and for generations to come.





ENVIRONMENTAL IMPACT STATEMENT EXECUTIVE SUMMARY

PART 2: SUMMARY OF VALUED COMPONENTS

Amended: July 19, 2013

SITE



CLEAN
ENERGY PROJECT

BChydro 

FOR GENERATIONS

ENVIRONMENTAL ASSESSMENT METHODOLOGY

This section of the Executive Summary provides an overview of the approach taken with each valued component (VC), including key indicators for potential effects, the assessment area, potential effects, proposed key mitigation measures and a conclusion by the Proponent on the significance of any potential residual effects.

Environmental Assessment Methodology

BC Hydro conducted a comprehensive study of baseline conditions and background information to prepare for the effects assessment of the Project. Extensive planning and technical studies were conducted over a number of years and the findings are included in a large number of technical data reports that are appended to the EIS.

Based on this work and on input from, and consultation with, Aboriginal groups, the public, the scientific community, and government agencies, 22 VCs were selected for assessment and are categorized under five “pillars”: 1) environmental, 2) economic, 3) social, 4) heritage, and 5) health, consistent with the *BC Environmental Assessment Act*.

Spatial boundaries were selected for each VC to assess the potential effects of the Project. These boundaries vary for each VC and the EIS includes a scientific justification for their selection. The spatial boundaries for all VCs consider the Project activity zone. The Project activity zone is the area within which the project components will be found or will occur.

For each VC, the assessment of the effects for each of the Project components and physical activities in all phases is based on a comparison of the biophysical and human environments between the predicted future conditions with the Project, and the predicted future conditions without the Project. Potential adverse effects on the VC are described along with technically and economically feasible mitigation measures.

In the following pages, the valued components are presented in the same order as they appear in Volumes 2, 3 and 4 of the EIS.

Fish and Fish Habitat

Vegetation and Ecological Communities

Wildlife Resources

Greenhouse Gases

Local Government Revenue

Labour Market

Regional Economic Development

Population and Demographics

Housing

Community Infrastructure and Services

Current Use of Land and Resources for
Traditional Purposes

Agriculture

Forestry

Oil, Gas and Energy

Minerals and Aggregates

Harvest of Fish and Wildlife Resources

Outdoor Recreation and Tourism

Navigation

Visual Resources

Transportation

Heritage Resources

Human Health

FISH AND FISH HABITAT

Fish and fish habitat would potentially be affected by the construction and operation of the Project.

Scope Of The Effects Assessment

The fish and fish habitat assessment analyses potential effects of the Project on:

- Changes in Fish Habitat: Quality and quantity of fish habitats, habitat availability, water depth, velocity, water temperature, sedimentation, water quality, ice regime, aquatic productivity, food resources, and competition for food and habitat
- Changes in Fish Health and Survival: Species diversity; fish population distribution, fish population relative abundance, fish population biomass, sedimentation, stranding, fish entrainment, and total dissolved gas
- Changes in Fish Movement: Fish species population, movement patterns and general life history parameters (i.e., access to habitats), swim speeds, and fish entrainment

Assessment Area

The Local Assessment Area for fish habitat includes:

- the Peace River in the proposed reservoir area
- tributaries entering the proposed reservoir
- Peace River downstream of the proposed Site C Dam to the Many Islands Area, Alberta
- watercourses and water bodies within the transmission line and roadway rights-of-way
- watercourses and water bodies within the Project activity zone
- riparian areas adjacent to identified watercourses and water bodies

The Regional Assessment Area includes the Peace River from Peace Canyon Dam, B.C. to Vermilion Chutes, Alberta.

Baseline Conditions

Baseline conditions for each of the key indicators were compiled based on available literature, extensive, multi-year field studies and information from traditional land use studies.

The effects assessment is structured to evaluate how categories of effects on the VC (habitat, health and survival, and movement) would be affected by the activities during construction and operation of the Project.

FISH AND FISH HABITAT

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes to Fish Habitat	<p>Construction</p> <ul style="list-style-type: none"> • Place material relocation sites 15 m back from the high water level to avoid affecting Peace River fish habitat • Incorporate fish habitat features into the final capping of materials sites • Include fish habitat features (e.g., shears, large riprap point bars, etc.) in the final design of the north bank haul road • Compensate for fish habitat affected by Highway 29 realignment 'like for like' in the vicinity of the habitat loss • Contour Highway 29 materials sites prior to decommissioning to provide littoral fish habitat in the reservoir • Replace fish habitat by incorporating fish habitat features into the final design of the Hudson's Hope shoreline protection berm • Retain non-merchantable trees and vegetation in riparian areas within a 15 m buffer zone from the high water mark. Merchantable trees, and vegetation that could interfere with navigation, will be removed using clearing practices to maintain a 15 m machine-free zone • Manage construction footprints to reduce the impact on fish and fish habitat • Remove temporary structures from the river as soon as they are no longer required <p>Operation</p> <ul style="list-style-type: none"> • Manage reservoir fluctuation within a 1.8 m maximum normal operating range to reduce effects to the shoreline fish habitat • Where appropriate, plant a 15 m wide riparian area along the reservoir shoreline adjacent to BC Hydro-owned farmland to provide riparian habitat and bank stabilization • Enhance side channel complexes between the dam site and the confluence of the Peace and Pine rivers to increase wetted habitat during low flows • Create new wetted channels and restore back channels on the south bank island downstream of the dam to create off channel and back channel habitat
Changes to Fish Health and Survival continued...	<p>Construction Sediment Reduction Measures</p> <ul style="list-style-type: none"> • Adjust timing of construction activities to coincide with periods of high background sediment levels where feasible • Use clean rock materials for riprap construction to reduce the amount of sediment introduced into the aquatic environment • Reduce equipment production rates to limit the amount of sediment generated by equipment where needed • Berm or cap areas with high potential to produce sediment • Leave stumps in the reservoir in place during clearing to reduce soil disturbance and potential sedimentation issues, where feasible • Clear in winter, where feasible, to reduce soil disturbance • Conduct in-stream construction in isolated work areas when feasible

FISH AND FISH HABITAT

Potential Effects	Key Mitigation Measures
<p>Changes to Fish Health and Survival ...continued</p>	<p>Stranding Avoidance Measures</p> <ul style="list-style-type: none"> • Monitor fish habitat areas where periodic dewatering occurs to determine primary stranding locations • Implement a fish collection and relocation program for stranded fish • Enhance side channel complexes in the reach between the dam site and the confluence of the Peace and Pine Rivers to increase wetted habitat and to reduce stranding potential • Contour mainstem bars, where practical, to reduce potential for fish stranding <p>Fish Passage Measures</p> <ul style="list-style-type: none"> • Use large, slow rotating Francis turbines to increase entrainment survival • Design smooth and gradual transitions at the approach channel and penstock entrances and tailrace exit structures into the final design • Design the orientation and size of openings and exits to reduce hydraulic turbulence to reduce fish injury • Ensure smooth surface finishing on linings of tunnels and spillways • Reduce obstructions (e.g., boulders) from spillway and tailrace areas • Utilize large diameter diversion tunnels and associated hydraulics that provide low risk of fish mortality • Incorporate smooth and gradual transitions from the round tunnels to the square exits <p>Dissolved Gas Mitigation Measures</p> <ul style="list-style-type: none"> • The spillway design has been modified to reduce total dissolved gas generation • Develop and implement an operational procedure to reduce the number of hold points and duration of the reservoir filling and turbine commissioning to reduce total dissolved gas concentration in tailwater <p>Operations Measures to Reduce Total Dissolved Gas Generation:</p> <ul style="list-style-type: none"> • Develop and implement an operational procedure to manage the rate of discharge at each gate to reduce dissolved gas generation • Develop and implement an operational procedure to reduce total dissolved gas concentration in tailwater
<p>Changes to Fish Movement</p>	<ul style="list-style-type: none"> • Provide upstream fish passage during construction and operations by a trap and haul facility • Implement a periodic capture and translocation program for small-fish species (contingent on the results of investigative studies into the genetic exchange requirements of upstream and downstream populations)

FISH AND FISH HABITAT

Monitoring

An environmental monitoring program during construction will be developed to evaluate the effectiveness of these mitigation measures and to validate the predictions about physical changes in the environment during construction. In addition, Environmental Management Plans will be implemented during construction to limit impacts on fish and fish habitat, including, but not limited to, the Fish and Aquatic Habitat Management Plan, Erosion Prevention and Sediment Control Plan, and Surface Water Quality Management Plan.

Key Findings: Fish and Fish Habitat

The transformation of a river ecosystem to a reservoir would create a new and productive aquatic ecosystem. This new aquatic environment is expected to support a community of equal or greater productivity than the existing riverine environment. However, the composition of fish species would change.

Species such as kokanee, lake whitefish, lake trout, burbot, peamouth and rainbow trout that can adapt to the new ecosystem would benefit. Other species that rely on riverine habitats may decline in the reservoir environment. Three distinct groups of the species that may decline in the new ecosystem may be lost: the migratory component of the Moberly River Arctic grayling, migratory bull trout that spawn in the Halfway River, and mountain whitefish that rear in the Peace River and spawn in tributaries of the Peace River or the Peace River mainstem upstream of the Site C dam site.

The loss of these distinct groups would result from the loss of river habitat, reduced fish health and survival during construction and reservoir filling, and hindered fish movement. Although these distinct groups would be affected, Arctic grayling, bull trout and mountain whitefish would continue to be present in Peace River tributaries and downstream of the reservoir and may persist in the reservoir.

As a result of the potential loss of these distinct groups of fish, the Project may result in a significant adverse effect on fish and fish habitat.

VEGETATION AND ECOLOGICAL COMMUNITIES

12

The potential effects of the Project on vegetation and ecological communities (terrestrial ecosystems, rare and sensitive ecological communities, and rare vascular and non-vascular plants) are assessed based on one general effect category – habitat alteration and fragmentation – which covers the temporary and permanent loss and fragmentation of vegetation and ecological communities, including wetlands.

Assessment Area

The Local Assessment Area for vegetation and ecological communities includes the Project activity zone buffered by an additional 1,000 m, and downstream from the Site C dam to the Alberta border buffered by 1,000 m on both the south and north banks of the Peace River.

The Regional Assessment Area comprises five Wildlife Management Units, including most of the Peace Lowlands eco-section and all Project components.

Baseline Conditions

Baseline conditions for each of the key indicators was compiled from available literature, field studies, and information from traditional land use studies.

This assessment evaluates how categories of effects on the VC (habitat alteration and fragmentation) would be affected by activities during construction and operation of the Project.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Habitat alteration and fragmentation	<ul style="list-style-type: none"> Place transmission towers and temporary roads away from wetlands and known rare plant occurrences where feasible Establish Environmental Protection Zones to protect known rare plant occurrences located adjacent to construction areas where feasible Plan and implement construction activities in a manner that seeks to maintain the hydrology of adjacent wetlands, particularly where known rare plant occurrences are present Implement measures to maintain existing hydrological patterns as much as possible if roads cannot avoid wetlands Install culverts under access roads to maintain hydrological balance Install sedimentation barriers as needed Retain vegetation on steep, unstable slopes that would be highly susceptible to landslides if the vegetation was removed Retain non-merchantable trees and vegetation in riparian areas within a 15 m buffer zone from the high water mark. Merchantable trees and vegetation that could interfere with navigation will be removed using clearing practices to maintain a 15 m machine-free zone. Develop a wetland mitigation and compensation plan Employ a hydrologist to assist with developing site-specific measures to reduce changes to the existing hydrological balance and wetland function during construction of the Jackfish Lake Road, Project access roads, and the transmission line. Consider an experimental rare plant translocation program for suitable rare plant species found within the reservoir and other areas where Project components are certain to remove the populations.
continued...	

