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Regulatory Affairs Correspondence Email: gas.regulatory.affairs@fortisbc.com

January 16, 2014

<u>Via Email</u> Original via Mail

British Columbia Utilities Commission Sixth Floor 900 Howe Street Vancouver, B.C. V6Z 2N3

Attention: Ms. Erica M. Hamilton, Commission Secretary

Dear Ms. Hamilton:

Re: FortisBC Energy Inc. (FEI)

Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application) for the Fort Nelson Service Area

Response to the British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1

On November 29, 2013, FEI filed the Application as referenced above. In accordance with Commission Order G-207-13 setting out the Regulatory Timetable for the review of the Application, FEI respectfully submits the attached response to BCUC IR No. 1.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (e-mail only): Registered Parties



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 1

2	A.	CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY	. 2
3	В.	REVENUE REQUIREMENT AND RATE IMPACT	44
4	C.	PUBLIC AND FIRST NATIONS CONSULTATION	.66



Information Request (IR) No. 1

1 Α. CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

- 2 1.0 **Reference: Executive Summary**
- 3

Exhibit B-1, Secti on 1.2, pp. 1, 2

- 4
- "The original crossing of the Muskwa River was completed in the early 1960's." (p. 1)
- 5 1.1 Does FEI know if the original crossing pipeline was abandoned in place?
- 6 7

Response:

8 The original 1960s pipeline crossing utilized the existing bridge over the Muskwa River. This 9 bridge was replaced in the early 1970s and therefore the original crossing pipeline would have

- 10 been removed as part of the bridge demolition and would not have been abandoned in place.
- 11
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- 13
- 14
- 15
- 1.1.1 Does FEI have any location information for the original pipeline or any other buried lines/structures?
- 16

17 **Response:**

18 FEI has location information of the original pipeline crossing and other buried utility lines. 19 During the planning process, FEI located another foreign utility and found remains of some 20 portions of the original bridge structure. The pipeline route of the preferred HDD alternative has 21 been designed to be well clear of all these known structures, the river, and the riparian area.

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- 26 "The remaining cover may not be sufficient to withstand another freshet and the pipeline 27 could be seriously damaged which may result in loss of gas supply to Fort Nelson 28 customers, a pipeline loss would completely disable FEI's ability to supply natural gas to 29 its customers in FEFN. Thus, FEI believes it necessary to replace the pipeline crossing by May 1, 2014, prior to the 2014 Muskwa River freshet." (p. 2) 30
- 31 1.2 Does FEI have any back-up provisions available should a pipeline loss occur?
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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 3

1 Response:

2 FEI has explored both an LNG and temporary pipeline crossing option as a backup provision. 3 Due to the relatively high peak load demand of the Fort Nelson customers downstream of the 4 Muskwa crossing in colder weather, the logistics of moving the required quantity of LNG to the 5 site in the event of a pipeline failure was considered impractical. As a result, provisions have 6 been made with Public Works Government Services Canada (PWGSC) to expedite the 7 installation of a temporary pipeline across the Muskwa River Highway Bridge to restore service 8 in the event of the failure of the in-stream crossing. FEI is currently working through the 9 indemnification provisions that PWGSC have indicated they may require.

10 11	
12 13 14 15	1.2.1 What is the nearest LNG production / distribution facility?
16 17 18 19	The closest LNG distribution facility is located near Calgary, but it is not capable of delivering the volumes required. The nearest facility capable of delivering appropriate volumes is FEI's Tilbury LNG facility located in Delta on the Lower Mainland of British Columbia. Please also refer to the response to BCUC IR 1.1.2.3 and 1.1.2.4.
20 21	
22 23 24 25 26	1.2.2 What is the peak load for Fort Nelson customers that would be affected by a pipeline loss? <u>Response:</u>
27 28	For the 2013/2014 winter season, the forecast peak demand for the affected customers in Fort Nelson (i.e. north of the Muskwa River) is 4.44 mmscfd.
29 30	
31 32 33	1.2.3 How long would an LNG tanker be able to supply Fort Nelson at 80% of peak demand?



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014	
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 4	

2 Response:

FEI's LNG tankers have a capacity of 890,000 scf to 945,000 scf. At 80% of peak demand, a
tanker could provide about 6 – 6.5 hours of supply to the current customers in Fort Nelson
downstream (i.e. north) of the Muskwa River crossing.

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1.2.4 Does FEI have LNG tankers available on stand-by as a back-up and is this practical? Please explain.

12 **Response:**

FEI currently has access to two LNG tankers for providing back-up natural gas distribution services. These tankers are primarily used for small scale planned work or emergency outages requiring LNG support and are also utilized for deliveries of LNG to LNG transportation customers in the Lower Mainland.

Because of the gas volume required for consumption and the distance and travel time between
Delta and Fort Nelson, timely delivery cannot be made to sustain flow. For these reasons FEI
has discounted LNG as a practical back-up in the event of a failure of the existing Muskwa river
crossing.

- 21
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 25 "FEI is applying to the Commission to replace the existing NPS 6 pipeline crossing of the
 26 Muskwa River in Fort Nelson, BC with a NPS 6 pipeline crossing installed by trenchless
 27 construction." (p. 1)
 28 1.3 Please provide evidence that shows consumption patterns (ie. peak day history
- 28 1.3 Please provide evidence that shows consumption patterns (ie. peak day history 29 and forecasts for Fort Nelson downstream of the crossing) and maximum 30 capacity of the NPS 6 pipeline to demonstrate the correct pipeline sizing.
- 31



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Dago 5
Information Request (IR) No. 1	Fage 5

1 Response:

2 Due to the limited line pack available on the Fort Nelson transmission lateral, FEI determines

3 the capacity of the lateral based on peak hour flows which represent 5.5% of the peak day flow.

4 The values listed in the table below are peak hour flows.

5 The table shows the peak hour load increase for the distribution system north of the Muskwa 6 River for the 5 year period 2008 to 2013 and the forecasted loads based on FEI's most recent 7 forecast in 5 year increments to 2038. The percentage increase in growth for each 5 year 8 period is also shown. The load forecast is refreshed annually and is based on an account 9 forecast considering provincial housing starts data by the Conference Board of Canada and a 10 municipal breakdown of household formations by BC Stats combined with FEI's current Fort 11 Nelson customer utilization rates drawn from billing consumption records for the 2 year period 12 and and a

12 ending December 31, 2012.

	2008	2013	2018	2023	2028	2033	2038
System load (std m ³ /hr)	6472	6918	7535	8132	8957	10200	12050
% load growth		6.9%	8.9%	7.9%	10.2%	13.9%	18.1%

Fort Nelson System North of Muskwa River

13

14 FEI's current load forecast for the Fort Nelson Gate Station shows rates of growth increasing in

future years. Downstream (north) of the Muskwa crossing, by 2033 expected peak hour flow of 16 10,200 std m³/hr would be 147% of the current peak hour rate of 6,918 std m³/hr. By 2038, the

17 same area is forecast to be 174% of current requirements, or 12,050 std m³/hr.

The existing pipeline with a NPS 6 crossing has the capacity to meet 159% (11000 std m³/hr) of
 the current demand at Fort Nelson Gate Station when considering contract minimum supply
 pressure of 500 psig (3450 kPa) at the Spectra Fort Nelson tap.

The Spectra Fort Nelson tap, due to its location on the Spectra system, historically sees pressures far above the contract minimum. If FEI considers its minimum observed historical supply pressure of 590 psig (4068kPa), the existing pipeline has the capacity to supply over 14,000 std m³/hr or 205% of current demand north of the Muskwa River crossing. This is well beyond FEI's forecasted 25 year load requirements.

Based on FEI's current forecast, the existing Fort Nelson transmission pipeline lateral with an
 NPS 6 crossing of the Muskwa River would have sufficient capacity to meet forecasted demand
 until at least 2035.

