BC Hydro
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August 3, 2018

Canadian Environmental Assessment Agency
National Programs Division
160 Elgin Street
Ottawa, ON K1A 0H3

Attn: Nicolas Courville, Senior Enforcement Officer
Christie Nelson, Project Manager

Dear Nicolas Courville and Christie Nelson:

Re: Site C Project – Proposed Changes to the Use of West Pine Quarry for the construction of the Highway 29 realignment, Hudson's Hope shoreline protection, and areas along the reservoir requiring protection during reservoir filling.

1. INTRODUCTION

On November 25, 2014, the Minister of the Environment issued a Decision Statement for the Site C Clean Energy Project setting out a description of the Project and the conditions under which the Project can be constructed and operated. The purpose of this letter is to inform you about proposed changes to use West Pine Quarry, in addition to the already approved Portage Mountain Quarry, as a source of quarry and excavated material for the construction of the Highway 29 realignment, Hudson's Hope shoreline protection, and areas along the reservoir requiring protection during reservoir filling as described in Section 4.3 of the Environmental Impact Statement (EIS). Specifically, this letter describes:

- The difference between the Project Description in the EIS and the proposed amended plan for source materials for the Highway 29 realignment, Hudson's Hope Shoreline Protection and areas along the reservoir requiring protection during reservoir filling
- The impact of using the proposed amended plan for source materials for the Highway 29 realignment, Hudson's Hope Shoreline Protection and areas along the reservoir requiring protection during reservoir filling to Project Description in the Decision Statement
- The impact of using the proposed amended plan for source materials for the Highway 29 realignment, Hudson's Hope Shoreline Protection and areas along the reservoir requiring protection during reservoir filling to the conditions set out in the Decision Statement
- Studies on the use of West Pine Quarry and Portage Mountain Quarry for Highway 29 realignment, Hudson's Hope Shoreline Protection and areas along the reservoir requiring protection during reservoir filling submitted during the environmental assessment
- Indigenous group consultation on the proposed amended plan
- Government approvals related to the proposed amended plan

Overall, the proposed change is not expected to result in any changes to the Description of the Project set out in the Decision Statement, or have any effect on the Decision Statement conditions under which the Project can be constructed and operated. The proposed plan to use West Pine Quarry as an additional source of quarry and excavated material will enable BC Hydro to construct the Highway 29 realignment in the most cost effective manner possible for the Project, ensuring affordable power for ratepayers.

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2. DIFFERENCE BETWEEN THE EIS AND THE PROPOSED AMENDED PLAN FOR SOURCE MATERIALS

Table 1 below summarizes the revisions to the plan for sources materials described in the EIS. Please refer to Appendix A, Proposed Modifications to the EIS, for a redline version of the changes summarized in Table 1.

Table 1. EIS Source Material Plan Compared to Proposed Amended Plan for Source Materials

Statement Text from the EIS	Revision to EIS Text
Section 4.3.5.2.3 West Pine Quarry: "Permanent riprap and bedding material would be required for the upstream face of the dam, approach channel lining, containment dikes, coffer dams, some parts of the diversion tunnel inlet and outlet channels, the tailrace, and the discharge channel"	"Permanent riprap and bedding material would be required for the upstream face of the dam, approach channel lining, containment dikes, coffer dams, some parts of the diversion tunnel inlet and outlet channels, the tailrace, the discharge channel**, Highway 29 construction, Hudson's Hope shoreline protection, and for areas along the reservoir requiring protection during reservoir filling**."
Section 4.3.5.2.3 West Pine Quarry: "2. Haul material directly to the dam site area using highway-rated haul trucks, using both existing public roads and the Project access road (See Section 4.3.7)"	"2. Haul material directly to the dam site area, **Highway 29 realignment segments, Hudson's Hope Shoreline Protection, and areas of the reservoir requiring protection during reservoir filling using highway-rated haul trucks on existing public roads** (See Section 4.3.7)"
Section 4.3.5.2.4 Portage Mountain Quarry: "Permanent riprap and bedding material for the Hudson's Hope shoreline protection, for areas along the reservoir requiring protection during reservoir filling and for Highway 29 construction would be sourced from Portage Mountain, 16km southwest of Hudson's Hope.	"Permanent riprap and bedding material for the Hudson's Hope shoreline protection, for areas along the reservoir requiring protection during reservoir filling and for Highway 29 construction would be sourced from Portage Mountain, 16km southwest of Hudson's Hope **or from West Pine Quarry, 138 km southwest of Hudson's Hope**.
Table 4.7 Approximate Quantities of Materials for Highway 29, Access Roads, and Hudson's Hope Shoreline Protection: the first sub-column heading: "Portage Mountain Quarry"	Table 4.7 Approximate Quantities of Materials for Highway 29, Access Roads, and Hudson's Hope Shoreline Protection: the first sub-column heading: "**Portage Mountain Quarry or West Pine Quarry**"
Table 4.9 Approximate Quantities of Unsuitable and Surplus Materials for Highway 29, Access Roads, and Hudson's Hope Shoreline Protection: the first sub-column heading: "Portage Mountain Quarry"	Table 4.9 Approximate Quantities of Unsuitable and Surplus Materials for Highway 29, Access Roads, and Hudson's Hope Shoreline Protection: the first sub-column heading: "**Portage Mountain Quarry or West Pine Quarry**"

Background

Quarried and excavated materials are required for the construction of a number of project components including the dam, generating station and spillways, Highway 29 realignments, access roads, and the Hudson's Hope shoreline protection. These materials are planned to be sourced from various locations in the Project vicinity, including Portage Mountain and West Pine Quarry. At the time of the Environmental Impact Statement and issuance of the Decision Statement, riprap and bedding material for Highway 29 construction, Hudson's Hope shoreline protection, and for other areas requiring protection during reservoir filling were planned to be sourced from Portage Mountain Quarry.