13

VEGETATION AND ECOLOGICAL COMMUNITIES

Potential Effects	Key Mitigation Measures
<p>... continued</p> <p>Habitat alteration and fragmentation</p>	<p>BC Hydro will fund a compensation program that will include:</p> <ul style="list-style-type: none"> • A survey of habitat enhancement projects in the Regional Assessment Area to identify projects that might provide compensation for rare and sensitive habitats and protect occurrences of rare plants (e.g., wetlands). If suitable habitat enhancement projects can be found, BC Hydro will provide assistance (financial or in-kind) to the appropriate managing organization. • Identification of areas that are under threat from development or in need of habitat enhancement. Where opportunities exist, BC Hydro will consider direct purchase – if offered for sale – and/or management of these lands to enhance or retain rare plant values. BC Hydro will also consider contributing to other protection options where direct purchase is not feasible. <p>Implement the following Environmental Management Plans:</p> <ul style="list-style-type: none"> • Air Quality Management • Erosion Prevention and Sediment Control • Fisheries and Aquatic Habitat Management • Fuel Handling and Storage Management • Soil Management Site Restoration and Revegetation • Vegetation and Invasive Plant Management

Key Findings: Vegetation and Ecological Communities

The creation of the reservoir and other Project activities would alter and fragment some unique terrestrial ecosystems that include marl fen, tufa seeps, and old and mature riparian and floodplain forests. In addition, occurrences of rare vascular and non-vascular plants would be lost.

14

As a result of potential alteration and fragmentation of unique terrestrial ecosystems and loss of occurrences of vascular and non-vascular plant species at risk, a determination of significance has been made.

15

WILDLIFE RESOURCES

The Wildlife Resources assessment considers the potential effects to habitat alteration and fragmentation, disturbance and displacement, and mortality for the following wildlife groups: butterflies and dragonflies, amphibians and reptiles, migratory birds, non-migratory gamebirds, raptors, bats, furbearers, ungulates, and large carnivores.

Assessment area

The Local Assessment Area (LAA) encompasses the Project activity zone, buffered

by an additional 1,000 m. The LAA also extends downstream from the Site C dam to the Alberta border and includes a 1,000 m buffer on both the south and north banks of the Peace River. The Regional Assessment Area (RAA) includes five Wildlife Management Units and includes most of the Peace Lowlands eco-section and incorporates all Project components.

Baseline conditions for each of the key indicators was compiled based on available literature, field studies, and information from traditional land use studies.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
16 Habitat Alteration and Fragmentation continued...	<p>Wetlands</p> <ul style="list-style-type: none"> • Develop a wetland mitigation and compensation plan • Establish appropriate barriers and Environmental Protection Zones to avoid direct disturbance to wetland sites • Create new wetland habitat areas for migratory birds and a range of other species • Create areas that are “fish-free”, where appropriate, to reduce the effects of fish predation on invertebrates, amphibian eggs and larvae, and young birds • Maintain existing hydraulic patterns if roads cannot avoid wetlands; ditches, culverts, and other structures will be placed to maintain the natural drainage patterns and allow the movement of flows <p>Habitats</p> <ul style="list-style-type: none"> • Retain vegetation on steep, unstable slopes that would be highly susceptible to landslides if the vegetation was removed • Retain non-merchantable trees and vegetation in riparian areas within a 15 m buffer zone from the high water mark. Merchantable trees and vegetation that could interfere with navigation will be removed using clearing practices to maintain a 15 m machine-free zone • Locate artificial dens on warm aspect slopes in open areas away from major roads • Incorporate nest boxes for cavity-nesting waterfowl into wetland mitigation plans and within riparian vegetation zones, where feasible • Provide a portion of BC Hydro-owned land for breeding habitat for Northern Harrier and Short-eared Owl. Wetland compensation will also be made available to address some habitat losses for these two species • Incorporate bat roosting habitat features into new bridge designs, where feasible • Install bat boxes on free-standing poles or on facility walls where their presence will not interfere with facility operations and maintenance • Create and disperse natural or artificial piles of coarse woody debris to maintain fisher foraging areas and cold-weather rest sites • Create arboreal resting sites for fisher • Provide artificial fisher den boxes within forested stands that have limited Tier 3 trees

WILDLIFE RESOURCES

Potential Effects	Key Mitigation Measures
<p>17</p> <p>... continued Habitat Alteration and Fragmentation</p>	<p>Ungulates</p> <ul style="list-style-type: none"> • Manage BC Hydro-owned lands at the Halfway River and Wilder Creek to provide ungulate winter range on the north bank of the Peace River <p>Environmental Management Plans</p> <ul style="list-style-type: none"> • Implement the following Environmental Management Plans: <ul style="list-style-type: none"> • Erosion Prevention and Sediment Control Plan • Fisheries and Aquatic habitat Management Plan • Fuel Handling and Storage Management Plan • Soil Management Site Restoration and Re-vegetation • Surface Water Quality Management Plan • Vegetation and Invasive Plant Management Plan
<p>18</p> <p>Disturbance and Displacement</p>	<p>Construction</p> <ul style="list-style-type: none"> • Reduce, where feasible, light pollution at work sites • Restrict access on roads used by work crews during construction • Incorporate the location of rare species along the transmission line right-of-way or adjacent to generation facilities into BC Hydro's GIS-based mapping system • Provide all known sharp-tailed grouse lek locations during the final construction design phase • Use appropriate flagging if work is required immediately adjacent to any leks, and instruct personnel to avoid these sites • Develop a detailed Human-Bear Conflict Management Plan for the Project • Implement the following Environmental Management Plans: <ul style="list-style-type: none"> • Soil Management Site Restoration and Revegetation Plan • Wildlife Management Plan <p>Bald Eagles</p> <ul style="list-style-type: none"> • Update the baseline data on Bald Eagle nest sites from 2011 prior to commencement of construction • Erect Bald Eagle nesting platforms along the reservoir shoreline. If an active nest is lost due to the Project, new nesting structures will be provided • Retain Bald Eagle nests outside the dam construction area that are confirmed active the year that clearing is started within the reservoir through the entire construction phase until reservoir filling is initiated • Remove nests that could be lost during seasonal flooding associated with dam construction. For active nests retained through the construction period, a "no-clearing buffer" around each active nest will be implemented

WILDLIFE RESOURCES

Potential Effects	Key Mitigation Measures
Mortality	<ul style="list-style-type: none"> • Design a portion of the wetlands created to compensate for habitat loss to remain fish-free to eliminate predation to invertebrates (dragonfly larva), amphibians, and reptiles • Include amphibian passage structures in road design where roads are adjacent to wetlands or amphibian migrations • Clear forested habitat – potential roosting and cover sites for bats and fisher – before inundation begins. Clearing will take place during late fall and winter, before the birthing season, and when bats are not present or are in hibernacula, where feasible • Schedule construction activities following guidance from Peace Region Selected Terrestrial and Aquatic Wildlife Least Risk Windows • Incorporate transmission tower design elements to reduce risk of bird collision mortality • Develop a Human-Bear Conflict Management Plan • Implement the following Environmental Management Plans: <ul style="list-style-type: none"> • Erosion Prevention and Sediment Control Plan • Fuel Handling and Storage Management Plan • Vegetation and Invasive Plant Management Plan • Wildlife Management Plan

19

Key Findings: Wildlife Resources

The residual effects to wildlife resources would be local for all indicators except migratory birds, and would not jeopardize the persistence of those indicator groups in a regional context.

Habitat for certain migratory birds (Canada, Cape May and Bay-breasted Warblers, Yellow Rail and Nelson’s Sparrow) would be affected by the creation of the reservoir. Because these select migratory birds are considered species at risk, a determination of significance has been made. All other species of wildlife are not expected to be significantly affected by the Project as proposed mitigation will be effective or the populations are not at risk.

GREENHOUSE GASES

The assessment of greenhouse gases considers the net change in greenhouse gas (GHG) emissions from the construction and operations phase of the Project, including emissions associated with construction activities, land use change and clearing to form the reservoir.

Scope of Effects Assessment

During construction, GHG emissions are expected from direct fuel combustion associated with equipment operation, and from emissions associated with materials used in construction (e.g., concrete, fly ash, steel, stainless steel, aluminum and copper). GHG emissions are expected to result from the Project's land clearing and construction activities and are estimated over the construction phase and for Project operations.

The results are reported using the following key indicators:

- Total Project GHG emissions, and net emissions considering the change from current conditions to post-inundation scenarios
- GHG emissions intensity per unit of energy (t CO₂e/kWh), including comparison with other modes of electricity generation

Assessment Area

The Local Assessment Area is the Project activity zone, which is the area within which GHG emissions from construction activities would occur and where the reservoir would be formed.

In recognition of the nature of the potential environmental effects of a change in GHG emissions on global climate, the assessment compares Project-related GHG emissions to global, national, and provincial GHG emissions.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from literature reviews, provincial and federal datasets, and development of a Project-specific carbon mass-balance model.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Emission of GHGs from construction activities	<ul style="list-style-type: none">• Implement fleet management measures to reduce fuel consumption and increase fuel efficiency
Release of GHGs during operation	<ul style="list-style-type: none">• Reduce the long-term conversion of land while still achieving the purpose of the Project

Monitoring

The GHG emission generating activities would be monitored throughout construction and operations.

Key Findings: Greenhouse Gases

The residual Project-related quantities of GHGs released to the atmosphere are a small fraction of the provincial, national, and global emissions, and are considered low (in terms of total and emission intensity) in the context of CEA Agency guidance.

The environmental effects of the Project on Greenhouse Gases are determined to be not significant because GHG emissions from the Project are low in relation to other forms of non-renewable electricity generation and in relation to the provincial, regional or national GHG emission totals.

The Project would result in a net benefit from a GHG perspective, producing electricity with substantively lower GHG emissions per unit energy produced compared to non-renewable thermal electricity generation resources.

LOCAL GOVERNMENT REVENUE

The Project could affect the use of land, services and infrastructure and could affect local government revenues and expenditures.

Scope of the Effects Assessment

The effects assessment for local and regional government revenues and expenditures considers changes to local government expenditures on programs and services, and local government revenues from property taxes, grants in lieu payments, sales of services, transfers and other income.