The river crossing, sized at NPS 6 and located very near the end of the lateral, will not become a bottleneck to improve capacity in the foreseeable future. Pipeline reinforcements, if they



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 6

1 become necessary, will not be directed at increasing the size of the NPS 6 Muskwa River 2 crossing. Improvements would be directed to existing NPS4 pipeline segments located north 3 and south of the proposed crossing. If, for example, the existing NPS 4 segments on the 4 transmission lateral were replaced with NPS 6, the total delivery capacity would increase to 5 15,210 std m³/hr or 220% of current demand with 500 psig available at the Spectra Fort Nelson 6 tap. Following that, improvements would most likely be directed at other pipeline segments 7 nearer the Spectra Fort Nelson tap where the capacity improvements would benefit customers 8 on both sides of the Muskwa River crossing.

9 10		
11 12 13 14 15	1.4 <u>Response:</u>	Based on FEI's long term forecast for growth in the affected service area, how long into the future will the NPS 6 pipeline have sufficient capacity?
16	Please refer t	to the response to BCUC IR 1.1.3.
17 18		
19 20 21 22	1.5	Has FEI consulted with the affected municipalities on the forecast growth in demand and capacity of the NPS 6 pipeline?
23	<u>Response:</u>	
24 25 26	Yes, the Con Nelson, and t the potential e	npany has met directly with Randy McLean, the CAO for the Municipality of Fort the Fort Nelson Chamber of Commerce to discuss projected load growth including expansion to the Fort Nelson Airport.
27 28		
29 30 31 32 33	1.6	Are there any alternative supply sources (i.e. pipelines or gas wells) from which natural gas could be provided to Fort Nelson? Has FEI assessed these alternatives?



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 7

1 Response:

2 FEI considered alternative natural gas supply source located on the north side of the Muskwa 3 River. Spectra Energy's 24" Beaver River pipeline, located just west of town (crossing the 4 Alaska Highway at mile 301) was identified as a potential source due to its close proximity and 5 high volume availability; however, this alternative isn't viable as gas composition (trace sour gas 6 and high levels of CO₂) in the line does not meet specifications for burner tip use without 7 complex processing. Construction of a processing facility would require an extremely high 8 capital outlay and significant annual O&M costs in perpetuity and was therefore not further 9 considered.



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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 8

2.0 1 **Reference:** History

Exhibit B-1, Section 1.3, p. 5, Section 4.2.3, pp. 19, 20

"In late 2012, in consideration of ongoing PWGSC requirements, FEI began review of the remaining crossing options more closely with regard to cost, feasibility, risk assessment and appropriateness, while continuing to pursue approval with PWGSC until May of 2013 when the FEI appeal to the Minister responsible for PWGSC was rejected. On May 17, 2013 the PWGSC Assistant Deputy Minister advised it was unable to accommodate a new pipeline on the bridge." (p. 5)

- 9 "Unfortunately, in July 2012 PWGSC advised FEI that the request for permission to 10 attach a natural gas pipeline to the Muskwa River Bridge had been denied." (p. 19)
- 11 In September 2012, FEI met with PWGSC staff in Gatineau...PWGSC communicated to 12 FEI in December 2012 that they considered that their decision was final." (p. 20)
- 13 2.1 Given the risk and urgency expressed of the pipeline failure and that FEI began 14 reviewing alternative crossing options "in late 2012" and given that it had already 15 looked at the alternatives in its 2011 application please explain why it took FEI 16 until November 29, 2013 to submit a CPCN application for expedited approval.
- 17

18 **Response:**

19 For a long period, FEI believed that PWGSC would accept the installation of the replacement 20 pipeline on the Muskwa River Bridge. Section 4.2.3 provides more details as to FEI's activities 21 with respect to PWGSC. Being mindful of the small rate base that would bear the cost of this 22 Project, FEI pursued all avenues with PWGSC in hopes of securing approval of the bridge 23 option. FEI operates a number of pipelines on bridges, and the proposed Muskwa River Bridge 24 design met all technical requirements. Following the meeting with PWGSC in Gatineau in 25 September 2012, FEI had the understanding that FEI had to increase the quality of the cost and 26 risk information of the other crossing alternatives in order to maintain dialogue with PWGSC. 27 This was begun in January 2013, with additional analysis of the in-stream pipeline crossing 28 replacement options.

29 Following the PWGSC Minister's rejection of the bridge option in May 2013, and with the 30 knowledge that the pipeline exposure in the river had increased, FEI coordinated, investigated, 31 updated and reported on the in-stream pipeline protection options and viable crossing 32 replacement options from mid-May to November. Once this was completed, FEI was able to 33 make an informed decision about the next best pipeline crossing alternative. FEI advised the 34 Commission of the increasing costs (but not yet finalized) in mid-September. Following 35 completion of the revised cost estimates and internal review and approvals, FEI submitted the 36 CPCN application formally to the Commission on November 29, 2013.



1	3.0	Refere	ence:	Pipeline Crossing Alternatives and Flexibility
2			[Exhibit B-1, Section 1.4, p. 5
3 4		"FEI p revise	roposes d risk ass	to proceed with the HDD option that was originally proposed, but with a sessment and an updated cost estimate." (p. 5)
5 6 7		3.1	Please confide	clarify if FEI means a revised risk assessment from the one provided ntially as Appendix G.
8	<u>Resp</u>	onse:		
9 10 11 12	FEI de G. FE the 20 Apper	oes not I means 011 RR/ ndix G.	mean a r s a revise A. The re	revised risk assessment from the one provided confidentially as Appendix ed risk assessment of the HDD option from the one originally provided in evised risk assessment is included with the Application confidentially as
13 14				
15 16 17 18 19	<u>Resp</u>	onse:	3.1.1	Would this be part of the Request For Quotation as indicated in Table 5- 1 of the Application?
20	Pleas	e refer to	o the res	ponse to BCUC IR 1.3.1.
21 22				
23 24 25 26 27	Resp	onse:	3.1.2	Could this revised risk assessment affect FEI's Table 5-3 HDD Risk Control Summary?
28	Pleas	e refer t	o the res	ponse to BCUC IR 1.3.1
20	540			
29 30				
31				

FORTIS BC ^{**}		FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application) Submission D			Submission Date: January 16, 2014				
		Respon	se to British (Columbia Utili Informatio	ities Commis n Request (I	sion (BCUC R) No. 1	or the Comr	nission)	Page 10
1 2 3 4 5	<u>Response:</u>		3.1.2.1	How will Risk Ass update c	FEI infor sessment occur?	rm the C and on	ommissic what bas	on of chan sis or frequ	ges to its Project uency should this
6	FEI will prov	ride the upo	dated info	rmation if	and as re	equested	by the C	ommissior	1.
7 8									
9 10									
11	"The	refore, FEI	wishes to	o retain fle	exibility in	choosing	g the cros	sing meth	odology to permit
12	requ	irements."	(p. 5)	ussing the	al meets		onmental	i, lecinica	ii, and regulatory
14 15	3.2	When w the May	ould FEI 1, 2014 i	need to o in service	r be able date?	to confir	m the cro	essing met	hodology to meet
10	<u>Response:</u>								
18 19	FEI will be contractor is	able to co establishe	onfirm the ed. This is	e crossing s currently	g method / planned	lology or to be mi	nce an a d-Februa	greement ry, 2014.	with the chosen
20 21									
22							6 41		
23 24		3.2.1	How will any upd	ated cost	rm the C estimate	from tha	on of the torward	crossing ard in the	methodology and Application?
25									
26	<u>Response:</u>								
27 28	FEI will pro updated cos	ovide inform ts estimate	mation alles if and a	bout the as request	selected ed by the	crossing Commis) method ssion.	ology and	any associated
29									



4.0

Reference: **PROJECT NEED BY MAY 2014**

Mitigation

Exhibit B-1, Section 3.3, p. 14

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In the Application FEI states:

5 "In the intervening months until the Project can be completed, FEI implemented protection measures to improve the integrity of the north bank of the Muskwa River by 6 7 selective placement of a large number of 500kg sandbags...In the event that FEI cannot 8 proceed with the pipeline crossing replacement prior to the spring freshet, FEI may be 9 required to undertake additional protective measures to maintain pipeline integrity." 10 (Exhibit B-1, p. 14)

11 4.1 Please confirm that in the event FEI cannot proceed with the pipeline crossing 12 replacement prior to the spring freshet that the additional protective measures 13 FEI may be required to undertake would be similar to the activities that FEI has 14 already implemented with similar costs (i.e. adding sand bags for approx. \$250k).