Since the final submission of the EIS and issuance of the Decision Statement, BC Hydro has received new information about two species of bats whose hibernacula are located on the slopes of the original design of Portage Mountain Quarry (little brown myotis and northern long-eared myotis). As both bat species have been identified as Endangered under the federal *Species at Risk Act*, BC Hydro is redesigning the location of the quarry operating face and the layout of the quarry haul road to avoid disturbance to the hibernacula. BC Hydro is also planning to implement timing restrictions to avoid disturbance to the hibernacula. These design changes and timing restrictions will very likely result in increased operational costs with respect to extracting material from the quarry. The increased costs may be such that the use of the Portage Mountain Quarry material will no longer be a cost effective source of material for the Highway 29 realignment construction, Hudson's Hope shoreline protection and areas requiring protection during reservoir filling.

The full redesign and cost analysis for Portage Mountain Quarry will take approximately one year to complete. BC Hydro is submitting this amendment request to the Environmental Assessment Office now because quarried material from West Pine will be required by the fall of 2018 for a segment of Highway 29 construction. Depending on the outcome of the redesign and cost analysis, West Pine Quarry may also be the source of material for the construction of all of Highway 29 realignment segments, Hudson's Hope shoreline protection and areas requiring protection during reservoir filling.

Haul Route

West Pine Quarry is located approximately 73km west of Chetwynd on Highway 97, while Portage Mountain is located west of the existing Peace Canyon Dam, accessed by way of Canyon Drive and Forest Service Roads. Appendix B contains map showing the respective locations and haul routes from Portage Mountain Quarry and West Pine Quarry to Hudson's Hope. Hudson's Hope is selected as the end point to both haul routes for this amendment request, as distances farther east along Highway 29 are common to both quarries. The haul routes and distances for both West Pine Quarry and Portage Mountain to Hudson's Hope are summarized in Table 2.

Table 2. Comparison of West Pine Quarry and Portage Mountain Quarry Haul Route Distances

Portage Mountain Quarry to Hudson's Hope		**West Pine Quarry to Hudson's Hope**	
Segment	**Length**	**Segment**	**Length**
Forest Service Road R14210	10.0km	Highway 97	73.3km
Canyon Road	9.2km	Highway 29 (Chetwynd to Moberly)	64.5km
Total Distance	19.2km	**Total Distance**	138.0km

The hauling distance from West Pine Quarry to Hudson's Hope is approximately 119 km longer than the distance from Portage Mountain Quarry to Hudson's Hope. Both haul routes (with the exception of Forest Service Road R14210) are located on numbered provincial highways and public roads. Truck operators will be required to observe and conform to established speed zones and regulatory signage, including restrictions on the use of air brakes within community areas, pedestrian crossings, and school zone speed limits, on these roads. Truck operation and mechanical condition requirements will also be in effect. Such regulatory measures are established by the Ministry of Transportation and Infrastructure (MoTI) and are enforced by police agencies and the Commercial Vehicle Safety Enforcement branch of MoTI per their respective mandates.

Hauling Schedules and Traffic Volume

Hauling schedules will be at the discretion of the construction contractors to meet their requirements, and will take place year-round. A typical 10 hour work day will begin with the first load at 6:00 am and the final delivery at approximately 4:30 pm during the hauling period. The normal work week is six days – from Monday to Saturday -- though a seven-day work week may occur if required due to material demand, or in order to make up for schedule delays.

From 2018 to 2022, the total projected volume of quarry and excavated material for construction of the Highway 29 realignment and Hudson's Hope Shoreline Protection is approximately 170,000 m^3. This is equal to an average of 526 m^3 per day for a total of 323 haul days (Table 3 below shows the ranges of required volumes and anticipated annual haul days for the construction period. Note that the quarried and excavated material required for areas of the reservoir requiring protection during reservoir filling is not included in the traffic/hauling analysis. This material will be used on an as needed basis and will not require regular hauling as do regular construction works for the Highway 29 realignment and Hudson's Hope Shoreline Protection.)

Because West Pine Quarry is a greater distance from the construction site(s) than Portage Mountain Quarry, more trucks are required to deliver the needed materials, but fewer trips will be made per day due to travel time. Overall, BC Hydro estimates that hauling material from West Pine Quarry will result in approximately 80 one-way, or 40 return, vehicle trips per day (equivalent to 8 one-way vehicle trips per hour, or one truck every 7.5 minutes). Using material from Portage Mountain Quarry will result in approximately 96 one-way, or 48 return, vehicle trips per day (equivalent to over 9 trucks per hour, or one truck every 6.5 minutes)[1]. A calculation sheet for traffic volumes is provided in Appendix C.

Table 3: Annual Volume of Quarried and Excavated Material and Annual Haul Days

Year	Approximate Required Volume (m^3)	Anticipated Annual Haul Days
2018	20,240	35 - 42
2019	39,400	69 - 82
2020	7,210	13 - 15
2021	69,820	122 - 145
2022	31,800	56 - 66
Total	168,470	295 - 350

Notes: The volumes expressed are of usable construction materials only. Table 3 expresses annual haul day in a range because the number of haul days would vary depending on whether the material is hauled from one or both of the quarries in a given year.

[1] These calculations are based on the assumption of a standard truck hauling capacity of 12 m^3 and a 10 hour work day.

3. EFFECT OF THE REVISED GSS DESIGN ON THE PROJECT DESCRIPTION IN THE DECISION STATEMENT

The Project Description in the Decision Statement focuses on the components of the Project:

> "BC Hydro and Power Authority (the Proponent) proposes to construct and operate a dam and 1,100-megawatt hydroelectric generating station on the Peace River in northeastern British Columbia. The Site C Clean Energy Project (the Designated Project) would be the third in a series of dams on the Peace River in British Columbia. The project components would consist of an earthfill d am, 1,050 metres long and 60 metres high, a 1,100-megawatt generating station and associated structures, a 83-kilometre long reservoir, realignment of four section of Highway 29, and two 77-kilometre transmission lines along an existing transmission line right-of-way connecting Site C to Peace Canyon."