Assessment Area

The Local Assessment Area for local government revenues includes the Cities of Fort St. John and Dawson Creek, the District of Taylor, Hudson's Hope, Chetwynd, and the Peace River Regional District (Electoral Areas B, C, D, and E). This is the area where physical and workforce effects would potentially affect local government revenues and expenditures.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Literature reviews, including historical and current local government revenue and expenditure data
- Interviews with municipal governments, Peace River Regional District, provincial government, and BC Hydro representatives concerning current services utilization and infrastructure demand

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in local government revenue: local governments may experience changes in both revenue and costs related to meeting the demands of new local residents, workforce, or impacts to infrastructure	<ul style="list-style-type: none"> • Implement measures to address potential effects on demand for services and infrastructure, as described under Community Infrastructure and Services Provide Project workforce camps that will be self-sufficient and not dependent upon local government services • Provide a one-time contribution to the District of Hudson's Hope to address land no longer available for development • Provide annual grants-in-lieu payments estimated at \$1.3 million annually to local governments as directed by provincial Order-In-Council, throughout operations

Key Findings: Local Government Revenue

Additional direct, indirect and induced incremental tax revenues to local governments would result from economic activity during the construction phase of the Project. No residual adverse effects are anticipated for Local Government Revenue following the application of mitigation measures. Refer to Community Infrastructure and Services for additional information.

LABOUR MARKET

Labour supply requirements may be drawn from residents living near the Project and persons residing elsewhere in B.C., Canada, or internationally.

Scope of the Effects Assessment

The Labour Market assessment considers:

- The Project’s direct labour needs relative to the expected availability and type of skills of persons in the Local Assessment Area, the number of persons by occupation and industry affiliation, and the availability of skilled local labour force and turnover rates
- The indirect Project employment (calculated using the British Columbia Input Output Model), and the number of persons by occupation and industry affiliation
- A comparison of Project labour requirements against local labour supply and demand by skill category (baseline and forecast)

Assessment Area

The Local Assessment Area for Labour Market comprises the Peace River Regional District and the Northern Rockies Regional Municipality, which, together, are known as the Northeast Development Region. The Regional Assessment Area includes the Local Assessment Area plus the Fraser Fort George Regional District (FFRD).

Baseline Conditions

Baseline conditions are described using information collected from literature reviews, including First Nations community baseline profiles, local, provincial and federal government datasets, interviews with labour organizations and employment offices, and the results of consultation between BC Hydro and Aboriginal groups.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in demand for direct and indirect construction phase labour	<ul style="list-style-type: none"> • Use local labour supply as available • Augment and enhance the local labour supply: <ul style="list-style-type: none"> • Provide support for training and skill development, focused on increasing the local labour market participation rate and skill level of LAA population • Fund student bursaries for trades training • Support Aboriginal training initiatives and capacity building • Recruit, including accessing labour pools outside of the region, and attract new entrants to the local labour force • Fund additional daycare spaces in the Fort St. John area to support spousal participation in the labour market • Encourage Aboriginal participation in the workforce

Key Findings: Labour Market

Following the implementation of mitigation measures, no residual adverse effects are expected on the Labour Market.

REGIONAL ECONOMIC DEVELOPMENT

Regional economic development is the change in areas of the economy, such as business competitiveness, that contribute to a region's overall economy and standard of living. Expenditures made by the Project would accrue to individuals, businesses, and communities in the region, and thereby contribute to the development of the regional economy. Regional economic development is valued by communities because it represents opportunities for wealth creation and contributes to community stability and strength.

Scope of the Effects Assessment

The Regional Economic Development assessment analyses potential effects of the Project on regional business and contracting opportunities, capabilities and capacity in consideration of regional business, and contracting characteristics. The assessment compares the Project's contracting requirements with the regional business and contracting profile, capabilities, and capacity, including consideration of Aboriginal businesses.

Assessment Area

The Local Assessment Area for Regional Economic Development includes the Peace River Regional District and the Northern Rockies Regional Municipality, which together comprise the boundaries of the B.C. Northeast Development Region. The Northeast Development Region is a regional economic unit with business services clustered in its southern communities of Fort St. John and Dawson Creek, and in the north in Fort Nelson. This is the geographical area where Project interactions with the regional economic development VC will occur.

The Regional Assessment Area consists of the Peace River Regional District, the Northern Rockies Regional Municipality, and the Fraser Fort George Regional District.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from literature reviews, including local, provincial and federal government data, interviews with government officials, industry organizations, and economic development offices, data for Aboriginal businesses and peoples and First Nations communities, information provided by First Nations communities, and results of consultation between BC Hydro and Aboriginal groups.

REGIONAL ECONOMIC DEVELOPMENT

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
<p>Change in business opportunities during construction</p> <p>Change in Local Assessment Area business and contracting profile, capabilities, and capacity during construction</p>	<ul style="list-style-type: none"> • Continue the Project business liaison program <ul style="list-style-type: none"> • Work with local Economic Development Commissions and business organizations • Continue to deliver business information sessions • Broadly communicate contracting opportunities • Encourage use of, and participation in, the Project business directory • Apply BC Hydro Aboriginal procurement policy to increase Aboriginal participation in Project business opportunities • Seek information on Aboriginal businesses and capabilities

Key Findings: Regional Economic Development

The Project is anticipated to have beneficial effects on Regional Economic Development during construction, as opportunities would be created for businesses and contractors directly involved in Project construction, as well as for those involved in industries and activities that would benefit from indirect and induced expenditures.

The Project would increase regional business opportunities during construction and operations of the Project. In addition to total labour costs of \$1.7 billion, direct purchases from supplier industries in B.C. are estimated to be \$1.4 billion. Regional economic increases are estimated at \$225 million in direct and indirect expenditures to businesses in the region, with an additional induced impact of approximately \$100 million. This would accompany regional increases of \$130 million in total GDP, \$80 million in total household income, and 2,300 person years of total employment during construction. Total direct, indirect and induced regional supplier output is estimated to total approximately \$320 million.

Beneficiaries would include suppliers in the following industries: construction, transport, finance, insurance, real estate, rental and leasing services, manufacturing, professional, scientific and technical services, wholesale trade and operating, office, cafeteria, and laboratory supplies.

CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES

The Project has the potential to change the lands, water, or resources, or access to lands, water or resources used by Aboriginal groups for traditional purposes.

Scope of the Effects Assessment

Effects assessment for Current Use of Lands and Resources for Traditional Purposes considers changes to the following:

- current use of lands and resources for hunting, fishing, and trapping activities, including the location of the activity, the species targeted, access to the activity, and the traditional uses of the harvested animals; and
- current use of lands and resources for activities other than hunting, fishing, and trapping, by Aboriginal groups, including nature, location, access to the resource, and traditional use purposes.

Assessment Area

Both the Local Assessment Area (LAA) and the Regional Assessment Area (RAA) for the assessment of the potential effects of the Project on the Current Use of Lands and Resources for Traditional Purposes are based on the spatial boundaries set out in other sections of the EIS, as follows:

1. Fishing opportunities and practices: the LAA and RAA are based on the LAA and RAA for the Fish and Fish Habitat VC.

2. Hunting and trapping opportunities: the LAA and RAA are based on the Wildlife Resources VC.
3. Cultural and traditional uses of the land: the LAA and RAA are based on the LAA and RAA for the Vegetation and Ecological Communities VC.

Baseline Conditions

Baseline conditions for current use of lands and resources for hunting, fishing, and trapping activities, and for current use of lands and resources for other activities were described using information collected from: Project description and other project-related information, Project-specific Traditional Land Use Studies, Community Baseline Reports, or other Project-related information provided by Aboriginal groups at the time of writing that include information on past, current and future use of resources, Ethno-historical, anthropological and geographical literature, results of BC Hydro consultation with Aboriginal groups, and results of the Fish and Fish Habitat, Vegetation and Ecological Communities, and Wildlife Resources Effects Assessments.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes in fishing, hunting and trapping opportunities and practices	<ul style="list-style-type: none"> • Consider developing fish and wildlife habitat compensation programs that align with BC Hydro compensation programs. • Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect fishing, hunting and trapping opportunities or access. • Develop a communications program to inform harvesters of longer term changes in fish community composition. • Implement mitigation measures set out in Fish and Fish Habitat, Wildlife Resources, and those set out in Harvest of Fish and Wildlife Resources.

CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES

Potential Effects	Key Mitigation Measures
<p>Changes in other cultural and traditional uses of the land</p>	<ul style="list-style-type: none"> • Work with Aboriginal groups to ground truth traditional land use information for specific areas within the Project activity zone prior to commencing construction. Continue to consult with Aboriginal groups regarding clearing plans and protocols. • Develop a communications program to inform harvesters of planned or unplanned events that may affect opportunities to harvest plants, berries, and other resources. • Consider developing habitat compensation programs that align with BC Hydro compensation programs. • Work with Aboriginal groups to identify permanent habitation structures used in the current use of lands and resources for traditional purposes that may be lost to inundation. Effects on cabins associated with tenured trap lines will be addressed as set out in the Harvest of Fish and Wildlife Resources VC. Where untenured cabins may be impacted by the Project, BC Hydro will work with Aboriginal individuals to determine appropriate measures that could be implemented. • Work with Aboriginal groups to identify potential sites for re-location of medicinal and food plants to compensate for areas that will be inundated. • Use only indigenous and/or non-invasive plants and grasses in re-vegetation programs associated with the Project. • Engage with Aboriginal groups around any reclamation phase that may present opportunities to restore ecological communities that support species of high traditional use value. • Be prepared to provide support for the indigenous plant nursery owned by West Moberly and Sauteau First Nations located at Moberly Lake. The First Nations have a business plan to support propagation of a wide range of indigenous plant species for use in reclamation work. • Establish a Culture and Heritage Resources Committee to provide advice and guidance on the mitigation of specific effects of the Project on culture and heritage resources. The Committee would consist of BC Hydro officials and Aboriginal members whose communities are in the immediate vicinity of the Project. • Consider implementing, in consultation with Aboriginal groups and British Columbia where appropriate, the following potential initiatives: <ul style="list-style-type: none"> • the identification and naming of key cultural sites and the potential to integrate Aboriginal names into Project operations and sites; • recording of stories and history associated with key cultural sites that may be affected by the Project; • the protection and documentation, including mapping, of important Aboriginal trails and sites. • Contribute funding to support a youth culture camp that includes transfer of knowledge around medicinal and food plants; • Engage with Aboriginal groups to commemorate lost and/or inundated places; • Engage with Aboriginal groups around potential plans to undertake ceremonies prior to the commencement of construction on key elements of the Project; and • Develop and implement an education program respecting Aboriginal culture, history and use of lands and resources in the Project Area to be offered to all workers on the Project. • Implement all mitigation measures set out in Vegetation and Ecological Communities , Heritage Resources, and those measures supporting the development of new shoreline recreation sites in Outdoor Recreation and Tourism.

24

25

CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES

Key Findings: Current Use of Lands and Resources for Traditional Purposes

1. Current use of lands and resources for traditional purposes - fishing

(26) Fishing opportunities and practices of Blueberry River First Nations, Saulteau First Nations, Treaty 8 Tribal Association (Doig River, Halfway River, Prophet River, and West Moberly First Nations), McLeod Lake Indian Band, Metis Nation BC, Duncan's First Nation and Horse Lake First Nation are expected to be adversely affected during construction and operation due to reduced access to fishing areas (including potentially increased competition with non-Aboriginal anglers), and potentially reduced success in harvest of targeted species. The transformation of the river into a reservoir would create a new and productive aquatic ecosystem. This new aquatic environment is expected to support a community of equal or greater productivity, however the composition of fish species would change.