16 Response:

17 Bank protective measures implemented in late 2013 were developed with the anticipation that a 18 crossing replacement would be undertaken before the 2014 freshet. Any future temporary 19 mitigation measures would exceed the completed repair work, and therefore the associated cost 20 would differ.

21 To illustrate potential mitigation measures required and associated costs in the event FEI 22 cannot proceed with the pipeline crossing replacement prior to the spring freshet, please refer to 23 the response to BCUC IR 1.4.1.1.

24			
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26			
27		4.1.1	Otherwise, please explain the measures that FEI would take and please
28			provide a cost estimate for that work.
29			
30	<u>Response:</u>		
21	The mitigatic	n moaci	ures that EEL would undertake include the installation of a temperature

31 The mitigation measures that FEI would undertake include the installation of a temporary 32 pipeline on the Muskwa River Bridge (terms and conditions presently under negotiation with 33 PWGSC) and then bypassing the existing in-stream crossing until the new crossing is 34 completed. The in-stream pipeline would be abandoned, the load transferred to the temporary



1 pipeline, and then ultimately transferred to the new pipeline crossing. Please also refer to the 2 response to the BCUC IR 1.1.2.

Temporary pipeline protection currently under consideration comprise of river bed protectionand enhanced bank armouring. These activities include:

- Installation of 0.3m thick gabion mattresses over the exposed pipeline in the river bed
 (length of approximately 50 m, extending 10 m upstream and 10 m downstream of the
 pipeline)
- Additional gabion mattresses to extend protection upstream on the left bank, at the toe
 of the riprap revetment.
- A Class 2 riprap (D_{50} = 500 mm) revetment along the left bank that would extend approximately 10 to 15 m upstream and downstream of the pipeline.
- A Class 2 riprap (D_{50} = 500 mm) key trench on the left bank, starting 10 to 15 m upstream of the pipeline and extending 10 to 15 m into the bank.
- 14

The above mitigation measures are from a recent review, analysis and assessment of the crossing by Worley Parsons Canada in mid-2013. This work included an estimate of \$1,350,000 plus contingency (±30%) considering 2013 construction costs. The estimate has not been updated with consideration of a 2014 timeline, and does not consider ongoing monitoring and maintenance requirements.

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- 4.1.2 Please explain how long, reasonably speaking, these additional mitigation measures could be expected to extend the existing pipeline's integrity. In other words, could one spend a reasonable amount of money in the interim to prolong the pipeline's integrity such that a different project could be reasonably be undertaken after the spring freshet without considerably increasing the probability of a pipeline failure?
- 30
- 31 Response:

River bed protection and enhanced bank armouring could provide pipeline protection for two or
 more years. However, the approach contains inherent risk with no guarantee of increasing
 crossing integrity due to difficulty of completing in-stream work (high current and low visibility



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 13

1 conditions) and uncertainty in predicting mitigation performance in a highly active river system.

2 A permanent solution would still be required.

FEI believes that its proposed solution of installing a NPS 6 pipeline crossing by trenchless construction prior to the 2014 spring freshet is the most desirable and cost effective long-term solution.

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- 94.2Please discuss the likelihood that the HDD option will be implemented before the10spring 2014 freshet, if, as FEI requests, the Commission approves this11Application on January 31, 2013.
- 12

13 **Response:**

The key project activities and associated schedule milestone dates are presented in Table 5-1 of the Application. It will be necessary to meet each of these milestones, including Commission approval of this Application on January 31 2014, to successfully implement the HDD option before the spring 2014 freshet. FEI believes that these dates are achievable and will endeavor to meet these dates. If these dates are met, FEI is confident that a pipeline crossing can be successfully completed before the spring 2014 freshet.

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4.2.1 Does FEI expect to incur premium charges to expedite this project? If so, what are these premiums charges and how much are they expected to be?

27 <u>Response:</u>

FEI believes it has developed a realistic cost estimate for this Project. The cost estimate considers the cost and pace of work due to the unique winter working conditions in a relatively remote and frigid location. While FEI does not expect premium charges, market conditions will only become evident after receipt of the RFQ bids from contractors.

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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 14

4.2.2 Has FEI considered the implications of expediting the HDD work may have on project execution, such as cost, safety and reliability? Please elaborate.

5 **Response:**

6 FEI and Jacobs have considered the implications of expediting the HDD construction work and 7 have concluded that it is not feasible to expedite the HDD construction as the estimated 8 construction schedule is based on a work breakdown structure comprising of tasks with fixed 9 duration to meet safety and reliability criteria. Thus, while it is possible to manage the RFQ and 10 HDD contractor selection process on an expedited basis, the HDD construction shall be 11 completed to a fixed timeline.



Information Request (IR) No. 1

1	5.0	Refere	ence:	Options Analysis
2				Exhibit B-1, Section 4, pp. 17, 18
3				Geotechnical Investigations
4 5 6 7 8 9		"The g gravel In ant Option geoted 2010."	geotechr layers tl icipation n, due chnical in chnical in	nical investigation of the proposed pipeline crossing location indicated hat substantially increased the cost and risk of an HDD crossing option of the potentially significant increase in the cost estimate for the HDD to the anticipated challenging ground conditions detected by the nvestigation, FEI re-evaluated the remaining crossing alternatives in late 7, 18)
10 11 12 13 14		5.1	Has FE investig option of the 2	El or its contractors completed further geotechnical investigations since the gation that found substantially increased cost and risk of an HDD crossing or is FEI relying on the geotechnical investigations that were done as part 2010/11 application?
15	Respo	onse:		
16 17 18 19 20 21 22 23 24	The g scale chang were of HDD boreho south gravel geoted	eotechn of pipel ed sinc complet detailec ole was side of s and chnical o	ical inve line cros e the in ed in 20 l engine comple the rive underlyin data and	estigations which were completed in 2010 are considered sufficient for the asing project proposed. The relevant subsurface conditions will not have vestigations that identified the potentially challenging subsurface gravels 10. The results are still applicable and FEI continues to rely on them. The pering phase of the Project is currently underway. One (1) additional eted on January 3, 2014 at the planned HDD drill entry location on the r crossing to provide better definition of the geologic contact between the ng silt and clays. This additional information will reinforce the current I inform the ongoing detailed design and RFQ process.
25 26				
27 28 29 30 31			5.1.1	Is the geotechnical investigation that FEI and its contractors are relying on for cost and risk assessment of an HDD crossing considered to be thorough and still relative?
32	<u>Resp</u>	onse:		
33	Please	e refer t	o the res	sponse to BCUC IR 1.5.1.
34				
35				



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 16

5.1.2 Is any further geotechnical investigation scheduled and necessary?

4 **Response:**

5	Please refer	to the response	to BCUC IR 1.5.1.
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5.2 Could certain geotechnical conditions make an HDD crossing impractical (ie. is there a risk of non-completion)?

11 12 Response:

13 The gravel layers identified by the geotechnical investigations present potential challenges to 14 the successful completion of the HDD drill. However, for the river crossing, the pilot bore also 15 serves as the reamed hole which reduces the risk associated with maintaining borehole stability 16 that occurs when a pilot bore is reamed to a larger diameter for installation of the product pipe. 17 In addition to reducing the risk of inadvertent returns (frac-out), the surface casings are also 18 intended to further reduce the risk of pilot bore instability through the upper gravels (as 19 compared to drilling the pilot bore without the use of a surface casing). These measures to 20 minimize the risk of non-completion of the HDD are listed within the Application, page 45, Table 21 5-3. They are established HDD techniques which have facilitated other successful HDD drills 22 through challenging ground conditions such as the gravels present at the Muskwa River 23 crossing location.