No changes to the Project Description in the Decision Statement will be required as a result of the proposed amended plan.

4. IMPACT TO DECISION STATEMENT CONDITIONS

The proposed amended hauling plan is not anticipated to cause any adverse effects on valued components beyond the effects that were considered during the environmental assessment of the Project. For this assessment, the following valued components were reviewed and are described below: transportation, wildlife resources, and current use of lands and resources for traditional purposes. These valued components are reflected in three Decision Statement conditions:

Condition 12 – Health of Aboriginal Peoples – air quality
Condition 14 – Current use of lands and resources for traditional purposes
Condition 16 – Species at risk, at risk and sensitive ecological communities and rare plants

<u>Transportation (Condition 12)</u>

An increase in traffic volumes can lead to changes in transportation delay and safety. Increased traffic volumes generally result in road users experiencing changes in travel times (delays) – e.g., at intersections -- and collisions in proportion to the incremental traffic volumes attributable to Project construction. The proposed amended plan to haul from West Pine Quarry would result in all or some of the Project traffic currently forecast for Canyon Drive in Hudson's Hope being shifted to (a) Highway 97 between West Pine Quarry and the intersection with Highway 29 in Chetwynd and (b) Highway 29 between Highway 97 and the intersection of Highway 29 and Canyon Drive in Hudson's Hope (see Figure 1). This shift of traffic is not anticipated to lead to changes in background traffic (non-Project traffic), Project-related traffic, or Highway 29/Canyon Drive intersection traffic beyond what was assessed in the EIS. As such, the proposed amended plan does not change the results of the environmental assessment for transportation or require any additional proposed mitigation or monitoring.

Background traffic

New information obtained since the EIS indicates that background traffic on Highway 29 north of Highway 97, Highway 97 west of Highway 29, and Highway 97 east of Highway 29 is lower than was

forecast in the EIS. Background traffic volumes were updated using the Ministry of Transportation and Infrastructure daily count data from 2014, which were lower than those predicted for 2014 during the Environmental Assessment (see Table 4). As shown in Table 5, this results in lower predicted 'background' traffic volumes through to 2023. The background traffic was reforecast for 2023 using the same methodology described in the EIS, Volume 4, Appendix B, Project Traffic Analysis. Because the traffic impact was assessed and mitigation was proposed based on higher total volumes of background and Project traffic, the proposed amended haul plan does not require any additional proposed mitigation or monitoring.

Table 4 EIS and Actual Traffic Volumes - 2014

Road Segment	2014 estimated - EIS volumes	2014 - actual volumes	Difference
Hwy 29 north of Hwy 97	7,500 vpd	4,900 vpd	-2,600
Hwy 97 west of Hwy 29	6,360 vpd	4,800 vpd	-1,560
Hwy 97 east of Hwy 29	9,900 vpd	8,400 vpd	-1,500

Table 5 EIS and Updated Traffic Volume Estimates - 2023

Road Segment	2023 estimated - EIS volumes	2023 estimated - (updated)[1]	Difference
Hwy 29 north of Hwy 97	8,600 vpd	5,600 vpd	-3,000
Hwy 97 west of Hwy 29	7,300 vpd	5,500 vpd	-1,800
Hwy 97 east of Hwy 29	11,300 vpd	9,600 vpd	-1,700

Note 1: This column displays the updated estimate for traffic volumes in 2023 using a 1.5% growth rate based on the actual volumes recorded in 2014.

Project Traffic – West Pine Quarry to Highway 29 at Jackfish Lake Road

The assessment of transportation in the EIS describes approximately 800,000 m^3 of permanent riprap being hauled by vehicle over eight years from West Pine Quarry, through Chetwynd and up Highway 29 to Jackfish Lake Road, to the Dam Site Area. This Project traffic was not forecasted to change the Level of Service at the Highway 97/Highway 29 (Chetwynd) intersection.

Due to a decision by the main civil works contractor, permanent riprap will not be hauled to the dam site area by vehicle, but instead will be transported by rail. As described above, hauling approximately 170,000 m^3 material from West Pine Quarry for the construction of the Highway 29 realignment segments and Hudson's Hope shoreline protection will result in approximately 80 one-way, or 40 return, vehicle trips per day (equivalent to 8 one-way vehicle trips per hour, or one truck every 7.5 minutes). This is approximately the same volume of traffic predicted in the EIS for the hauling of permanent riprap from West Pine Quarry to the dam site area, though the total number of days of hauling is lower due to the reduced volume of material.[2] The proposed amended haul plan is not anticipated to cause additional traffic above what was assessed for this section of road, and will therefore not require any additional proposed mitigation or monitoring beyond what was described in the EIS.

[2] In the peak year, the EIS predicted that 15,500 vehicle loads would travel along this route, amounting to 31,000 one-way vehicle trips. Average daily traffic was predicted to be just 85 one-way, or 40 return, trips per day. The typical one-way peak hour volume was predicted to be 5 trips per hour per direction. This is equal to approximately one truck every 6 minutes considering both directions. This Project traffic was not forecast to change the Level of Service at the Hwy 97/Hwy 29 (Chetwynd) intersection.

Traffic along Highway 29 between Jackfish Lake Road and Canyon Drive intersections

The proposed amended haul plan will result in an increase in traffic along Highway 29 between its intersections with Jackfish Lake Road in Chetwynd and Canyon Drive in Hudson's Hope. Although this segment of Highway 29 was not assessed in the EIS, BC Hydro did report that it carries approximately 8,000 vehicles per day. This segment of Highway 29 passes through Moberly Lake with a reduced speed limit and also passes the Hudson's Hope School with a school zone speed limit of 30 km per hour, both enforced by police. Monitoring the intersections of Highway 29 with Jackfish Lake Road and Canyon Drive will capture if this segment of road will experience an increase in traffic due to the proposed amended plan. If required, additional or monitoring or mitigation beyond what was described in the EIS will be implemented.