Although some aspects of the traditional purpose of the activity may be altered by transferring them to another location, fishing practices of Aboriginal people are adaptable, spatially and temporally. For these reasons, a determination of significance has not been made.

2. Current use of lands and resources for traditional purposes - hunting and trapping

(27) Hunting and trapping opportunities and practices of Blueberry River First Nations, Saulteau First Nations, Treaty 8 Tribal Association (Doig River, Halfway River, Prophet River, and West Moberly First Nations), McLeod Lake Indian Band, Metis Nation BC, Duncan's First Nation, Horse Lake First Nation and Dene Tha' First Nation may be adversely affected due to temporary reductions in availability of targeted species and temporarily reduced access to hunting areas during construction. As the effect would be temporary in nature and may be accommodated in other areas of the LAA, the traditional purpose of the activity would not be undermined. Therefore, a determination of

significance has not been made for the potential effects of the Project on current use of lands and resources for hunting and trapping.

3. Current use of lands and resources for traditional purposes - other cultural and traditional uses

Due to permanent loss of use of, and access to certain culturally important places and valued landscapes within the LAA, the use of those areas by Blueberry River First Nations, Saulteau First Nations, Treaty 8 Tribal Association (Doig River, Halfway River, Prophet River, and West Moberly First Nations), McLeod Lake Indian Band, Metis Nation BC, Duncan's First Nation and Horse Lake First Nation will be permanently impacted (28)

For Blueberry River First Nations, Saulteau First Nations and Treaty 8 Tribal Association (Doig River, Halfway River, Prophet River, and West Moberly First Nations), the effect on other cultural and traditional uses is expected to be significant at particular high value places along the Peace most notably at Bear Flats, Farrell Creek and Attachie. These spaces, identified by these Aboriginal groups to be of high value will be inundated and access to them will be permanently changed. For these reasons, a determination of significance has been made for the potential adverse effect of the Project on Current Use of Lands and Resources for Traditional Purposes. In addition, the effect on other cultural and traditional uses would be significant for McLeod Lake Indian Band at the confluence of the Peace River with the Halfway River. (29)

AGRICULTURE

Agriculture is an important component of the economy in the Peace region. The effect of the Project on the valued component of agriculture is assessed considering the interactions between the Project and the four key aspects of agricultural land base, farm operations, the agricultural economy, and food production and consumption.

Scope of Effects Assessment

The effect of the Project on the valued component of agriculture is assessed considering the interactions between the Project and the four key aspects.

Loss of agricultural land considers the following key indicators:

- Land capability ratings (soil and climatic capability)
- Crop suitability
- Agricultural land use and Crown land tenures
- Agricultural utility (reflects relative likelihood of cultivation)

Effects on individual farm operations consider the following key indicators:

- Direct loss of land
- Changes to access routes
- Loss of farm infrastructure
- Soil disturbance and compaction
- Changes to livestock movement patterns
- Changes to irrigation and livestock watering facilities
- Changes to local hydrology and groundwater
- Changes to drainage patterns
- 30 • Changes to wildlife presence
- Introduction and proliferation of invasive plant species
- Increased biosecurity risks
- Farm worker safety
- Reservoir induced changes to microclimate on adjacent agricultural operations

Change to the agricultural economy considers the following key indicators:

- Agricultural costs and revenues at the individual farm level
- Primary agricultural economic activity
- Opportunities for potential new agricultural economic activity
- Secondary agricultural economic activity

Changes to regional food production and consumption consider the following key indicators: regional food production and food consumption.

Assessment Area

The Local Assessment Area for changes to the agricultural land base and changes to individual farm operations includes the Project activity zone plus the remainder of any farm operations that overlap with the Project activity zone.

The Local Assessment Area for changes to agricultural economic activity and changes to food production and consumption includes the entire Peace Agricultural Region (Peace River Regional District and the Northern Rockies Regional Municipality).

The Regional Assessment Area includes the entire Peace Agricultural Region.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Literature reviews including local, provincial and federal government datasets
- Field surveys
- Orthophotographs and spatial analysis
- Interviews with land owners and operators, relevant agricultural associations, representatives of agriculturally related industries and representatives of government agencies

AGRICULTURE

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Temporary loss of agricultural land (construction and operations)	Implement Environmental Management Plans <ul style="list-style-type: none"> • Soil Management, Site Restoration, and Revegetation Plan • Borrow and Quarry Sites Reclamation Plan • Vegetation and Invasive Plant Management Plan
Permanent loss of agricultural land (construction and operations)	Implement mitigation measures including: <ul style="list-style-type: none"> • Agricultural compensation fund to support projects such as irrigation and drainage improvements • Relocation of suitable quality soil in selected locations • Inclusion of land in the Agricultural Land Reserve based on discussion with the ALC, Crown and private landowners
Effects on individual farm operations during construction	Acquire land required for the Project and reimburse associated financial losses Implement environmental management plans, including: <ul style="list-style-type: none"> • Soil Management, Site Restoration and Revegetation Plan • Vegetation and Invasive Plant Management Plan (including biosecurity protocols) • Traffic Management Plan • Public Safety Management Plan
Effects on individual farm operations during Project operations	Evaluate effects at a property level and enter into agreements with affected landowners to mitigate in the event of: <ul style="list-style-type: none"> • Crop and stored feed damage due to changes in wildlife habitat utilization • Crop drying due to changes in climatic factors • Crop production due to changes in groundwater elevation • Potential for unauthorized access to farm properties due to change in land or waterbased access • Livestock damage due to new access to the reservoir
Change to agricultural economic activity (construction and operations)	Implement an Agricultural Compensation Fund
Change to regional food production and consumption during construction and operations	No changes anticipated to regional food self-reliance

AGRICULTURE

Monitoring

For reservoir adjacent agricultural operations where there is not already an agreement with BC Hydro, the Proponent will monitor specific environmental factors, and evaluate associated potential effects on:

- Crop and stored feed damage due to changes in wildlife habitat utilization
- Crop drying due to changes in climatic factors
- Crop production due to changes in groundwater elevation

32

Annual monitoring will be done for a minimum of five years following reservoir filling.

The Proponent will also monitor climatic factors relevant to future irrigation improvement decisions that may be proposed under the agricultural compensation fund. Annual monitoring will be undertaken from 2022 to 2032.

Key Findings: Agriculture

The creation of the reservoir and other Project activities would result in the permanent loss of 3,433 hectares of Class 1 through 3 lands, of which approximately 1,299 hectares have high agricultural utility, and 367 hectares have moderate agricultural utility. Approximately 541 ha of land within the Project activity zone is currently cultivated and used for canola, grain, forage, and improved pasture.

While there would be a significant loss of land with agricultural capability, overall agriculture production in the region would be expected to improve with implementation of the proposed agricultural compensation fund. These improvements would mitigate the loss of current and potential production from lands affected by the Project.

The mitigation measures described above would mitigate the Project effects on agricultural production and agricultural economies. Therefore, a determination of significance has not been made for Agriculture.

FORESTRY

33 The Forestry assessment considers the Project’s interactions with the forest land base, Crown forest land management, and the forest industry.

Scope of Effects Assessment

The Forestry assessment considers changes in land use, resource use, access and activities related to industrial forest use, and changes in land use that affect Crown forest management. The assessment considers the following key indicators:

- Timber harvesting land base
- Site productivity
- Annual Allowable Cut
- Inventory of timber in the project clearing plan
- Harvest trends
- Forest sector employment
- B.C. government stumpage revenue

Assessment Area

The Local Assessment Area for forestry is the Project activity zone. The Regional Assessment Area is composed of three forest management units: Dawson Creek TSA, Fort St. John TSA, and the Peace River supply block of Tree Farm Licence (TFL) 48.

Baseline Conditions

Baseline conditions are described using information collected from:

- The Project Vegetation, Clearing and Debris Management Plan
- Field surveys and forest inventories
- Existing literature, government forest management reports
- Interviews with forest industry stakeholders
- GIS analysis of spatial components
- Aboriginal and traditional community knowledge related to forestry

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in land use, resource use, access, and activities related to industrial forestry use	No change anticipated to industrial forest use
Change in land use that affects Crown Forest Management	The province would use existing policies to manage changes to Old Growth Management Areas and one wood lot licence area

Key Findings: Forestry

The Project activity zone would overlap less than 0.02% of the total timber harvesting land base on which industrial forestry activities occur, therefore, there would not be an expected change to the annual allowable cut or to licence quotas to harvest Crown timber. In addition, the region’s established timber mills have the capacity to process the merchantable timber volumes associated with the clearing volumes.

For these reasons, no adverse residual effects are anticipated on forestry associated with the Project.

OIL, GAS AND ENERGY

The Oil, Gas and Energy assessment considers the Project's interactions with the land base and with the oil, gas, and energy industry activity.

Scope of Effects Assessment

The assessment considers changes in land and resource use for tenured oil, gas, and energy activities, operations, and facilities, and changes in access for oil and gas industry activities.

Assessment Area

The Local Assessment Area and Regional Assessment Area for the assessment of the Valued Component of oil, gas and energy is the Project activity zone.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Literature reviews including local, provincial and federal government datasets
- Orthophotographs, spatial analysis, and mapping
- Interviews with land owners and operators, relevant agricultural associations, representatives of agriculturally related industries and representatives of government agencies
- Results of consultation between BC Hydro and Aboriginal groups

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in land and resource use, and oil and gas infrastructure (construction and operations)	<ul style="list-style-type: none"> • Conclude agreements and implement any agreed to provisions, where appropriate, with third-party tenure holders • Implement monitoring measures for infrastructure that could be affected by the Project; if adverse effects are identified, work with affected party to identify and implement appropriate mitigation

Potential Effects	Key Mitigation Measures
Access to oil and gas resources and industry activity (construction)	<ul style="list-style-type: none"> • Access to resources would not be restricted. No mitigation required

Monitoring

Spectra Energy operates a gas plant downstream of the Project. While studies undertaken show there is a potential change to water temperature and sediment transport expected due to the Project, whether or not this would lead to an actual adverse effect on Spectra Energy's operations can only be determined through a monitoring program. Therefore, it is recommended that BC Hydro and Spectra Energy develop a monitoring program for the construction phase to identify change to Peace River sediment at the Spectra intakes, and for the first 10 years of the operations phase, to identify change to water temperature at the Spectra intakes and related adverse effects on their cooler operations. If it is determined that there is an adverse effect on Spectra operations, BC Hydro will work with Spectra Energy to develop a mitigation plan.

Key Findings: Oil, Gas and Energy

The Project would occupy a negligible portion, about 0.11%, of the total petroleum and natural gas tenure area in the Peace River Regional District. Small scale hydro, wind power, and biomass energy production projects are not currently proposed within the Local Assessment Area. Where the Project's use of land affects existing tenured oil, gas, and energy industry activity or infrastructure, agreements would be concluded and provisions implemented where appropriate with affected third party tenure holders.

With agreements in place with third party tenure holders as required, and implementation of monitoring at Spectra Energy, and if necessary, mitigation measures, no residual adverse effects are anticipated.