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5.2.1 Is FEI reasonably certain that these conditions do not exist for this crossing?

- 29
- 30 **Response:**

31 The geotechnical investigations completed in 2010 and summarized in Section 5.3.7.1 of the 32 Application confirm geologic conditions (the presence of gravel) exist at the proposed site that 33 could adversely impact the HDD installation especially if there was a need to ream the pilot bore 34 to a larger diameter. However, this Project will only require the drilling of the pilot bore and no



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 17

reaming. Pilot bores have a higher degree of success in difficult ground conditions in
 comparison to reamed holes in difficult ground conditions.

- 5.3 Please discuss whether or not further pre-construction investigative measures
 could be taken to reduce the uncertainty in the HDD construction method. If so,
 what are these methods, how much would they cost to perform and what are the
 benefits? Would the contingency amount be reduced, if these actions are taken?
 If not, please explain why not. If so, please estimate how much.
- 11

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12 **Response:**

For the Muskwa Project, the geotechnical investigative measures completed to date comprise of four (4) sampling test holes spaced approximately equidistant across the proposed crossing alignment. Geophysical investigative measures were also completed, which complemented the test hole data and provided a complete profile of the subsurface layers. The number of test holes and accompanying geophysical investigative measures are reasonable for the proposed length and complexity of this crossing.

Further, pre-construction investigations would consist of additional test holes and each test hole will cost approximately \$50,000 - \$75,000 to complete, depending on depth. Additional test holes would be unlikely to change the geotechnical results already confirmed and the uncertainty (challenges) associated with HDD construction through the gravel layers would still remain.

Additional test holes can be useful if the additional information will improve the confidence of the interpretation and offer potential risk or cost reduction as a result. FEI has completed another test hole to more accurately locate a gravel layer boundary whose location may influence casing location and length. Generally speaking, additional investigative measures will have diminishing returns with respect to cost and risk reduction to the Project and the corresponding contingency.

- FEI believes that the geotechnical investigation has effectively balanced the amount of test hole data with confidence of the knowledge of sub-surface conditions and therefore it would not be prudent to continue additional expenditures on more test holes.
- 32



Information Request (IR) No. 1

1	6.0	Refere	ence:	Options Analysis	
2				Exhibit B-1, Section 4, pp. 22, 23, 32	
3				HDD Risk Analysis and Contingency	
4 5 7 8 9 10		"The c includi comm The re estima manag conting	current (ng proj issioning esulting ate; prir gement, gency.	Class 3 estimate of \$5.76 million is inclusive of all project capital co- oject management, engineering, permitting, materials, construction and and contingency. The 2010 Class 3 cost estimate was \$4.09 million of cost estimate has increased in most aspects with respect to the 20 marily with increases to the non-core construction costs of pro- , engineering, inspections services, permit requirements, and The cost increase is due to:	osts and 010 ject risk
11 12 13		 a inc we 	greater creased ere cons	r understanding of the HDD construction risk profile, which warran I contingency to cover the residual risk after all feasible mitigation measu sidered;" (pp. 22, 23)	ited ires
14 15 16 17	<u>Resp</u>	6.1 onse:	For ea dollar a	ach the four cost increase categories listed on page 23, please provide amount increases from the 2010 estimate.	the
18 19 20	This re inform negoti	esponse nation th iate.	e is bein nat mus	ng filed confidentially with the Commission only as it contains details of o st be kept confidential at this time in order to preserve FEI's ability	cost / to
21 22 23 24 25 26 27 28	Respo	6.2 onse:	Please the \$5. include mitigat	e confirm whether the "feasible mitigation measures" costs were include 5.76 million estimate and provide a dollar amount and itemized list for th ed mitigation measures (or direct staff to where these itemized, inclu- tion measures are found).	d in ese ded
29 30	The "i	feasible	mitigati	tion measures" are included in the \$5.76 million estimate. The mitigated in the risk register and contingency analysis provided confidentially	tion

- 31 Appendix G of the Application.
- 32
- 33
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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 19

6.3 Please confirm that the contingency estimates are for the un-mitigated risks.

2

3 Response:

4 FEI confirms that the contingency estimates are for the potential realization of residual risks 5 after all feasible mitigation measures have been considered. As stated in FEI's response to 6 BCUC IR 1.6.2, feasible mitigation measures were included in the \$5.76 million estimate.

7 8 9 10 11 "The main unmitigated risks identified for the HDD Option include: 12 The gravel stratum is deeper and/or more challenging than indicated in the 13 ٠ 14 geotechnical report; 15 Gas pipeline coating damage (during pullback); 16 HDD hole collapse; 17 • Difficulty installing the casings; Remote location causes delays during construction; 18 19 Permitting delays; and 20 Bid responses higher than projected." • 21 (p. 32) 22 23 6.4 Please confirm that the contingency estimate is to cover these unmitigated risks. 24 25 **Response:** 26 The contingency estimate is to cover the residual potential impact of the following risks: 27 The gravel stratum deeper and/or more challenging than indicated in the geotechnical • 28 report; 29 Gas pipeline coating damage; • HDD hole collapse; 30 31 Difficulty in installing the casings; 32 Delays resulting from remote location during construction; and 33 Permitting delays.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 20

- 2 The contingency estimate does not include the following risk which cannot be estimated at this 3 stage of the Project until RFQ bid responses are received:
- 4 5 6
- 7
- 8
- 6.5 Please provide the amount of contingency and how it was calculated.

Bid responses higher than projected.

- 9
- 10 **Response:**

11 This response is being filed confidentially with the Commission only as it contains details of cost 12 information that must be kept confidential at this time in order to preserve FEI's ability to 13 negotiate.

- 11
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- 16
- 17 6.6 Please provide FEI's contracting plan to manage these unmitigated risks.
- 18

19 Response:

FEI's plan is to mitigate these risks with prudent planning or risk reduction techniques including potentially transferring or sharing the risk with the successful Contractor based on negotiation and agreement. The risk register of Appendix G provides information on how FEI was able to mitigate various project and construction risks.

FEI's contracting plan is to assert that each party accepts those risks that they are best able to manage and the remaining risks are negotiated to be shared or accepted by either party. This model, properly administrated, should minimize the cost of the construction by compensating for risk events only when they occur, and should certain risk events occur, the cost of mitigating the risk is minimized by having a process in place.

Following the RFQ process, analysis of the responses should provide insight into how the various contractors choose to accept, transfer, or share the various Project risks including the gravel layers.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 21

1 In the Muskwa River crossing, the primary risk is generally accepted to be the gravel layers

- 2 under the surface. FEI believes that these gravel layers are manageable if a competent
- 3 contractor is selected and there is competent oversight by the inspectors.



7.0 1 **Reference: OPTIONS ANALYSIS** 2 Exhibit B-1, Section 4.3.2, p. 24 3 In-stream Options 4 In the Application FEI states: 5 "Communication with Fort Nelson First Nations indicated that they would be resistant to any river disturbance and DFO also directs that any in-stream options are only 6 7 considered if all other options are not feasible." (Exhibit 1-1, p. 24) 8 7.1 Please discuss what Fort Nelson rate payers have said in regards to in-stream 9 options. 10 11 **Response:** 12 FEI has not received specific comments from Fort Nelson ratepayers regarding in-stream 13 options. 14 15 16 17 7.2 Please discuss FEI's past experience with in-stream options. Has FEI (or its 18 recent predecessors) in the last 10 years engaged in in-stream pipeline crossings 19 at other locations? If so, where are these other locations, what methods were 20 used and when were the crossings installed?