Traffic at Canyon Drive / Highway 29 intersection

BC Hydro assessed the intersection of Canyon Drive and Highway 29 to forecast the traffic that would result from the proposed amended plan to haul material from West Pine Quarry instead of Portage Mountain Quarry for Highway 29 realignment segments and Hudson's Hope shoreline protection. The proposed amended plan is not expected to change the Level of Service, or the average delay in seconds per vehicle, for the intersection. The proposed amended plan will not change the total amount of traffic transiting the Canyon Dr / Highway 29 intersection in Hudson's Hope, when compared to the plan to haul from Portage Mountain Quarry. Traffic at the intersection will change in that vehicles from West Pine will come into Hudson's Hope from the south along Highway 29, instead of from the west from Portage Mountain Quarry. The West Pine Quarry traffic on Canyon Drive will stop at the Highway 29 / Canyon Drive intersection stop sign when turning to go east on Highway 29. From Portage Mountain Quarry, vehicles have the right of way to proceed straight through the intersection. In addition, vehicles from West Pine Quarry will not interact with pedestrians using the uncontrolled cross-walk across Canyon Drive to the post office. They will pass the Hudson's Hope School, which is located on Highway 29 and has school zones speed limit of 30 km per hour, enforced by police.

<u>Wildlife Resources (Conditions 14 and 16)</u>

The anticipated distance travelled by vehicles per haul day is 1,843 km when Portage Mountain is the source of material for the Project works, and 11,040 km from West Pine Quarry. Increased haul distances increase the risk of wildlife mortality due to vehicle collisions. However, mitigation such as adhering to speed limits and further reducing speed to adapt to inclement driving conditions, will reduce the risk of vehicle collisions with wildlife. Although the risk of wildlife vehicle collisions is likely to increase due to the longer haul distances associated with hauling from West Pine Quarry, the residual impacts of the change on wildlife mortality are not likely to result in measureable impacts on wildlife populations overlapping haul roads. Therefore, the residual incremental effects of increased reliance on West Pine Quarry on wildlife mortality are expected to be negligible, and would not change the conclusions of the EIS.

West Pine Quarry occurs within a recognized caribou herd range, which was recognized in the EIS. However, mitigation was identified so that there would be no impacts on woodland caribou due to quarry operations (EIS, Section 14.1.2). Specifically, to avoid disturbance to caribou blasting at West Pine quarry is prohibited January 1 to March 31, and restricted to no greater than historical levels during the period of May 15 to June 14 each year of operation (see Section 4.2 of the Site C Construction

Environmental Management Plan)[3]. The West Pine Quarry has been in operation by the B.C. Ministry of Transportation and Infrastructure since 2001. Operations at West Pine Quarry will not encroach upon important habitats noted in recovery planning and activities will continue to follow practices currently used by the B.C. Ministry of Transportation and Infrastructure. These identified mitigation measures will remain in place for use of West Pine Quarry by BC Hydro for Site C, regardless of the amount of reliance on West Pine Quarry for aggregate material; therefore, there will continue to be no expected impacts on woodland caribou due to quarry operations.

Current Use of Lands and Resources for Traditional Purposes (Condition 14)

Project effects on Current Use of Lands and Resources for Traditional Purposes were assessed in the EIS by considering Project changes to current use of lands and resources for hunting, fishing and trapping activities, as well as current use of lands and resources for activities other than hunting, fishing and trapping by Aboriginal groups. No interaction with the valued component of fish and fish habitat is anticipated due to the proposed amended plan to haul material from West Pine Quarry for Highway 29 realignment, Hudson's Hope Shoreline Protection and areas along the reservoir requiring protection during reservoir filling. In addition, the proposed amended plan does not result in any additional effects on Wildlife Resources beyond what was assessed in the EIS. Therefore, the proposed amended plan is not expected to cause any additional effects on the current use of lands and resources beyond those predicted in the EIS.

5. RELATED STUDIES

The following sections and appendix of the EIS provide additional information regarding the assessed effects of hauling material along roadways for the Site C Project:

- Volume 2, Section 14, Wildlife Resources
- Volume 2, Section 15, Greenhouse Gases
- Volume 4, Section 31, Transportation
- Volume 4, Appendix B, Project Traffic Analysis

[3] https://www.sitecproject.com/document-library/environmental-management

6. PROVINCIAL ENVIRONMENTAL ASSESSMENT CERTIFICATE

In addition to the federal Decision Statement authorizing the Site C Project, the use of West Pine Quarry for the construction of the Highway 29 realignment, Hudson's Hope shoreline protection, and areas along the reservoir requiring protection during reservoir filling is authorized under provincial Environmental Assessment Certificate (EAC) #14-02. The EAC includes detailed Project design elements. As such, BC Hydro is currently seeking an amendment to EAC #14-02 to reflect the proposed amended plan for source materials.

7. INDIGENOUS GROUP CONSULTATION/ENGAGEMENT

Environmental Assessment

During the environmental assessment process for the project, Indigenous groups identified specific concerns around West Pine Quarry related to project impacts on caribou habitat. Comments provided by Indigenous groups during the environmental assessment, and BC Hydro's responses, are available on the EAO's website for the project. [4]

EIS Amendment Request

BC Hydro's draft request to the Environmental Assessment Office to amend Section 4.3.5.2.3, Section 4.3.5.2.4, Table 4.7 and Table 4.9 of Schedule A to EAC #E14-02 (which are the same as Section 4.3.5.2.3, Section 4.3.5.2.4, Table 4.7 and Table 4.9 of of the EIS) was provided to the following Indigenous groups on July 6, 2018: Blueberry River First Nation, Dene Tha' First Nation, Doig River First Nation, Duncan's First Nation, Fort Nelson First Nation, Halfway River First Nation, Horse Lake First Nation, McLeod Lake Indian Band, Saulteau First Nations, and Nun wa dee (representing Prophet River First Nation and West Moberly First Nations), Kelly Lake Métis Settlement Society and Métis Nation British Columbia. BC Hydro requested that Indigenous groups provide comments by July 18 and offered to meet to review the draft amendment request. Indigenous groups were advised that their input would inform the final amendment request to be submitted by end of July 2018. No comments were received from Indigenous groups on the requested amendment.