MINERALS AND AGGREGATES

The Project’s use of land would overlap with areas where potential exists for mineral and aggregate production, or where there are existing quarries or pits. The Project’s effects on minerals and aggregates are assessed in consideration of the changes to land use, resource use, and access, the Project’s use of local aggregate for construction activities, and any new or improved access to aggregate sources created by the Project.

Scope of Effects Assessment

The assessment considers changes in land use, resource use, access, and activities related to aggregate utilization using the following indicators:

- Metal, industrial mineral and aggregate potential
- Record of exploration and development
- Historic production record
- Remaining mine or pit life
- Existing mineral and aggregate tenures
- Mineral reserves

The Project’s consumption of local aggregate deposits for construction activities considers the volume of aggregate material expected to be purchased by the Project relative to local market conditions, and the local and regional aggregate pricing and current and forecast consumption profile. Any new or improved access to aggregate sources created by the Project are also considered.

Assessment Area

The Minerals and Aggregates Local Assessment Area is the Project activity zone, plus the area within the Five-Year Beach Line, which is the area where the Project occupation of the land base would interact with the exploration or development of minerals and aggregates. The Regional Assessment Area is the north Peace area, including the City of Fort St. John, the districts of Taylor and Hudson’s Hope, and Peace River Regional District Area C.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from existing literature, including provincial mineral and aggregate databases and reports, interviews with Ministry of Transportation and Infrastructure staff, field investigations to identify the location, quality and quantity of materials within the Project activity zone as potential construction materials sources, GIS analysis to estimate Project overlap with mineral and aggregate resources. Where relevant, Aboriginal community and traditional knowledge was reviewed for information related to the minerals and aggregates.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change to land use, resource use, access, and activities related to industrial mineral and aggregate utilization during construction	<p>Negotiate a Memorandum of Understanding (MOU) with the BC Ministry of Transportation and Infrastructure to compensate for material used by the Project and to maintain material availability for ministry operational needs. MOU to include:</p> <ul style="list-style-type: none"> • aggregate source strategy to compensate for inundated Ministry aggregate sources • BC Hydro commitment to stockpile surplus rock material at the West Pine, Wuthrich, and Portage quarries and make them available for other aggregate users

Key Findings: Minerals and Aggregates

No residual adverse effects on minerals and aggregates are anticipated following application of the proposed mitigation measures, and conclusion of agreements where appropriate with affected third Party mineral and aggregate tenure holders.

HARVEST OF FISH AND WILDLIFE RESOURCES

The Peace River and surrounding area is used for the harvest of fish and wildlife resources. The Project is expected to have effects on the use of, and access to, harvesting areas (including tenured harvesting areas), and has the potential to affect the availability of harvested species. The Project would affect these opportunities through physical change of the land base. The Project effects on the harvest of fish and wildlife resources are assessed by considering Project changes to the use of, and access to, hunting, fishing, trapline, and guide outfitter areas, tenures areas, or the availability of harvested species based on the results of the assessment of the Project on fish and wildlife resources.

Scope of Effects Assessment

The assessment of changes to fishing opportunities, hunting opportunities and harvesting areas considers public hunting and fishing licence sales, areas, and harvest information, including numbers and species, and angler creel surveys.

The assessment of changes in trapping opportunities considers tenured trapline areas, infrastructure, harvest volumes and areas, and operating information, as well as Aboriginal employment or use of tenured traplines.

The assessment of changes in guide outfitting activities considers tenured guide outfitter areas, infrastructure, harvest volumes and areas, and operating information, as well as Aboriginal participation in tenured guide outfitting operations.

Assessment Area

The Local Assessment Area for Harvest of Fish and Wildlife Resources is the Project activity zone, the area within reservoir impact lines, and the Peace River downstream to the Alberta border. This includes the areas that may be changed due to Project activities where changes in the land or setting would affect harvesting activities, or which overlap with administrative boundaries for harvesting related tenures and licences, including the Peace River downstream to the Alberta border for fishing activities. The Regional Assessment Area is the Peace River Regional District, and corresponds to the administrative boundary within which the Project resides.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- B.C. Ministry of Forestry, Lands and Natural Resource Operations data
- Reports on creel survey and other fishing survey results
- Public hunting data acquired from B.C. Ministry of Forestry, Lands and Natural Resource Operations
- Fishing data acquired from B.C. Ministry of Forestry, Lands and Natural Resource Operations
- Trapline tenure and harvest data acquired from provincial government sources
- Guide outfitting data acquired from B.C. Ministry of Forestry, Lands and Natural Resource Operations
- Orthophotographs and spatial analysis
- Field visits and surveys
- Interviews with government representatives, trappers, and guide outfitters with tenures in the Project activity zone, and hunting and fishing group representatives
- Results of consultation between BC Hydro and Aboriginal groups

HARVEST OF FISH AND WILDLIFE RESOURCES

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes in fishing and hunting opportunities (construction)	<ul style="list-style-type: none"> • Implement Outdoor Recreation and Tourism mitigation measures that support recreational shoreline use, boating access, and waterbased navigation to mitigate construction effects on fishing and hunting opportunities • Implement Fish and Fish Habitat, and Wildlife Resources mitigation measures that support fish and wildlife populations to mitigate construction effects on fishing and hunting opportunities
Changes in level of use of harvesting areas (construction)	<ul style="list-style-type: none"> • No changes anticipated
Changes in trapping opportunities (construction)	<ul style="list-style-type: none"> • Implement Wildlife Resources mitigation measures that support fur-bearing populations to support the availability of harvestable species for trapping • Conclude agreements and implement any agreed-to provisions, where appropriate, with third-party tenured trapline holders
Changes in guide outfitter activities (construction)	<ul style="list-style-type: none"> • Provide communications regarding area or road closures to help outfitters plan their guided activities to avoid conflict with the Project • Implement Outdoor Recreation and Tourism mitigation measures that support recreational shoreline use, boating access, and waterbased navigation to mitigate construction effects on guide-outfitting opportunities • Implement Wildlife Resources mitigation measures that support game populations to support the availability of harvestable species for guide outfitting activities • Conclude agreements and implement any agreed-to provisions, where appropriate, with third-party tenured guide-outfitters
Changes in hunting and fishing opportunities (operations)	<ul style="list-style-type: none"> • No changes anticipated
Changes in trapping opportunities (operations)	<ul style="list-style-type: none"> • Conclude agreements and implement any agreed-to provisions, where appropriate, with third-party tenured trapline holders
Changes in guide outfitter activities (operations)	<ul style="list-style-type: none"> • Implement Wildlife Resources mitigation measures that support game populations to support the availability of harvestable species for guide outfitting activities

Key Findings: Harvest of Fish and Wildlife Resources

Hunting would continue in areas around the Site C reservoir and bag limits would not be expected to be reduced as a result of the Project. Where the Project adversely affects existing tenured guide-outfitters or trapline holders, agreements will be concluded and any provisions of those agreements will be implemented, where appropriate with affected third Party tenure holders.

A residual adverse effect is expected due to some temporary losses of fishing and hunting opportunities during construction. Overall, fishing opportunities would increase during operations, catch limits would not be expected to be reduced, hunting would continue in areas around the Site C reservoir, and bag limits would not be expected to be reduced as a result of the Project. Therefore, the effects are not considered to be significant.

OUTDOOR RECREATION AND TOURISM

The Outdoor Recreation and Tourism assessment considers the Project's interactions with outdoor recreation and tourism features, amenities, sites, activities, visitor levels, and use levels.

Scope of the Effects Assessment

Changes in outdoor recreation and tourism infrastructure are considered using the following indicators:

- Outdoor recreation features and amenities, including recreation sites, trails, parks, and Peace River Boudreau Lakes proposed protected area
- Tourism features and amenities, including visitor centres, tourist accommodations, and attractions
- Commercial outdoor recreation interests
- Recreation activities undertaken on the land base, including activities, locations, and seasonal nature of activities

The assessment of changes to outdoor recreation use levels and regional tourism visitor levels considers outdoor recreation use levels, and regional tourism visitor levels.

Assessment Area

The Outdoor Recreation and Tourism Local Assessment Area is the Project activity zone, the area within the reservoir impact lines and the Peace River downstream to Peace Island Park by Taylor. The Regional Assessment Area is the Peace River Regional District.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Government and industry databases of recreation and tourism sites, infrastructure and tenures
- A two year Peace River recreation and angler survey
- Interviews with local recreation groups, tourism operators and representatives of government ministries
- GIS analysis to estimate the Project overlap with outdoor recreation and tourism resources
- Aboriginal community and traditional knowledge was reviewed for information related to the Outdoor Recreation and Tourism

OUTDOOR RECREATION AND TOURISM

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes in outdoor recreation and tourism infrastructure	<ul style="list-style-type: none"> • Establish and operate three new permanent reservoir launches and day use sites (Cache Creek and Lynx Creek trailer launches and Hudson’s Hope Shoreline Protection small craft launch) to replace flooded boat launch areas • Identify public communications procedures for public safety hazards, and access restrictions and closures during construction of the dam using a Public Safety Management Plan • Provide funds to the District of Hudson’s Hope for the enhancement of Alwin Holland Park or other community shoreline recreation areas • Provide a Community Recreation Site Fund to support development of new shoreline recreation sites on the reservoir and on the Peace River and tributaries between the Project and the Alberta border • Provide technical support to outdoor recreation providers who require access to the reservoir to assist with their development along, or adaptation to, new shoreline conditions • Establish a permanent north bank dam site public viewpoint
Change in outdoor recreation and tourism use levels	<p>The Project is anticipated to increase recreation and tourism use levels during construction, and would not require specific mitigation measures. Implementing the following housing measures would also support recreation and tourism use:</p> <ul style="list-style-type: none"> • Work with the private sector and local government to develop new RV sites • Implement on-site workforce housing
Changes in outdoor recreation and tourism infrastructure	<ul style="list-style-type: none"> • Develop a Public Safety Management Plan that will identify public communications procedures for public safety hazards, and access restrictions and closures during operation • Identify public communications procedures for public safety hazards, and access restrictions and closures during operation • Fund the development of a Peace River and Site C Reservoir Navigation and Recreation Opportunities Plan

Key Findings: Outdoor Recreation and Tourism

Some recreation opportunities would be temporarily reduced for short periods during the construction phase, and while new infrastructure is being developed. As a result, during construction, a residual adverse effect is expected due to temporary losses of recreation and tourism access and infrastructure.

BC Hydro will provide replacement boat launches and day use areas in the reservoir and will implement a number of measures to support other community groups and the District of Hudson’s Hope in developing new reservoir recreation infrastructure. Therefore, for the operations phase, recreation and tourism are expected to benefit due to new recreation opportunities. As a result, a determination of significance on outdoor recreation and tourism has not been made.

NAVIGATION

The Navigation assessment considers changes and potential effects to water-based navigation (navigation) and air navigation (aviation). These include Project-related changes to navigability and navigation use of water bodies, aviation routes and visibility, and operation of the ferry and ice bridge crossings of the Peace River at Shaftesbury and Tompkins Landing in Alberta.