Information Request (IR) No. 1

21

22 Response:

In the past 10 years, FEI (or its recent predecessors) has not undertaken any new in-stream
 pipeline crossings of streams or rivers. In the same period, FEI has conducted in-stream
 mitigation of over 50 vulnerable pipeline crossings primarily to install measures to prevent
 further channel bank or bed erosion/degradation at the existing pipeline crossings.



Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1

1	8.0	Refere	ence:	OPTIONS ANALYSIS
2				Exhibit B-1, Section 4.3.3, p. 25
3				New Aerial Pipeline Bridge Crossing
4		In the	Applicat	tion FEI states:
5 6 7		"The construction therefore	advanta uction sore usua	age of the Aerial Crossing is that there is reasonable certainty of success because the construction risks are generally observable and ally managed with more certainty." (Exhibit 1-1, p. 25)
8 9 10 11 12 13 14	Respo	8.1	Please allotted the m constru 2013 d	e explain the differences, if any, in the size of contingency that FEI has d for the aerial crossing method versus the HDD, the isolated open cut and nicro tunnel methods, considering there is reasonable certainty of uction success for the aerial crossing. Please provide response in both lollars and in percent of total project costs.
15 16 17 18	This re inform negoti	esponse ation th ate.	e is bein nat mus	g filed confidentially with the Commission only as it contains details of cost t be kept confidential at this time in order to preserve FEI's ability to
19 20 21		In the .	Applicat	tion FEI states:
22 23 24 25 26		"The stakeh the Ae and FN bed."	disadva Iolders k Irial Pipe NFN hav (sic) (Ex	ntage of the Aerial Bridge Crossing is potential objection by local because of the aesthetics of the structure and its size. The construction of eline bridge Crossing will impact the riparian zone adjacent to the structure we expressed strong concern of any option that will disturb the river or river whibit 1-1, p. 25)
27 28 29	Deem	8.2	Please If so, p	e discuss if local stakeholders have objected to the aerial bridge crossing. lease provide evidence to the fact.
30	Kespo	onse:		
31	Local	stakeho	lders ha	ave not objected to an aerial bridge crossing as it was not presented as an

option. As indicated in the response to BCUC IR 1.29.2, the FNFN indicate they will not support
 the option of installing an aerial crossing due to the greater environmental impact expected from

34 this technique.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 24

Please discuss how the aerial bridge crossing will impact the riparian zone

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7 <u>Response:</u>

8.3

8 The aerial bridge crossing would have support structures located within the riparian 9 management area. The footprint of the aerial crossing and support structures would result in 10 permanent loss of riparian vegetation. Further, additional temporary riparian disturbance would 11 occur due to site access roads and workspace requirements during construction.

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8.4 Please discuss how, if at all, the aerial bridge will disturb the river or river bed.

16

17 <u>Response:</u>

The aerial bridge crossing will not create any disturbance to the river or the river bed. The proposed aerial bridge is expected to clear the river but will impact the riparian area with bridge foundations and cable stays. Additionally, this riparian area must be kept clear of trees and

21 brush for the duration of the aerial crossing life.

adjacent to the structure.



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Information Request (IR) No. 1

9.0 **Reference: OPTIONS ANALYSIS** Exhibit B-1, Section 4.3.4, p. 26 Micro tunnel In the Application FEI explains that the micro tunnel approach requires a "special fluid". (Exhibit 1-1, p. 26) 9.1 Please describe the composition of the "special fluid" and please provide its Material Safety Data Sheets. Response: The "special fluid" refers to the drilling fluid which is a mixture of water, bentonite material and possibly additives to enhance the properties of the mixture. Bentonite is a naturally occurring material that consists of variable proportions of various minerals and the additives are likely to consist of polymers. Soda Ash may be added to adjust the water's pH level. Bentonite is an environmentally benign product and when mixed with water it creates an inert fluid which is used in the drilling process to aid in lubrication of the drill head and assists in filling and sealing any voids as the drill head progresses. Please refer to Attachment 9.1 for the Material Safety Data Sheet for bentonite, soda ash and additives typically used for drilling. 9.2 Please discuss the volume of "special fluid" anticipated to be used if the micro tunnel approach were taken. Response: The volume of "special fluid" for a Microtunnel installation would be dependent on how efficient the separation plant is at removing the excavated spoils from the fluid. Depending on the separation volume capacity, the volume of slurry for a Microtunnel installation could be in the order of about 2000-3000 gallons (7,500-11,000 L).

- 29 30
- 31
- 329.3Please discuss the effects, if any, the "special fluid" may have on the
environment and/or human health, during and after project construction.
- 34



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 26

1 Response:

- 2 It is not anticipated that the special fluid will have any residual effect on the environment and/or
- 3 human health during and after Project construction. MSDS sheets for all proposed drilling fluids
- 4 will be reviewed and approved by FEI prior to Project implementation.



1 10.0 **Reference: OPTIONS ANALYSIS** 2 Exhibit B-1, Section 4.4.1, p. 27, Table 4-2 3 **Financial Considerations** 4 In Table 4-2, FEI lists the 75 yr NPV of O&M costs in as spent (\$ million). 5 10.1 Please discuss why there are no O&M costs listed in Table 4-2 for HDD, Isolated Open Cut, and Micro tunnel options. 6 7 8 **Response:** 9 There are no O&M costs added for HDD, Isolated Open Cut and Microtunnel options because

Information Request (IR) No. 1

the incremental O&M for these crossings is an extension of the normal maintenance practices of
the existing adjacent pipelines. That is, these options involve the installation of a below ground
(buried) pipeline crossing, which would be protected by the existing FEI pipeline Cathodic
Protection (CP) system, and maintained in a similar fashion to other FEI buried pipeline assets.

The aerial bridge crossing results in incremental O&M because it would place a large above ground steel structure spanning the Muskwa River on which the gas pipeline would then be mounted and supported. The large steel super structure of the aerial crossing would require periodic maintenance to protect against corrosion and to check for other damage. In addition, the above ground pipeline would be exposed to the elements. As such, the specific activities required to maintain the integrity of the aerial crossing are over and above standard buried pipeline crossing O&M costs.

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 25 In the Application, FEI states:
 26 "As shown above, the HDD Option is the least expensive option due to the shortest construction period and the efficiency offered in terms of installing the new pipeline crossing under the river with the least effort." (p. 27)
 29 10.2 Please discuss how the estimates for each option listed in Table 4-2 have
 - 10.2 Please discuss how the estimates for each option listed in Table 4-2 have overlapping ranges and considerably different contingency amounts, and as a result, the HDD Option might not be the least expensive option.
- 31 32



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 28
Information Request (IR) No. 1	Tage 20

1 Response:

Muskwa	Crossing Re	placement Pı Overlap	roject - Estim	ate
\$16.00 \$15.00 \$14.00 \$13.00 \$12.00 \$11.00 \$10.00 \$9.00 \$8.00 \$7.00 \$6.00 \$5.00 \$4.00 \$3.00 \$2.00	\$8.30 \$6.57 \$5.42	\$10.93 \$8.60 \$7.04	\$10.23 \$8.17 \$6.80	\$14.43 \$11.28 \$9.19
-پ	HDD	МТ	Aerial	Isolated Open Cut
◆ Estimate (\$000,000s)	\$6.57	\$8.60	\$8.17	\$11.28
– Low Bound (\$000,000s)	\$5.42	\$7.04	\$6.80	\$9.19
– High Bound (\$000,000)	\$8.30	\$10.93	\$10.23	\$14.43

2

3 The capital and development cost and upper and lower bound estimates (in 2013 dollars) are 4 summarized and compared graphically in the above chart for each of the crossing options. The 5 upper (+30%) and lower (-20%) bound represents the estimate accuracy range which indicates 6 the degree to which the final capital cost outcome for the project may vary from the estimated 7 capital cost. AACE International Recommended Practice No. 17R-97 states that the primary 8 estimate characteristic is level of project definition; as opposed to expected accuracy range 9 which is a secondary characteristic. These estimates have all been developed to a similar 10 AACE Class 3 level of project definition and include contingencies.