Regulatory and compliance matters for BC Hydro's northeast projects (including Site C) are discussed during regular/monthly meetings with some BC Treaty 8 First Nations. Upon request, the West Pine Quarry Use EAC amendment will also be introduced and discussed at meetings scheduled for September 2018. The West Pine Quarry Use EAC amendment application will also be presented to Treaty 8 First Nations at the Site C Permitting Forum #10 in September 2018.

8. GOVERNMENT APPROVALS

In addition to the federal Decision Statement and provincial Environmental Assessment Certificate #E14-02 authorizing the Site C Project, the removal and transport of quarried and excavated materials, site preparation, and access construction activities are authorized under:

[4] The table of Information Requests from Indigenous groups and BC Hydro's responses can be found at https://projects.eao.gov.bc.ca/api/document/5887e174d876de1347b512d1/fetch

West Pine Quarry

- *Mines Act* Notice of Work – West Pine Quarry – File 1640182-201401
- *Mines Act* Notice of Work – West Pine Quarry, File 1640182-201601
- *Forest Act* Section 52 Authorization for Clearing – West Pine Quarry
- *Forest Act* Occupant Licence to Cut #12 – West Pine Quarry – File L50577
- *Land Act* Licence of Occupation – West Pine Quarry – File 8015784
- *Water Sustainability Act* Section 10 Short Term Use – West Pine Quarry – File A703726

Portage Mountain

- *Mines Act* Notice of Work – Portage Mountain Quarry Trial Blasting 2018 – File 1641424-201801
- *Forest Act* Occupant Licence to Cut #3 – Portage Mountain – File L50259
- *Land Act* Licence of Occupation – Portage Mountain – File 8015495
- *Water Sustainability Act* Section 10 Short Term Use – Portage Mountain Quarry – File 9000338

These approvals are available on the Project's website, at: https://www.sitecproject.com/document-library/permits-and-authorizations

9. ATTACHMENTS

Appendix A: Proposed Modifications to EIS Section 4.3

- Excerpt from the EIS showing the changes proposed by this amendment request in redline.

Appendix B: Figure

- Figure showing the haul route to Hudson's Hope from West Pine Quarry and from Portage Mountain.

Appendix C: Traffic Volume and Distance Calculations

10. CLOSURE

I trust this submission provides useful information regarding BC Hydro's request to amend the EIS. We look forward to discussing these amendments with you further. In the meantime, please don't hesitate to contact me at 604-695-5204 if you have any questions or comments.

Regards,
<Original signed by>

Karen von Muehldorfer
Regulatory Manager
Site C Clean Energy Project
Karen.vonMuehldorfer@bchydro.com

Cc: Shanna Mason, Environment, Regulation, Community Impacts & Properties Director, BC Hydro

APPENDIX A: Proposed Modifications to EIS

(see pages 4-27, 4-29, 4-30, 4-31)

Table 4.7 Approximate Quantities of Materials for Highway 29, Access Roads, and Hudson's Hope Shoreline Protection

Material Description		Volume Placed (1,000 Compacted m^3)						
		Portage Mountain Quarry or West Pine Quarry	Inundated Areas Along Reservoir	Road Alignment Excavation	Dam Site Area	Del Rio Pit	Commercial Pits	Total
North bank – Highway 29 realignment, access roads and reservoir shoreline protection during filling	Riprap and bedding	447	N/A	N/A	N/A		N/A	447
	Granular aggregates (processed)	N/A	484	N/A	N/A	N/A		484
	Fill and borrow	N/A	9,381	830	N/A	N/A	7	10,218
	Concrete aggregates	N/A	N/A	N/A	N/A	N/A	12	12
South bank – access roads	Riprap and bedding	2	N/A	N/A	N/A	N/A	N/A	2
	Granular aggregates (processed)	N/A	N/A	N/A	N/A	50	464	514
	Fill and borrow	N/A	N/A	301	118	200	77	697
	Concrete aggregates	N/A	N/A	N/A	N/A	N/A	16	16
Hudson's Hope shoreline protection	Riprap and bedding	172	N/A	N/A	N/A	N/A	N/A	172
	Granular aggregates (processed)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Fill and borrow	N/A	N/A	306	N/A	N/A	N/A	306
Total		621	9,381	1,437	118	250	1,060	12,868

NOTE:

N/A – not applicable

1 **Table 4.8 Approximate Quantities of Unsuitable and Surplus Material for Dam, Generating Station, and Spillways**

Material Description	Volume Placed (1,000 Placed m^3)				
	West Pine Quarry	Wuthrich Quarry	85th Avenue Industrial Lands	Dam Site Area	Total
Surplus[a]	1,150	915	N/A	N/A	2,065
Unsuitable[b]	N/A	N/A	325	12,085	12,085
Stripping and overburden	242	330	177	20,304	21,053
Total	1,392	1,245	502	32,389	35,528

NOTES:

[a] Surplus materials at West Pine and Wuthrich would be stockpiled for usage by BCMOTI or by others; unsuitable material at the 85th Avenue Industrial Lands would be used for final landscaping

[b] Unsuitable materials for construction would be relocated as described in Section 4.3.2.3 N/A – not applicable

Table 4.8 Approximate Quantities of Unsuitable and Surplus Materials for Highway 29, Access Roads, and Hudson's Hope Shoreline Protection