Scope of Effects Assessment

The assessment of changes to navigability and navigation use of defined navigable waters considers the following indicators:

- Defined existing navigable waters using the methodology outlined in the River Classification System established for rivers in B.C.
- Current navigation use (e.g., vessel/boat traffic) of the defined navigable waters for transportation, recreation, and commercial purposes
- Navigation hazards in waterways

The assessment of navigation use restrictions considers current navigation use of the defined navigable waters for transportation, recreation, and commercial purposes.

The assessment of changes to aviation use at the North Peace Regional Airport considers air navigation routes and current aviation visibility.

The assessment of aviation use and visibility of structures and overhead wiring considers air navigation routes.

The assessment of changes to the operation of ice bridges consider operations for ferries and ice bridges at Shaftesbury and Tompkins Landing.

Assessment Area

The Local Assessment Area and Regional Assessment Area for navigation is the Project activity zone, the Peace River downstream to Peace Island Park, and the locations of the Shaftesbury and Tompkins Landing ice bridges.

The aviation Local Assessment Area represents the area around the North Peace Regional Airport in which potential adverse effects are assessed from a land use perspective. The Regional Assessment Area includes the area from North Peace Regional Airport to the crest of the proposed Site C dam.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from literature reviews and technical data reports, orthophotographs and spatial analysis, field visits and surveys, interviews with local government representatives and recreational interest groups, and the results of consultation between BC Hydro and Aboriginal groups.

NAVIGATION

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes to navigability, navigational use, and access during construction	<ul style="list-style-type: none"> • Provide recreational boaters with information about restricted navigation zones at the dam site, any temporary navigation or boat launch access closures associated with active work areas for reservoir clearing, Highway 29 relocation, and Hudson's Hope shoreline protection construction, as part of the Public Safety Management Plan • Build three boat launches along the reservoir accessible via Highway 29 to support navigability and navigational use • BC Hydro will fund community groups to support re-establishment of recreational sites on the reservoir and downstream, and to re-establish and create new use patterns and access • BC Hydro will provide technical support to outdoor recreational providers to facilitate further public and private sector investment opportunities associated with the use of the reservoir and downstream • BC Hydro will fund the development of a Navigation and Recreation Opportunities Plan intended to enable the local communities to plan for boating and recreation opportunities created by the reservoir
Navigation use restrictions during construction	<ul style="list-style-type: none"> • BC Hydro's Public Safety Management Plan and supporting boater communication protocols, inclusive of adhering to the Canadian Dam Association Guidelines for Public Safety Around Dams, will address navigability and navigational use, and the identification of potential hazards and interferences in waterways • Provide public communication about areas that remain open to navigation and are accessible during construction (inclusive of boat launches and other public access)
Changes to navigability, navigational use, and access during operations	<ul style="list-style-type: none"> • Provide boater communications to enable trip planning and safety for boaters' recreational boating activities in consideration of any temporary navigation restrictions or public safety concerns during the early years of the reservoir operations
Potential navigational hazards in waterways during operations	<ul style="list-style-type: none"> • Communicate navigational hazards to boaters and supporting boater communication protocols during the operations phase through the Public Safety Management Plans. Signage, as required, will be provided in accordance with the Guidelines for Public Safety Around Dams

Monitoring

BC Hydro will regularly monitor shoreline conditions during the early years of reservoir operations, and the shoreline monitoring program results will support implementation of the Public Safety Management Plan boater communication protocols related to managing navigation hazards and public safety within the reservoir.

Key Findings: Navigation

The dam and associated permanent restriction to navigation would result in an adverse residual effect that remains after mitigation measures are in place. However, new types of navigable uses on the reservoir would be available during Project operations. Considering all aspects of Navigation, and implementation of the mitigation measures, the Project's net effect on navigation is considered not significant.

VISUAL RESOURCES

Visual resources would be affected within and around the Project activity zone as the Project would introduce permanent, visible features to the landscape. The key indicators for this effect are the visibility of Project components from selected sites and viewpoints, and predicted scenic values.

Scope of the Effects Assessment

The assessment of changes to visual resources considers representative viewpoints, including provincial Visual Landscape Inventory sites, and sites identified during field reconnaissance, that offer views of the reservoir and dam site.

The Local Assessment Area is the area within an 8 km buffer around the largest visible Project features (reservoir, dam site, and transmission line) and within a 1 km buffer around smaller visible Project components (quarried and excavated materials, worker accommodation). The Regional Assessment Area is identical to the Local Assessment Area.

Baseline Conditions

Baseline conditions for the key indicators are determined using Project information (dimensions of Project components), the Provincial Visual Landscape Inventory, representative sites selected from baseline viewpoints, GIS-based visibility analysis, field investigations and site visits, and Aboriginal community and traditional knowledge related to visual resources.

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes to visual resources (construction phase)	<ul style="list-style-type: none"> • Restore and re-vegetate disturbed surfaces in construction areas after disturbance activities cease in accordance with the Project Soil Management, Site Restoration, and Revegetation Plan • Landscape the shoreline protection in Hudson's Hope • Paint permanent buildings and other above ground structures to blend in with the character of the surrounding environment where possible • Select previously disturbed areas or areas generally hidden from view for the potential offsite workforce accommodation camps, where feasible

Key Findings: Visual Resources

The change in the visible landscape from a river valley to a reservoir could be considered either a positive or negative change by stakeholders, depending on the personal values placed on the existing river valley landscape. The effects of the Project on visual resources are not predicted to exceed the existing level of visible anthropogenic disturbances, including industrial and human developments. Effects on visual resources are not considered to be significant because the environment has been previously disturbed.

POPULATION AND DEMOGRAPHICS

An in-migration of workers would result in a change to local population and demographics, as the Project demand for skilled labour during construction would exceed the local labour supply. This population change would have the potential to affect the demand for housing, community infrastructure and services.

Scope of Effects Assessment

The assessment of Project effects on Population and Demographics considers the Project demand for labour, workforce accommodation plans, current and forecasted population, demographics, and household size and characteristics.

Assessment Area

The potential Project related effects on population and demographics are directly related to the potential effects of the Project on the labour market. Therefore, the Local Assessment Area is the Peace River Regional District. The majority of existing residents in the Peace River Regional District are within commuting distance of the Project. Most workers who choose to relocate to the area would likely live in close proximity to the Project work site. As a result, the assessment specifically focuses on potential population changes in Fort St. John.

The Regional Assessment Area is the same as the Local Assessment Area, as it includes the area where other projects may result in changes to the labour market and associated regional population levels.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Literature reviews including local, provincial and federal datasets
- Project labour estimates and population model
- Interviews with community officials, construction industry representatives and labour representatives
- Results of consultation between BC Hydro and Aboriginal groups

POPULATION AND DEMOGRAPHICS

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes to PRRD population, with specific reference to City of Fort St. John	<ul style="list-style-type: none"> • Implement mitigation measures proposed for the Labour Market and Housing VCs, including the provision of camp accommodation, to moderate growth of the local population • Implement mitigation measures proposed for the Community Infrastructure and Services VC to mitigate the effects of an increased local population
Changes to Aboriginal community populations	<ul style="list-style-type: none"> • Support Aboriginal persons in maintaining permanent residence in home communities by providing camp housing and commuter support where demand warrants • Implement workforce management policies to require contractors to offer crosscultural awareness training to their workers, and to adopt and monitor codes of conduct. BC Hydro will work with local area First Nations to develop and deliver the crosscultural awareness training

Key Findings: Population and Demographics

The regional population forecast, even without the Project, is for substantial growth over the next 20 years. The effect of the Project would be to advance this expected population growth during construction by about two years. Following construction the population is expected to return to near base case conditions.

The region's economy is characterized by major development cycles and construction projects, which have resulted in high in- and out-migration levels over the last decade. The changes to population expected from the Project are not outside the recent fluctuations experienced in the region, and thus, following the implementation of mitigation measures, the effect is not anticipated to be significant.

HOUSING

The Project demand for labour during construction is expected to result in an immigration of workers and a change in local population, and would become a driver of demand for local housing. The assessment of effects on housing takes into account the Project plans to provide worker accommodation, and the current capacity of the local housing market to respond to increased demand.

Scope of the Effects Assessment

Change in the demand for housing considers the following key indicators:

- Occupancy and vacancy rates
- Occupancy costs
- Multiple Listing Service activity
- Residential construction activity
- Planned housing developments and land available for housing
- Housing ownership and type

Assessment Area

The Local Assessment Area is the Peace River Regional District, which aligns with the assessment areas for Labour Market and Population and Demographics. As with population, the communities nearest to the Project, Fort St. John, District of Taylor, and PRRD Area C, are where the majority of immigrating new residents would be expected to live and, therefore, where demand for housing would be expected to change.

The Regional Assessment Area is the same as the Local Assessment Area.

Baseline Conditions

Baseline conditions for housing are described using information from existing literature and housing statistics from Statistics Canada, Canada Mortgage and Housing Corporation, BC Stats, local governments, First Nation communities, real estate organizations, regional housing studies undertaken by local governments, and interviews with representatives of government, housing and real estate organizations, non-market housing providers, and temporary accommodation providers.

HOUSING

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in the demand for housing during construction	<ul style="list-style-type: none"> • Scale camp capacity up or down as required to accommodate direct workers • Provide logistical assistance to the Project workforce seeking local accommodation, through a community camp coordinator • Build approximately 40 new permanent housing units to be used by the construction workforce in the Fort St. John area, to expand the supply of rental housing. Transition the units to permanent affordable housing use after construction • Build up to 10 new affordable housing units to be used by the community in the Fort St. John area, in partnership with BC Housing, to expand the supply of affordable housing • Expand the supply of temporary accommodation by expanding the supply of long-stay RV sites in partnership with the private sector or local governments • Pre-book hotel and motel space when substantial temporary hotel accommodations are required • Provide financial support to emergency or transitional housing providers in the Fort St. John area

Key Findings: Housing

The provision of workforce camps and new in-community housing units are proposed to mitigate effects on housing. The project demand for rental housing has the potential to create low vacancy rates when labour requirements and population effects are peaking, which is expected to be low in magnitude and duration as the market responds.

Because the housing market is expected to respond to the change in demand, and new units are, and will continue to be, built in response to increased demand, the residual effect of the Project on housing is not anticipated to be significant. As the market response may be delayed, the rental market vacancy rate and price will be monitored throughout the construction phase. Other mitigation measures will be implemented as required in consultation with the local community.

COMMUNITY INFRASTRUCTURE AND SERVICES

Population change and changes to the physical land base as a result of the Project would have the potential to affect community infrastructure and services provided to residents that live in proximity to the Project. The project effects on community infrastructure and services were assessed by taking into consideration changes in the demand for, or the provision of, community, emergency, education and health, and social services, and specific displacement of, or effects to, infrastructure, such as sewer and water systems.

Scope of Effects Assessment

The assessment of changes to the demand for, or provision of, community, emergency, education, and health and social services and facilities considers the following indicators:

- Health and social services: Vital statistics, medical service expenditures; medical and dental facilities; practitioner numbers and services
- Emergency services: Police, court, fire protection, ambulance services; provincial emergency planning
- Education services: Public schools; private schools; postsecondary institutions
- Community services: Recreation and leisure facilities, sewer and water services

The assessment also considers potential displacement to, or effects on, local government infrastructure, such as water and sanitary sewer systems, whose functionality may be directly affected by Project components.