It is appropriate to compare and evaluate the alternatives using the cost estimates that include the contingencies. This is because the sum reflects the specific characteristics of each option and provides for a more reasonable comparison of alternatives. Further, the overlapping ranges and differing contingency amounts do not mean that HDD might not be the least expensive option because, as 17R-97 also states, there are a myriad of complex relationships that may be exhibited among the estimate characteristics within the estimate classifications that



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 29

- 1 also need to be considered. Finally, as the level of project definition increases, the expected
- 2 accuracy of the estimate tends to improve, as indicated by a tighter +/- range which would likely
- 3 reduce and may eliminate the current overlap.



Information Request (IR) No. 1

1	11.0	Refer	ence:	OPTIONS ANALYSIS
2				Exhibit B-1, Section 4.4.1, p. 27, Table 4-2
3				Non-Financial Considerations
4 5 6 7	Posp	11.1	Please selecte	e discuss how future load growth would be met if the HDD option were ed.
1	<u>Resp</u>	<u>5115e.</u>		
8 9 10 11 12 13 14	For th pipelir the do capac than t existir how th	e reasc ne cross ownstrea ity cons the pipe ng Fort nis cross	ons desc sing of t am com straint in straint sec Nelson sing will	cribed in the response to BCUC IR 1.1.3, FEI is confident that an NPS 6 he Muskwa River will meet the foreseeable future growth requirements of imunity and is sized to ensure the crossing segment will not become a the foreseeable future. The current and future NPS 6 pipeline is larger gments immediately north and south of the Muskwa crossing where the transmission lateral has NPS 4 pipeline segments. For further detail on meet future load growth, please refer to the responses to BCUC IRs 1.1.3.
15 16				
17 18 19 20 21	Resp	11.2	Please for futu	e discuss what would be required if the aerial option were designed to allow are load growth.
22 23 24	Identio carrie BCUC	cal to th r pipe. CIR 1.1′	ne HDD The allo 1.1.	option, the aerial option would include a NPS 6 pipeline as the crossing owance for future growth remains the same as indicated in the response to
25 26				
27 28 29 30 31	Respo	11.3 onse:	Is it re in the i	asonably foreseeable that a larger than NPS 6 pipeline could be required next 25 years? Please explain.
32 33	Basec new N	l on cur NPS 6 (rently a crossing	vailable information, FEI is confident that the Fort Nelson lateral with the of the Muskwa River by trenchless construction will meet the capacity



1 requirements of the Fort Nelson community downstream of the crossing for the next 25 years.

- 2 Please refer to the response to BCUC IR 1.1.3.
- 3
- 4
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- 6 7

8

Which alternative would have the lowest cost to increase the crossing pipeline 11.4 size in the future?

9 **Response:**

- 10 It is difficult to respond to this question with any certainty because there are a significant number 11 of variables (technical, financial, environmental, and constructible) that would have to be 12 considered at the time of the potential crossing replacement.
- 13 As indicated in the responses to BCUC IRs 1.1.3 and 1.11.1, FEI is confident an increase to the 14 crossing pipeline size will not be required in the foreseeable future. Any pipeline 15 reinforcements, if they become necessary, will not be directed at increasing the size of the NPS 16 6 Muskwa River crossing. Improvements would be directed to existing NPS4 pipeline segments 17 located north and south of the proposed crossing. Following that, improvements would most 18 likely be directed at other pipeline segments nearer the Spectra Fort Nelson tap where the 19 capacity improvements would benefit customers on both sides of the Muskwa River crossing.
- 20 21 22 23 11.4.1 Should this be a consideration? 24
- 25 **Response:**
- 26 As described in response to BCUC IR 1.1.3, FEI is confident the NPS 6 crossing size will not be 27 a future capacity constraint and will meet the needs of the community of Fort Nelson for the 28 foreseeable future. The ability to upgrade the pipe size of the crossing does not need to be a 29 significant consideration.
- 30



Information Request (IR) No. 1

1	12.0	Refer	ence:	OPTIONS ANALYSIS
2				Exhibit B-1, Section 4.4.1, p. 27, Table 4-2
3				HDD and Microtunnel Unmitigated Risk Assessment
4		In the	Applica	tion FEI states:
5 6 7 8 9		"To qu new N Septe assoc p. 31)	uantify t /luskwa mber 2 iated w	he risks associated with using HDD or Microtunnel techniques to install the River pipeline crossing, Jacobs completed a formal risk workshop during 013, with the full participation of FEFN, to identify and quantify the risks ith the HDD and Microtunnel Option crossing methodology." (Exhibit B-1,
10 11 12 13 14	Resp	12.1 onse:	Please to par comm	e discuss whether or not other stakeholders, other than FEFN, were invited ticipate in the workshop. If they were, did they attend? Please discuss their ents. If they were not invited, please explain why not.
15 16 17 18 19	Stake works perso includ and E	holders hop. Ins nnel wa ed repr	other t stead, a as utiliz resentat ring. Th	than FEFN were not invited to participate in the trenchless crossing risk a diverse project team made up of external trenchless experts and internal ted to complete risk identification and analysis. The FEI internal team tives from Project Management, Procurement, Local Pipeline Operations, he FEI internal team present during the workshop also has knowledge of

20 local requirements and interests and has ongoing dialogue and interaction through normal

21 operations.



1	13.0	Reference:	Project Schedule
2			Exhibit B-1, Section 5.4, pp. 40-43, Executive Summary, p. 2
3 4 5 6		"The constru Act and sub January 20 project sche	action and operation of the Project are governed by the Oil and Gas Activities oject to the OGC regulationFEFN plans to file the Pipeline Application in 14 it is expected that the OGC permits can be obtained to meet the edule." (p. 42)
7 8 9 10 11	D ecent	13.1 On p proje perm time	bage 42, FEI lists four OGC permits it will need to be permitted to start the ect. Has FEI contacted the OGC to inform them of the applications for hits and has FEI received any indication that it can receive the approvals in to start construction in March, 2014 from the OGC?
12	Respo	onse:	
13 14 15 16 17	FEI m River the 20 require allowin	et with the O Project. At th 14 spring fres ements are pr ng <mark>7</mark> weeks fo	GC in Fort St. John on Nov 19, 2013 to review the details of the Muskwa is meeting FEI discussed the requirement to complete construction prior to shet. FEI is in regular communication with the OGC to ensure that application roperly met. FEI submitted the applications to the OGC on January 16, 2014, or the OGC to review and approve, which is likely to be adequate.
18 19			
20 21 22 23 24	<u>Respo</u>	13.1. onse:	.1 If no, on what basis does FEI expect that OGC permits can be obtained to meet the project schedule?
25	Please	e refer to the i	response to BCUC IR 1.13.1.
26 27			
28 29 30 31 32	Respo	13.2 Is a yes p	CPCN from the BCUC required before applying to the OGC for permits? If please explain.
33	No a	CPCN from th	e BCUC is not required before FEI's application to the OGC



3 4

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TM	FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
	Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 34

13.2.1 If no, for what reason(s) is FEI waiting until January to apply to the OGC?

7 Response:

8 FEI has been and is in communication with the OGC to ensure the permit process requirements 9 are understood. On January 10, 2014, FEI received further clarification regarding the permit 10 application requirements; by January 14 FEI had completed all the requirements to obtain 11 permit from the OGC; these were submitted to the OGC on January 16, 2014.