Material Description	Volume Placed (1,000 Placed m^3)					
	Portage Mountain Quarry or West Pine Quarry	Inundated Areas Along Reservoir	Road Alignment Excavation	Dam Site Area	Other Sources	Total
Surplus[a]	463	N/A	N/A	N/A	100	565
Unsuitable	N/A	N/A	9	N/A	N/A	9
Stripping and overburden	33	761	718	N/A	48	1,560
Total	498	761	727	N/A	148	2,134

NOTES:

[a] Surplus material at Portage Mountain and other gravel pits would be stockpiled for usage by BCMOTI or by others

N/A – not applicable

4.3.5.2.1 85th Avenue Industrial Lands

The 85th Avenue Industrial Lands is a 96 ha parcel of land located in the Peace River Regional District, adjacent to the City of Fort St. John. BC Hydro owns all parcels of land within the site. All impervious material (i.e., glacial till) required for the construction of the earthfill dam core and the approach channel lining would be excavated from the 85th Avenue Industrial Lands. The impervious core in the closure section of the Stage 2 upstream cofferdam (see Section 4.4.3.3) may also be sourced from the 85th Avenue Industrial Lands depending on the suitability of material available on-site.

A conveyor would transport material from 85th Avenue Industrial Lands to the dam site area. The conveyor would off-load materials into a large hopper or to a stockpile close to the hopper. Trucks would then be loaded directly from the hopper or by front-end loader from the stockpile and transport the material to the placing location within the dam site.

4.3.5.2.2 Wuthrich Quarry

Temporary riprap and bedding material would be required for construction of parts of cofferdams, for lining parts of the inlet and outlet channels of the diversion tunnels, and for the erosion protection of the access road along the north bank of the river (see Section 4.3.7). The source of this temporary riprap would be the Wuthrich Quarry, which is an existing BCMOTI quarry located approximately 7 km northwest of Fort St. John. Further development by BC Hydro would expand the area that has been excavated by BCMOTI, but would be within the current boundaries of the quarry.

Riprap and bedding material would be transported from Wuthrich Quarry to the dam site by highway trucks on existing public roads.

4.3.5.2.3 West Pine Quarry

Permanent riprap and bedding material would be required for the upstream face of the dam, approach channel lining, containment dikes, cofferdams, some parts of the diversion tunnel inlet and outlet channels, the tailrace, and the discharge channel, Highway 29 construction, Hudson's Hope shoreline protection, and for areas along the reservoir requiring protection during reservoir filling. The source of this permanent riprap and bedding material is the West Pine Quarry, located on provincial Crown land approximately 75 km southwest of Chetwynd along Highway 97 (approximately 160 km from the Project site).

There are currently two transportation options under consideration for the permanent riprap and bedding material:

1. Use the existing railway siding at the quarry and haul the material to the site by rail; one train per day would be required. Riprap and bedding would be unloaded at the Septimus Siding in the dam site area and moved to a stockpile. An extension of the siding may be required within the quarry. Due to breakage during extra handling. More rock would have to be quarried with this option.
2. Haul the material directly to the dam site area, Highway 29 realignment segments, Hudson's Hope Shoreline Protection, and areas of the reservoir requiring protection during reservoir filling using highway-rated haul trucks, ~~using~~on existing public roads ~~and the Project access road~~ (see Section 4.3.7)

The transportation option would be selected by the contractor(s) using the riprap and bedding. For the purposes of environmental assessment, the trucking option has been assumed, as while it has less quarrying it has the greater footprint.

4.3.5.2.4 Portage Mountain

Permanent riprap and bedding material for the Hudson's Hope shoreline protection, for the areas along the reservoir requiring protection during reservoir filling, and for Highway 29 construction would be sourced from Portage Mountain, 16 km southwest of Hudson's Hope or from West Pine Quarry, 138 km southwest of Hudson's Hope. Portage Mountain is currently undeveloped.

Excavated material would be transported from the quarry to the construction site using highway haul trucks via the access roads described in the development plan and existing public roads.

4.3.5.2.5 Del Rio Pit

Some of the gravel required for the construction of the Project access road and upgrades to the Jackfish Lake Road and other roads on the south bank would come from the Del Rio Pit, an existing gravel source operated by the BCMOTI. The pit is located 50 km north of Chetwynd, B.C., along Jackfish Lake Road, west onto Douglas Road and then onto Del Rio Pit Road.

The License of Occupation on Crown lands for the gravel reserve spans approximately 142 ha and is traversed by the 138 kV transmission line right-of-way.

4.3.5.2.6 Inundated Areas

Potential aggregate sources along the Peace River and tributary river valleys were identified. At each of the Highway 29 segments requiring realignment or upgrading, and for the Hudson's Hope shoreline protection, the closest sources within the area that would be flooded by the proposed reservoir have been identified as off-site sources for the required construction materials.

Where the sources would be at shallow depth after reservoir impoundment, opportunities for enhancement of fish habitat by contouring and habitat complexing would be explored.

4.3.5.2.7 Commercial Pits

Materials sourced from local commercial pits for construction of Highway 29 would include aggregates for the asphalt pavement and concrete.

Some fill for the Hudson's Hope shoreline protection could be sourced from local commercial pits.

Materials from commercial pits for the Project would be extracted under the terms of the development and other permits for those pits held by the pit owners.

4.3.5.2.8 Area E

Area E has been identified as a contingency pit for gravel to be used for road construction on the south bank or for construction of the earthfill dam. The identified area could provide up to one million m^3 of gravel. Area E is adjacent to the Teko Pit, located

4.3.5.3 On-Site Sources

4.3.5.3.1 Highway 29 and Hudson's Hope Shoreline Protection

Materials from excavations required for highway realignment that are suitable as fill would be used for the highway embankments.

As described in Volume 2 Appendix B Geology, Terrain Stability, and Soil, Part 2 Preliminary Reservoir Impact Lines, the Hudson's Hope shoreline protection would be a combination of a berm and slope flattening. Suitable material from the slope flattening excavation would be used for construction of the berm.