Assessment Area

The Local Assessment Area includes the City of Fort St. John, the District of Taylor, the District of Hudson's Hope, the District of Chetwynd, the City of Dawson Creek, and the Peace River Regional District.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Literature reviews, including First Nations, local, provincial and federal datasets
- Project labour estimates and a Project population model
- Interviews with municipal government, provincial government, key service providers, and post-secondary representatives
- Results of consultation between BC Hydro and Aboriginal groups

COMMUNITY INFRASTRUCTURE AND SERVICES

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in demand for, or provision of, services	<p>Health and Social Services</p> <ul style="list-style-type: none"> • Provide health care services (e.g. doctor, nurse) for Project workforce • Provide Northern Health with workforce and camp population statistics to help plan for service levels • Provide new families with local information package about health, education, and social services • Fund additional daycare spaces in the Fort St. John area
	<p>Emergency Services</p> <ul style="list-style-type: none"> • Communicate project management plans and activities to emergency service providers • Provide security, firefighting, first aid, and medical transport services for all Project construction sites and activities • Implement policies on safe living and work environment • Implement traffic management plan • Provide direct funding to the RCMP during construction to increase policing in the region • Provide on-site first aid and emergency transport • Provide on-site firefighting services • Develop Project emergency plans, including integration with existing BC Hydro Peace River facilities
	<p>Education Services</p> <ul style="list-style-type: none"> • Provide funding to Northern Opportunities to support their pre-apprenticeship program • Provide early notice to education institutions for planning purposes • Partner with education institutions on training
	<p>Recreation and Leisure Services</p> <ul style="list-style-type: none"> • Provide recreation facilities and programming at the camps for workforce • Work with the City of Fort St. John on potential workforce policies or service agreements regarding use of community leisure and recreation facilities
	<p>Solid Waste</p> <ul style="list-style-type: none"> • Implement construction waste management plan, including waste reduction and recycling policies, and management of industrial waste • Coordinate waste management planning with PRRD • Deliver and stockpile landfill cover material for Fort St. John landfill
	<p>Sewer and Water</p> <ul style="list-style-type: none"> • Evaluate options to integrate sewer and water systems required for the workforce camps to provide lasting benefits to the City of Fort St. John system
	<p>Displacement of Infrastructure</p> <ul style="list-style-type: none"> • Fund relocation of Hudson's Hope water intake, pumping station, and treatment plant • Work with each local government to develop an approach to determine or monitor the effects of the Project on the Hudson's Hope sewage lagoon, Fort St. John water supply (production and access), Taylor water supply (well site access), and PRRD's Charlie Lake outfall. BC Hydro would fund appropriate mitigation measures to maintain functionality of these municipal systems if adverse effects from the Project are identified.

COMMUNITY INFRASTRUCTURE AND SERVICES

Key Findings: Community Infrastructure and Services

The regional population forecast is for substantial growth in the region even without the Project. Therefore, demand on the region's community infrastructure and services is expected to increase even without the Project. In effect, the Project would advance expected population growth during construction by about two years.

The Project may affect local government infrastructure, and where an adverse effect is identified, BC Hydro would fund appropriate mitigation measures to maintain the functionality of these municipal systems.

The increased Project demand for health and social services associated with the incremental population gain is not expected to create capacity issues with major facilities and services. However, it is expected to create additional demand where there are currently wait-lists to access programs and services, and where Northern Health experiences challenges in recruiting health care specialists. Northern Health and other service providers would not experience effects that they have not regularly addressed over the last decade with major development projects.

Project induced population increases that would affect provincially funded services would be addressed through existing provincial budget planning. The provision of forecast and actual labour information will help these agencies plan for projected increases, alongside their usual sources of information for future planning. For example, Northern Health is expected to plan for increased levels of health services in consideration of new Project-related permanent residents in the area, and the need for potential additional hospital services for the on-site workforce.

Project induced population increases would also result in a higher local tax base, which would support local government in increasing their service levels.

BC Hydro will continue discussions with local governments toward community agreements that will include consideration of any specific effects on their communities. Where the Project would displace or impair the functioning of municipal infrastructure, appropriate measures would be implemented, funded by BC Hydro, to maintain the functionality of these systems.

Project effects on policing would be driven by population change, by the Project's increased use of roads, and the presence of the camp population. Therefore, BC Hydro will provide funds to support the RCMP in providing incremental policing.

As the workforce accommodation will be self sufficient and designed to accommodate the vast majority of worker needs, it is expected that there will be limited additional demand for community infrastructure and services from the Project. In addition, BC Hydro is proposing mitigation measures that are expected to address the temporary Project effects. As a result, a determination of significance has not been made for Community Infrastructure and Services.

TRANSPORTATION

The transportation system supports road, rail, and air travel. During construction the Project would use existing roads and railways, or would develop new roads, to move people, equipment, goods, and materials to and from construction and operational sites, potentially creating traffic delays and affecting road safety.

Scope of the Assessment

The transportation assessment considers potential effects of the Project on:

- Change in local road traffic volumes
- Change in road safety during construction, due to increases in traffic volumes, and upgrades to roads
- Change in road safety during operations, due to potential change in fog hours on roads
- Change in use of the airport
- Change in rail use

Assessment Area

The Local Assessment Area for transportation is the road and rail networks within the Project activity zone, including the surrounding road networks that would be used during construction, and the segment of Highway 97 between Taylor and Dawson Creek. The assessment area includes the North Peace Regional Airport.

The Regional Assessment Area comprises the Peace River Regional District, which encompasses a broader area and its major road networks. Other projects and activities within this larger area would use many of the same major road networks as the Project.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from Project planning for transportation routes and road improvements, Project traffic analysis and road safety analysis, regional transportation studies and traffic counts, and interviews with representatives of local and provincial governments.

TRANSPORTATION

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
<p>Minor traffic delays</p> <p>Decline in level of service on some roads and at some intersections</p> <p>Potential for impeded access to and egress from properties on some roads</p> <p>Small increase in collision frequency due to increased traffic on some routes</p> <p>Lower collision frequency due to permanent road upgrades on some routes</p>	<p>Highway 29 North</p> <ul style="list-style-type: none"> • Implement Traffic Management Plans, including Traffic Control Plans, Public Information Plans, Incident Plans, and Implementation Plans • Realign Highway 29, incorporating improvements for sections of the highway that would be inundated by the reservoir between Hudson's Hope and Bear Flat • On Canyon Drive west of Hudson's Hope, construct a paved brake check before the start of the 10% grade, and make it a mandatory requirement for Project-related trucks to stop and check vehicle brakes • Explore opportunities for constructing, and install if feasible, either arrestor beds or runaway lanes, or both, on Canyon Drive above Hudson's Hope <p>Highway 29 South</p> <ul style="list-style-type: none"> • Provide a shuttle service between Chetwynd and the dam site, based on demand. Work with the District of Chetwynd to identify suitable parking locations for workers using shuttles <p>Jackfish Lake Road</p> <ul style="list-style-type: none"> • Provide a shuttle service between Chetwynd and the Project site, based on demand • Equip Project vehicles travelling on the Project access road with radios • Control access to the Project access road at the north end of Jackfish Lake Road • Strengthen the road base and hardsurface 31 km of Jackfish Lake Road, widening where required • Examine the feasibility of widening the shoulders along the first 30 km of Jackfish Lake Road to meet current B.C. Ministry of Transportation and Infrastructure rural collector standards, potentially including two 1.5 m wide paved shoulders <p>North Bank Roads</p> <ul style="list-style-type: none"> • Implement a carpool program • Use a conveyor belt to transport materials from 85th Avenue Industrial Lands to dam site to avoid truck trips • Hard-surface 240 Road and the portion of 269 Road south of the intersection with 240 Road • Realign a portion of Old Fort Road south of 240 Road • Potentially widen shoulders or add a path on Old Fort Road between Highway 97 and the realigned segment, and between the end of the realigned segment and the gravel pit entrance at km 5.5 • Widen shoulders or add a path on 271 Road between the Wuthrich Quarry and Highway 97 • Conduct intersection lighting calculations to determine if illumination is warranted and then, in collaboration with the B.C. Ministry of Transportation and Infrastructure, consider installing intersection lighting
<p>Potentially higher accident rate due to poor visibility caused by fog during operations</p> <p>Improved road safety on some routes due to permanent road upgrades</p>	<p>Highway 97 North – Taylor Bridge and Approaches</p> <ul style="list-style-type: none"> • Monitor Taylor Bridge and low-lying approaches for changes in fog hours or density during the early years of Project operations. If required, implement mitigation measures to reduce driver speed and fog-related collisions, and to maintain overall road safety by considering the following: <ul style="list-style-type: none"> • Illumination on Taylor Bridge and bridge approaches • Changeable message signs which are visible in dense fog • Radio broadcasts and other forms of public communication

TRANSPORTATION

Monitoring

Monitoring will be undertaken at several locations to determine if additional traffic management measures would be required, including:

- The intersection of Highway 29 and Canyon Drive, to confirm any traffic delays resulting from construction. Potential mitigation could include construction of a dedicated left-hand turn slot, or changing intersection priority by revising pavement markings and signing
- The signalized intersection of Highway 29 South and Highway 97 South in Chetwynd, to determine if traffic signal timing adjustments could reduce overall intersection delay during construction
- Highway 97 signalized intersections in Fort St. John, to investigate the benefit of adjusting traffic signal timings to reduce overall intersection delay during construction.
- Local commuter road usage, to determine if local road use restrictions should be implemented, for example on Project traffic using 269 Road between 240 Road and Highway 97
- Taylor Bridge and low-lying approaches for fog conditions

Key Findings: Transportation

During construction, several routes would experience increases in traffic volumes and delays, resulting in an adverse effect on transportation. However, road safety levels within the Local Assessment Area would be within the normal variability of annual collision frequency. On some routes (Highway 29 North and Old Fort Road), implementation of mitigation measures and construction of road improvements are expected to improve road safety in the long term. No expected adverse effects are associated with rail use or use of the North Peace Regional Airport.

Long term benefits from road and highway infrastructure improvements will be accrued as part of the Project. Adverse effects associated with traffic delay and road safety would be confined to the period of construction and mitigation measures would be applied to reduce the effects. For these reasons, adverse residual effects on transportation are not considered significant.

HERITAGE RESOURCES

Palaeontological, archaeological, and historical sites, objects, and features are the key indicators that comprise the Heritage Resources valued component for the Project. These key indicators contain physical evidence of ancient flora and fauna or cultural materials including, but not limited to, remains of ancient campsites, subsistence procurement sites, historic structures, and locations containing burials.

Scope of Effects Assessment

The heritage assessment considers:

- Disturbance to heritage sites and features from Project-induced disturbance of palaeontological, archaeological and historical sites and features
- Disturbance to elements essential to the heritage character of features from Project-induced changes to context of palaeontological, archaeological and historical sites and features
- Disturbance to artifacts, features, human remains, and fossils from Project-induced disturbance of fossils and trace fossils, archaeological features and artifacts, and burials
- Hindrance or increase in access to sites and destroying contextual information from changes in level of accessibility to palaeontological, archaeological and historical sites
- Other relevant issues raised by Aboriginal groups in relation to changes to palaeontological, archaeological and historical sites, as well as preservation of heritage resources for cultural uses by Aboriginal peoples

Assessment Area

The Local Assessment Area and Regional Assessment Area for the heritage resources assessment are defined as the Project activity zone. Given the site-specific and stationary nature of heritage resources, this is the maximum area where potential direct and indirect Project effects on heritage resources are reasonably expected to occur.