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- 14 15
- "Conceptual engineering has been substantially completed, and construction is planned 16 17 to start in March 2014 with completion by early May 2014, prior to the spring 2013 freshet." (p. 40) 18
- "Thus, FEI believes it necessary to replace the pipeline crossing by May 1, 2014, prior to 19 the 2014 Muskwa River freshet." (p. 2) 20
- 21 13.3 Please confirm that FEI's schedule is to have the pipeline crossing completed 22 and in-service by May 1, 2014.
- 23

24 **Response:**

25 Please refer to the detailed schedule included as Appendix F in the Application. The completion 26 date of the new pipeline crossing in this schedule is May 9, 2014, corresponding to the goal of 27 completing in early May 2014, which is the typical early start date of the spring freshet.

- 28
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- 30
- 31 13.4 Please provide a more detailed (Gantt chart) covering the scheduled milestones 32 in Table 5-1 showing start dates, duration, end dates, dependencies and any 33 slack in the schedule to meet the "early May" In Service date.
- 34



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 35

1 Response:

2 A more detailed schedule (Gantt chart) was included as Appendix F in the Application.


1 14.0 **Reference: Risk Management**

Exhibit B-1, Section 5.7, pp. 43-46, Table 5-3

- 3 Table 5.3 states that permitting delays have a "mitigated likelihood" of 4 or "likely (51 – 4 80% chance)" and a "mitigated impact" of 5 or "very high (>\$1M or > 3 months)". (p. 45)
- 5 6

2

14.1 Please explain this high risk rating in the context of the previous questions regarding OGC permitting and FEI's statement on page 42 that FEI expects "that the OGC permits can be obtained to meet the project schedule."

7 8

9 Response:

10 Subsequent to completion of the risk assessment workshop on September 10, 2013, a meeting was held between the OGC and FEI on 17th November 2013. The exact permitting requirements 11 12 were determined and a deliverable and approval schedule was agreed to. This mitigated the 13 risk substantially and justified the statement that the OGC permits can be obtained to meet the

- 14 project schedule.
- 15
- 16

- 17
- 18 When did FEI conduct its risk assessment for the Project? 14.2
- 19
- 20 Response:

21 FEI conducted the risk assessment for the HDD and Microtunnel trenchless options for the 22 Project in September 2013.

23		
24		
25		
26		
27	Table	5.3 states that delays due to the remote location have a "mitigated likelihood" of 5
28	or "ve	ry likely (>80% chance) and a "mitigated impact" of 3 or "moderate (\$50k – 500k or
29	2-4 we	eeks)". (p.45)
30	14.3	Considering all the risk factors studied what would FEI calculate the probability of
31		meeting a May 1, 2014 in service date?
32		



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 37

1 Response:

To calculate the probability of meeting the in-service date would require a simulation analysis
(Monte Carlo or similar). This exercise was not completed for the Muskwa River Crossing
Project because it is not expected to add sufficient value by reducing cost or risk.

5 Nonetheless, FEI used expert judgment to identify the HDD risks, risk responses, and feasible 6 mitigation measures and appropriate contingencies. The risk register is included in Appendix G 7 and the main mitigated risks are listed in Table 5-3 of the Application. The risk analysis 8 identified delays that may affect Project cost and schedule. FEI believes that the mitigation 9 measures proposed in the risk register in Appendix G are robust in terms of mitigating the 10 potential impacts to the schedule to meet an in service date of early May 2014.

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- 14.4 Given the risk assessments done and mitigation considered, what would FEI calculate the P90 (90% probability of being below) cost estimate to be?
- 15 16

17 Response:

To calculate a P90 cost estimate would require a simulation analysis (Monte Carlo or similar).
This exercise was not completed for the Muskwa River Crossing Project because it is not
expected to add sufficient value by reducing cost or risk.

Nonetheless, in development of the current cost estimate FEI used expert judgment to identify the key cost components of the Project including allowances for identified HDD risks, risk responses and feasible mitigation measures and appropriate contingencies. While FEI cannot provide a P90 cost estimate, FEI is confident the cost estimate presented in the Application meets AACE Class 3 confidence level as defined in the AACE International Recommended Practice No. 10S-90.

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In its cover letter to the Application, FEI states that Appendix G, "contain information about how FEI's contingency for the Project was calculated. FEI will be going to the market for competitive bids for the materials and construction work. Thus, for the reason listed above, FEI requests the above information to be kept confidential." (p. 3 of FEI cover letter)



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 38

- 1 2
- 14.5 Please provide a redacted version of this more detailed risk analysis in Appendix G.
- 3
- 4 <u>Response:</u>
- 5 Please refer to Attachment 14.5 for a redacted version of Appendix G.
- 6



Information Request (IR) No. 1

1	15.0	Refere	ence:	Options Analysis	6		
2				Exhibit B-1, Sect	ion 4, pp. 25, 31		
3				Aerial Pipeline B	ridge Crossing		
4 5 7 8 9 10		"The constru- therefo Crossi structu (estima probab	advanta uction s ore usua ng is p ure and ated to ole stake	age of the Aeria success because ally managed with otential objection its size Anot be one year) and o eholder and certair	Crossing is that the construction more certainty by local stakehold her disadvantage cost to acquire per a First Nations obje	at there is reasonable risks are generally ob The disadvantage of the lers because of the aes of this option is the le mits, and additional effor ections." (p. 25)	certainty of servable and Aerial Bridge thetics of the ength of time ts to manage
11 12 13 14 15	Respo	15.1 onse:	Compa certain constru	are a P90 cost est construction suc uction only?	imate of this option cess of this option	n to the HDD option. Gi n does it have a lower	ven the more P90 cost for
16 17 18 19	Sectio of the was pr alterna	n 4 (opt feasible repared ative.	tions an e alterna for eac	alysis) of the Appliative options consider the option and the a	cation includes a f dered. An AACE C aerial bridge cross	inancial and non-financia class 3 estimate including ing was not selected as	al comparison g contingency the preferred
20 21 22	To cal Carlo Crossi	culate a or simi ng Proje	a P90 o lar) of ect optio	cost estimate for e each option. Th ons because it wou	each option would is exercise was n Ild not likely add si	require a simulation an not completed for the M ufficient value by reducing	alysis (Monte luskwa River g cost or risk.
23 24 25 26 27	With the lowest schedute to contradiction addition with the lowest schedute to contradiction addition.	he pres cost e ule requ sider tl nal con	ent kno stimate liremen nat any siderab	wledge, the HDD (including conting ts to install a new solution meeting le costs of short te	option is the pre gency) and is also pipeline crossing p this schedule wil rm protective meas	ferred alternative becau o the only alternative th prior to the 2014 freshet. I allow FEI to avoid the sures of the existing pipe	se it has the lat meets the It is important e potential of line crossing.
28 29							
30 31 32 33 34		FEI st satisfy mitigat	ates: "r the Co the ris	neither the Isolated ompany's objectiv sk of damage durir	d Open Cut Option e to install a new ng the 2014 spring	n nor the Aerial Crossir v pipeline crossing by freshet." (p. 31)	ıg Option will May 2014 to



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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 40

15.2 Please explain the significant difference in length of time estimates between the HDD option (2 months) and the Aerial Bridge option (12 months). Could this difference largely be due to the different estimating methodology used by the two different engineer/contractors who provided budget estimates?

6 **Response:**

7 The HDD crossing schedule (months) listed in Table 4.4 of the Application is 6 months and the 8 Aerial Bridge crossing schedule is 12 months. The increased duration is to accommodate a 9 more onerous First Nations consultation process and a more protracted environmental 10 permitting process. The difference in project schedule duration is dependent on the specifics 11 such as engineering, permitting, and onsite construction for planning and constructing the 12 different crossing technologies. It is independent of the methodologies of the engineering 13 consultants who prepared the schedule estimates.

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15.3 What are the additional permits and costs required compared to the HDD option.

19 Response:

The additional permits required for an Isolated Open Cut compared to the HDD option include a *Fisheries Act* Section 35(2) Authorization. Given the predicted scale of negative effect associated with the Isolated Open Cut option, it is anticipated that a fish habitat offsetting program will be required as a condition of the authorization in order to meet current federal Fisheries and Oceans' policy. Both the Isolated Open Cut and HDD will require *Water Act* and *Navigable Water Protection Act* approvals. The approvals required for the HDD option, however, will be very straight forward given that this crossing is trenchless in nature.