4.3.5.3.2 Dam, Generating Station, and Spillways

Impervious material for construction of cofferdams and lining of disposal areas would be sourced from required excavations and from a source on the north bank outside the limits of the north bank stabilization excavation.

About 40% of the fine filter for the earthfill dam would come from a source on the north bank of the river, and the remainder from the south bank terrace downstream of the dam.

All of the gravel excavated for the construction of the dam, generating station, and spillways would be used for construction.

Aggregates for concrete and RCC and gravel for the shell of the dam would be sourced from the south bank terrace downstream of the dam.

4.3.5.4 Alternative Off-Site Material Sources Considered

The following subsections describe alternative off-site sources of materials that were considered and provide the rationale as to why these sources are not proposed for use in construction of the Project.

4.3.5.4.1 Dam, Generating Station, and Spillways

Impervious Material

Reconnaissance studies concluded that suitable impervious material was likely to be found on the north side of the Peace River close to the dam site area, and was unlikely to be found on the south side.

Geotechnical investigations were carried out on the north side of the river in 2009 and 2010 to identify potential sources of impervious core material. The 2009 investigation focused on understanding the surficial geology and stratification of the area, and identified the most promising source areas for further investigations. The 2009 investigations consisted of:

- 104 auger holes (up to 35 m depth, 125 mm diameter)
- 7 test pits (up to 5.2 m depth)
- Laboratory testing on representative samples

Additional investigations were carried out in 2010 to further define the potential sources. The 2010 investigations consisted of:

- 15 sonic drill holes (up to 29 m depth and 120 mm diameter)
- 8 test pits (up to 8.3 m depth)
- 6 piezometers installed for groundwater level monitoring
- Laboratory testing on representative samples

Of the potential sources investigated on the north bank, the 85th Avenue Industrial Lands were selected as the source of the impervious fill because it:

- Is close to the dam site area
- Has best gradation and plasticity
- Would require minimal moisture conditioning, as it has an average natural moisture content that is 1.3% dry of average optimum moisture content
- Can be compacted to a high density with an average dry density of 2,094 kg/m^3 standard Proctor maximum dry density
- Has the highest shear strength, varying from 32 to 35 degrees
- Is a more consistent product and in greater thickness, meaning that little material would be wasted
- Has less topsoil cover

4.3.5.4.2 Temporary Riprap

Tea Creek, located 6 km upstream of the dam on the north bank, was originally considered as the source for temporary riprap for the dam site. The haul distance to the dam is approximately 12 km by existing roads. The deposit is made up of sandstone outcrops of the Dunvegan formation on a bedrock ledge above Tea Creek. The rock, which includes thinly bedded planes of fine-grained sandstone overlain with overburden materials, is approximately 20 m thick.

The area was preliminarily assessed for environmental effects and a resident bat population was discovered residing along the outcrop. Other potential effects included the existence of rare species of plants, haul routes on agricultural lands, and the effect on farm operations and residences within 0.9 km to the east and 2.5 km upstream on Tea Creek. Because of these considerations, Wuthrich Quarry was selected as the source of temporary riprap.

4.3.5.4.3 Permanent Riprap

The Portage Mountain Quarry was considered as an alternate source of permanent riprap. Haul routes from Portage Mountain to the dam site area would be through Hudson's Hope:

- East along Highway 29 to the Alaska Highway, through Fort St. John and via the Old Fort Road

- South on Highway 29 through Moberly to Jackfish Lake Road and via the Project access road; due to the restricted capacity of Hudson's Hope Bridge, the load size would be limited, potentially increasing the number of trucks

Due to the potential effect on traffic, this option was dropped, even though it would be $10 million cheaper than using material from the West Pine Quarry. Of particular concern were the long hills on Highway 29 where trucks hauling riprap would cause considerable delays.

4.3.5.4.4 Highway 29 and Hudson's Hope Shoreline Protection

Other potential riprap sources near to Highway 29 and Hudson's Hope are the Castle formation and the Pringle formation, both on Bullhead Mountain, approximately 6 km north of Portage Mountain. The thinly bedded rock outcrops would result in a lower potential yield than at Portage Mountain, which would increase the cost of production and generate a larger footprint than on Portage Mountain in order to produce the same volume of material. The absorption, specific gravity, and soundness results are below those acceptable for use as riprap. An access road capable of supporting haul units would be required to be constructed for approximately 4 km to the better of the two locations at the Pringle prospect. Therefore, the Bullhead Mountain sources are no longer being considered as potential sources of riprap.

4.3.6 Worker Accommodation

BC Hydro is planning for provision of worker accommodation during the construction phase. The operation phase annual average workforce is predominantly of a regular, long-term nature that would be easily accommodated in local communities.

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 between 800 and 1,700 workers (with contingency, up to 2,100 workers). Approximately 90% of the workforce would be required for construction activities at the dam site. About 10% 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. The workforce for the Project is expected to be composed of existing local residents, new local residents, and workers from outside the region who will maintain their permanent residence outside the region.

Worker accommodation planning is informed by the following objectives and considerations:

- Safety for public and workers
- Workforce attraction, retention, and well-being of workers and their families
- Project construction productivity, cost, and schedule
- Managing social and housing market effects in nearby communities, including opportunities to leave a beneficial housing legacy
- Support for new workers and their families who choose to move to the region