Baseline Conditions

Baseline conditions for each of the key indicators are described using information collected from:

- Literature reviews, including palaeontological resources, archaeological resources, and historical resources
- An extensive, multi-year field inventory and survey
- Consultation between BC Hydro and Aboriginal groups

HERITAGE RESOURCES

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Changes to resource integrity: <ul style="list-style-type: none"> • Surface disturbance • Disturbance of structures • Subsurface disturbance • Compaction • Erosion 	Construction Phase Depending on the nature and importance of identified heritage resources, various mitigation measures will be used: <ul style="list-style-type: none"> • Avoid sites and reduce resource damage where possible • Manage any found burials following provincial guidelines • Conduct additional reconnaissance and field surveys as warranted • Document historical sites and relocate important structures, if found • Recover heritage resources: staged scientific excavations, stratified sample excavations, systematic surface collection • Commemorate heritage resources as appropriate • Provide funds to local museums to support heritage programming • Implement a Heritage Resources Management Plan, Chance Find Procedure, and Construction Monitoring
Changes to resource accessibility: <ul style="list-style-type: none"> • Increased access • Unauthorized collection • Lack of access 	
Other relevant considerations raised by Aboriginal groups	Operations Phase <ul style="list-style-type: none"> • Conduct reconnaissance and systematic surface collection of exposed resources) or installation of protective measures • Implement a Heritage Resources Management Plan, Chance Find Procedure and reservoir erosion monitoring

Monitoring

Consistent with BC Hydro’s existing heritage reservoir monitoring program, shoreline erosion of heritage resources within the reservoir would be monitored for a period of no less than the first five years of operation. Predicted rates of sedimentation and erosion affecting shoreline heritage resources would be confirmed through shoreline monitoring.

In the event that low reservoir levels occur in the future and exposed heritage site locations can be safely accessed, emergency salvage and systematic data collection of exposed resources would help to mitigate the potential effects of erosion and unauthorized collection of heritage materials.

Key Findings: Heritage Resources

A Heritage Resources Management Plan would be implemented to address heritage site stewardship and protection relative to Project construction activities. The plan would include procedures for monitoring at known heritage site locations within the Project activity zone, as well as chance find procedures to be implemented in the event that heritage resources are encountered during construction. The Heritage Resources Management Plan would be developed with guidance, where applicable, from the B.C. Archaeology Branch, the Fossil Management Framework, the Fossil Management Review Technical Working Group, existing BC Hydro policies and procedures, and in consultation with Aboriginal groups.

Mitigation measures for heritage resources are expected to reduce potential effects, however, Project-related residual adverse effects may occur due to Project-induced disturbance.

HUMAN HEALTH

The potential for human health effects as a result of the Project may be associated with changes in air quality, water quality, noise and vibration, electric and magnetic fields, and methylmercury levels in fish.

Scope of the Effects Assessment

The Human Health assessment considers:

- Changes in potable and recreational water quality
- Changes in ambient air quality
- Change in noise and vibration
- Change in electric and magnetic fields (EMF)
- Change in country foods, methylmercury in fish

Assessment Area

The Local Assessment Area for each human health aspect was based on the technical study area boundaries for air quality, noise, water quality, and EMF studies, the mercury human health risk assessment, and specific locations of human use.

Baseline Conditions

The methods for compiling the baseline and undertaking the human health assessment draw upon the following information sources:

- Baseline and modelling results from the water quality, air quality, noise and vibration, EMF technical studies, and the mercury human health risk assessment
- Objectives, standards, and guidelines for air quality, water quality, noise and vibration, EMF, and methylmercury
- Health Canada guidance documents
- Information on recreation anglers and First Nations fish catch, retention and consumption
- Interviews with Health Canada and Northern Health

HUMAN HEALTH

Summary of Potential Effects and Mitigation Measures

Potential Effects	Key Mitigation Measures
Change in ambient air quality (construction)	<ul style="list-style-type: none"> • Implement Air Quality Management Plan • Utilize filters to contain particulate matter at concrete batch plants and crushers, and silos for fly ash cement and aggregate at concrete batch plants • Retain vegetation barriers where practical • Minimize burning of wood waste and follow B.C. Ministry of Environment Open Burning Smoke Control Regulation • Locate workforce camps outside the area of potential air quality exceedance • Conduct detailed modelling at dam site once the exact locations of emission sources are better defined. Modelling results will be used to determine where to place particulate matter monitors on the north and south bank • Monitor air quality associated with construction of Hudson's Hope Shoreline Protection; implement mitigation measures as required • Conduct further screening modelling at residences located 1.5 km from West Pine Quarry to identify potential exceedances at this site; and implement of air quality management plan at this site; as required
Change in noise and vibration (construction)	<ul style="list-style-type: none"> • Provide temporary noise barriers between work sites and receptors, use portable enclosures/barriers • Implement notification of work program for residents • Develop and implement Noise and Vibration Management Plans for work sites, monitor noise levels at work sites and implement adaptive management measures as required • Construct perimeter fencing • Retain or plant tree screens • Build berms and acoustic barriers • Enclose elements of conveyor belt system • Develop and implement noise monitoring and adaptive management as required
Change in potable and recreational water quality (construction and operations)	<p>Develop and implement the following Environmental Management Plans:</p> <ul style="list-style-type: none"> • Spill Prevention and Emergency Response Plan • Erosion Prevention and Sediment Control Plan • Groundwater Protection Plan
Country foods: methylmercury in fish (operations)	<ul style="list-style-type: none"> • Monitor methylmercury concentrations in fish to identify changes • Provide the public with information about safe fish consumption levels

Key Findings: Human Health

Development and implementation of environmental management plans and monitoring programs are expected to mitigate potential effects on Human Health. No residual effects are anticipated.

LIST OF AMENDMENTS

Environmental Impact Statement Executive Summary (Amended: 19 July, 2013)

Amendment #	Page #	Old text	New text
1	1	September 5, 2012	September 7, 2012
2	2	September	August
3	3	September 5, 2012	September 7, 2012
4	8	156	155
5	19	September 5, 2012	September 7, 2012
6	23	8	10.5
7	29	rare plants	rare vascular and non-vascular plants
8	30		access to the activity,
9	34	rare plants would be lost, including two plant species at risk (Drummond's thistle and little bluestem).	rare vascular and non-vascular plants would be lost. including two plant species at risk (Drummond's thistle and little bluestem).
10	34	and two rare plant species,	and loss of rare plant species,
11	34		In addition, the effect on other cultural and traditional uses would be significant for McLeod Lake Indian Band at the confluence of the Peace River with the Halfway River.
12	45	rare plants	rare vascular and non-vascular plants
13	45		<ul style="list-style-type: none"> • Develop a wetland mitigation and compensation plan • Employ a hydrologist to assist with developing site-specific measures to reduce changes to the existing hydrological balance and wetland function during construction of the Jackfish Lake Road, Project access roads, and the transmission line. • Consider an experimental rare plant translocation program for suitable rare plant species found within the reservoir and other areas where Project components are certain to remove the populations.
14	46	rare plants would be lost, including two red-listed rare plant species, Drummond's thistle and little bluestem.	rare vascular and non-vascular plants would be lost. including two red-listed rare plant species, Drummond's thistle and little bluestem.
15	46	occurrences of two plant species	occurrences of vascular and non-vascular plant species
16	47		<ul style="list-style-type: none"> • Develop a wetland mitigation and compensation plan
17	48	<ul style="list-style-type: none"> • Consider the use of supplemental ungulate feeding programs during severe winters 	<ul style="list-style-type: none"> • Consider the use of supplemental ungulate feeding programs during severe winters
18	48	grouse	sharp-tailed grouse
19	49		<ul style="list-style-type: none"> • Incorporate transmission tower design elements to reduce risk of bird collision mortality
20	55		access to the activity,
21	55		access to the resource,
22	55	<ul style="list-style-type: none"> • Consult with Aboriginal groups respecting the development of fish and wildlife habitat compensation programs that align with BC Hydro compensation programs. 	<ul style="list-style-type: none"> • Consider developing fish and wildlife habitat compensation programs that align with BC Hydro compensation programs.
23	55	<ul style="list-style-type: none"> • Seek input from Aboriginal groups respecting mitigation strategies. • Continue to consult with Aboriginal groups on clearing plans and protocols. 	<ul style="list-style-type: none"> • Seek input from Aboriginal groups respecting mitigation strategies. • Continue to consult with Aboriginal groups on clearing plans and protocols.

LIST OF AMENDMENTS, CONTINUED

Environmental Impact Statement Executive Summary (Amended: 19 July, 2013)

Amendment #	Page #	Old text	New text
24	56	<ul style="list-style-type: none"> Consult with Aboriginal groups respecting the development of habitat compensation projects that align with BC Hydro compensation programs. 	<ul style="list-style-type: none"> Consider developing habitat compensation programs that align with BC Hydro compensation programs.
25	56	<ul style="list-style-type: none"> Provide support for the indigenous plant nursery owned by West Moberly and Sauteau First Nations located at Moberly Lake. The First Nations have a business plan to support propagation of a wide range of indigenous plant species for use in reclamation work. 	<ul style="list-style-type: none"> Be prepared to provide support for the indigenous plant nursery owned by West Moberly and Sauteau First Nations located at Moberly Lake. The First Nations have a business plan to support propagation of a wide range of indigenous plant species for use in reclamation work.
26	57		, McLeod Lake Indian Band, Metis Nation BC,
27	57		, McLeod Lake Indian Band, Metis Nation BC,
28	57		, McLeod Lake Indian Band, Metis Nation BC,
29	57		In addition, the effect on other cultural and traditional uses would be significant for McLeod Lake Indian Band at the confluence of the Peace River with the Halfway River.
30	58		<ul style="list-style-type: none"> Changes to wildlife presence
31	59	<ul style="list-style-type: none"> Irrigation improvements Drainage improvements Relocation of suitable quality soil in selected locations Inclusion of land in the Agricultural Land Reserve Agricultural compensation fund 	<ul style="list-style-type: none"> Agricultural compensation fund to support projects such as irrigation and drainage improvements Relocation of suitable quality soil in selected locations Inclusion of land in the Agricultural Land Reserve based on discussion with the ALC, Crown and private landowners
32	60	<ul style="list-style-type: none"> Potential for unauthorized access to farm properties due to change in land or waterbased access Livestock damage due to new access to the reservoir 	<ul style="list-style-type: none"> Potential for unauthorized access to farm properties due to change in land or waterbased access Livestock damage due to new access to the reservoir
33	61		The Forestry assessment considers the Project's interactions with the forest land base, Crown forest land management, and the forest industry. Scope of Effects Assessment
34	81		, as well as preservation of heritage resources for cultural uses by Aboriginal peoples

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