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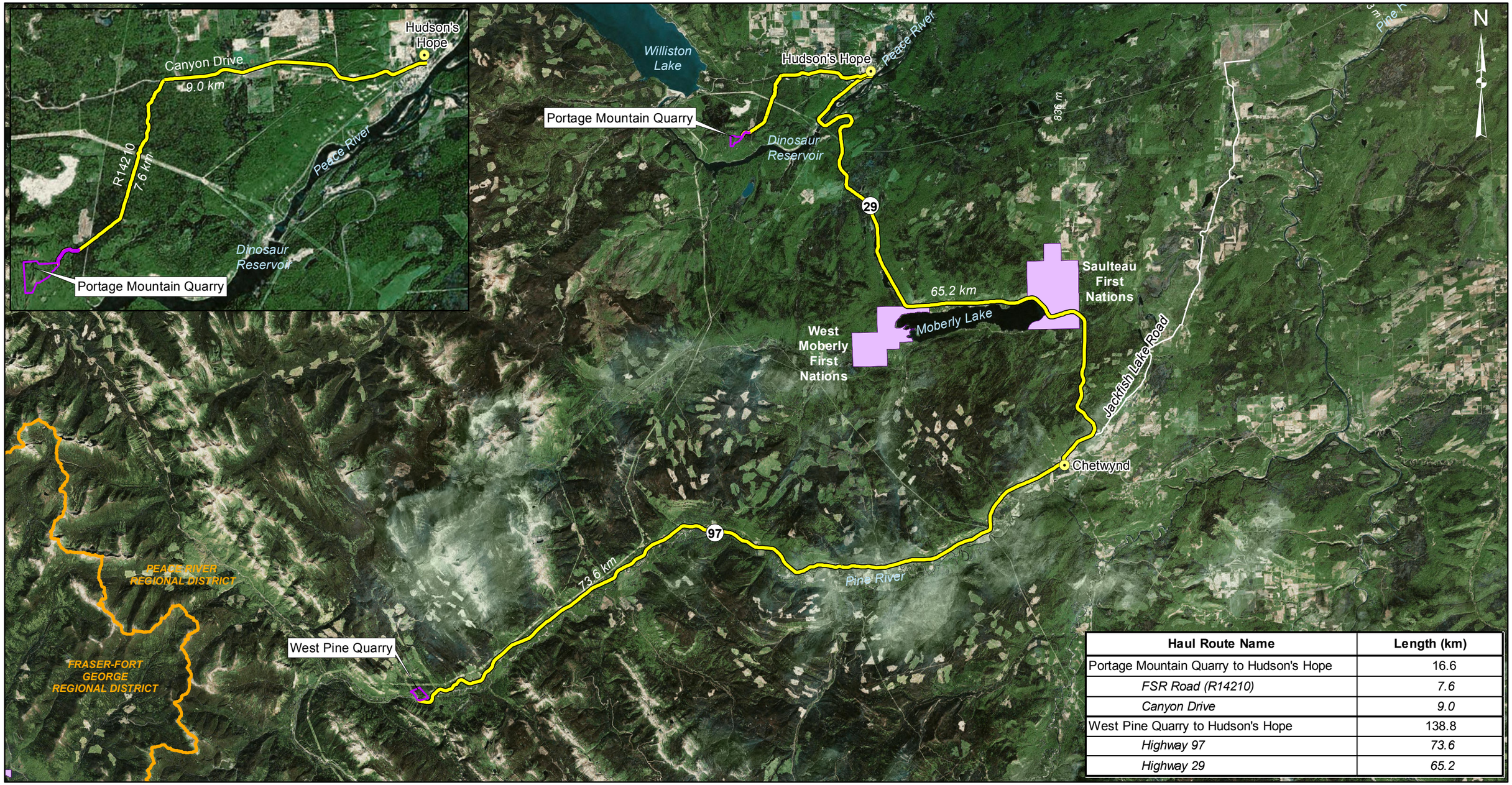
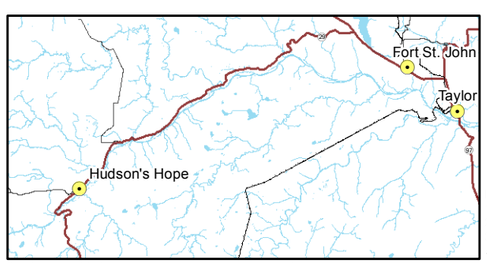
APPENDIX B: Figure -- Portage Mountain and West Pine Quarries Haul Routes



Haul Route Name	Length (km)
Portage Mountain Quarry to Hudson's Hope	16.6
FSR Road (R14210)	*7.6*
Canyon Drive	*9.0*
West Pine Quarry to Hudson's Hope	138.8
Highway 97	*73.6*
Highway 29	*65.2*



Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.
4. Imagery is based on ESRI ArcGIS Online Maps.

Legend

- Quarry
- Haul Route
- Reserve or Settlement
- Regional District Boundary

1:350,000 0 15 km

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Portage Mountain and West Pine Quarries Haul Routes

Date	Jul 20, 2018	DWG NO	1016-N11-00007	R 2

Construction of the Site C Clean Energy Project is subject to required regulatory and permitting approvals.

Path: X:\ArcGISProjects\RegulatoryHaul_Routes_1016_N11_00007.mxd

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APPENDIX C: Traffic Volume and Distance Calculations

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Approximate Hourly Traffic Impact and Daily Hauling Volume Calculations

Portage Mountain Quarry	
Maximum Daily Vehicles Working	12
Maximum Transportable Volume per Vehicle	$12m^3$
Operational Hours	10
Daily Trips to Worksite, per Vehicle	4
Daily Trips to Quarry site, per Vehicle	4
Total Daily Vehicle Trips (both directions)	96
Increase in Vehicles per Hour (rounded)	10
Maximum Daily Volume of Material Hauled	$576m^3$
Haul Distance (one direction)	19.2km
Total daily haul distance (both directions, all trucks)	1,843.2km

West Pine Quarry	
Maximum Daily Vehicles Working	20
Maximum Transportable Volume per Vehicle	$12m^3$
Operational Hours	10
Daily Trips to Worksite, per Vehicle	2
Daily Trips to Quarry site, per Vehicle	2
Total Daily Vehicle Trips (both directions)	80
Increase in Vehicles per Hour	8
Maximum Daily Volume of Material Hauled	$480m^3$
Haul Distance (one direction)	138km
Total daily haul distance (both directions, all trucks)	11,040km