The additional costs required for an Isolated Open Cut option pertain to the requirement for detailed fish habitat assessment, de-watering and environmental protection measures (fish salvage, water quality monitoring, sediment and erosion controls) during construction, site restoration (post-construction), and fish habitat offsetting design, construction and postconstruction effectiveness monitoring. The estimated additional cost to comply with the requirements to acquire these additional permits over the HDD option is approximately \$784,000.

The additional permits required for an Aerial Crossing option compared to the HDD option also include a potential *Fisheries Act* Section 35(2) Authorization. Considering the substantial predicted residual effect of the Aerial Crossing option on riparian vegetation, it is anticipated that



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 41

a fish habitat offsetting program will be required as a condition of the authorization to meet
current federal Fisheries and Oceans policy. Additionally, the aerial crossing will require an
application for Crown land for additional permanent right of way which requires First Nations
consultation and notification, and additional environmental assessments.

5 The additional costs required for an Aerial Crossing option pertain to the design, construction 6 and effectiveness monitoring of the off-setting habitat (if required) and significant riparian 7 restoration. The estimated additional cost to comply with the requirements to acquire these 8 additional permits over the HDD option is approximately \$504,000.

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15.4 Has FEI any evidence to support the "certain" objections from First Nations or

- 13 objection from other stakeholders of this option?
- 14

15 **Response:**

As noted in the response to BCUC IR 1.29.2, the FNFN indicate they will not support the option of installing an aerial crossing due to the greater environmental impact expected from this technique. The FNFN has also expressed strong objection to the Open Cut option due to potentially negative impacts to the river and fish. To date, comments or objections have not been received from any other stakeholders about either the Aerial Crossing or Open Cut option.



1 16.0 Reference: MISCELLANEOUS

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Exhibit B-1

Right-of-way (ROW)

16.1 Please confirm, or otherwise explain, that FEI will be have a ROW large enough
to support safe distances between the pipeline and surrounding development,
now, and in the future, and that FEI has reasonably taken into account future
potential development growth.

9 Response:

10 As with the existing Muskwa River crossing, the proposed replacement pipeline will be located 11 within the existing Alaska Highway road allowance. Most of the pipeline south of the location of

12 the river crossing is also in the Alaska Highway or other road allowances.

Locating the pipeline in the road allowance is advantageous as future development activity near the pipeline is then controlled by the road authority. Safety is ensured as buildings must be set back from the property line and excavation within the road allowance requires permission from the road authority. As well, the location and presence of the pipeline is indicated by frequent signage.

18 Specifically regarding the proposed replacement pipeline, it will be located under a river and 19 under adjacent land that is either not suitable for development (due to river deposits and/or 20 flooding) or cannot be developed due to being within the Alaska Highway road allowance; thus, 21 FEI believes there is no need for obtaining pipeline ROW in addition to the highway road 22 allowance. FEI also believes there is little chance of any roads being desired across the 23 replacement pipeline due to its location; however it is expected that the pipe specification 24 required for the HDD crossing design will permit roads to be built across the pipe if ever 25 required.

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- 2916.2Please confirm what Class Location, pursuant to Clause 4.3.2 of CSA Standard30Z662 Oil and Gas Pipeline Systems, the pipeline will be designed to comply with.
- 31

32 Response:

The new pipeline crossing design will meet the requirements of a Class 1 Location pursuant to Clause 4.3.2 of CSA Standard Z662 Oil and Gas Pipeline Systems. However, the pipe specification selected for the HDD crossing will result in a design factor which increases the



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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 43

1 factor of safety above that of a typical pipeline constructed in a Class 1 location.

16.2.1 Please discuss the risk that encroaching development poses, in the future, in relation to a future potential change in Class Location. Please discuss the steps FEI will take to ensure that the pipeline, as installed, will be suitable for the long term.

9 Response:

10 Please refer to the response to BCUC IR 1.16.1. Due to the nature of local topography and

11 floodplain there is low risk that future development would encroach and result in a class location

12 change at the pipeline crossing location.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 44
Information Request (IR) No. 1	

1 Β. **REVENUE REQUIREMENT AND RATE IMPACT** 2 17.0 Reference: **COST ESTIMATE DETAILS** 3 Exhibit B-1, Section 1.2, p. 4 4 **Mitigation Costs** 5 The application on page 4 states: "In the event that FEI cannot proceed with the pipeline crossing replacement prior to the spring freshet, FEI may be required to undertake 6 7 additional protective measures to maintain pipeline integrity." 8 17.1 Please provide a cost estimate for these potential protective measures. 9 10 Response: 11 Please refer to the response to BCUC IR 1.4.1.1. 12 13 14 15 17.2 If FEI were required to undergo additional protective measures, would FEI record 16 these costs as an operating expense in 2014, similar to its treatment of the 17 mitigation costs incurred in 2013? 18 19 Response: 20 The treatment of additional protective measures, if required, would depend on a variety of 21 factors such as the specific measure(s) taken, the length of time that the measure(s) would be 22 in place, the impact of the measure(s) on the life of the existing pipeline, as well as accounting 23 and capitalization policies. 24 25 26 17.2.1 If not, please explain why not and how FEI would instead propose to record these costs. 27 28 29 **Response:** 30 Please refer to the response to BCUC IR 1.17.2.



1	18.0	Refer	ence:	OPTIONS EVALUATION
2				Exhibit B-1, Section 4.4.1, Table 4-2, pp. 27-28
3				Financial Considerations
4 5 6 7		18.1	Please the lev period	e explain why FEI chose 25 years as the time period with which to calculate velized rate impact for each of the project alternatives. Why was this time determined to be most appropriate?
8	<u>Resp</u>	onse:		
9 10 11 12	FEI ch and is analys no sch	nose a 2 s consis sis. In a neduled	25 year stent wi addition major (evaluation period because it provides an adequately long term perspective th the evaluation period that FEI generally uses for CPCNs and financial , because the options all involve significant upfront capital investments and capital upgrades in the foreseeable future, a longer evaluation period would

13 not have much, if any, impact on the levelized rate.



1 19.0 Reference: COST ESTIMATE DETAILS

Exhibit B-1, Section 6.1.2, p. 50

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Project Development Costs

The application on page 50 states: "Of the estimated Project development costs of \$0.8
million, approximately \$710 thousand has been incurred to date, with a remaining \$100
thousand in expected costs to be incurred by the end of 2013."

7 19.1 Please describe and provide a breakdown of the remaining \$100 thousand in
 8 project development costs expected to be incurred.

10 **Response:**

- 11 The remaining \$100 thousand in project development costs was spent on project development
- 12 engineering and project management costs as shown in the table below:

Period	Engineering	Project Management	Total			
YTD Nov 2013	505,000	207,000	712,000			
Dec 2013	84,000	14,000	98,000			
Total	589,000	221,000	810,000			

13



1 20.0 **Reference: COST ESTIMATE DETAILS** 2 Exhibit B-1: Section 6.1.2, Table 6-3, p. 49; Section 6.3.2, Table 6-5, 3 p. 52 4 **Project Development Costs**

Table 6-3 provides a breakdown and description of the project development costs 5 incurred in each of the years 2009 through 2013. 6

7 Table 6-5 provides a total AFUDC amount for the deferred costs of \$130 thousand.

- 8 20.1 Please provide a continuity schedule in the form of a fully functioning excel 9 spreadsheet which shows the additions to project development costs each year 10 and the amount of AFUDC taken in each of the years 2009 through 2013. 11 Please show all calculations and indicate any assumptions that were made.
- 12

13 Response:

14 Please refer to Attachment 20.1 for the fully functioning Excel spreadsheet which shows the 15 forecast project development and AFUDC deferral account additions for 2009 through 2014.

16 In the review of the AFUDC for this response, FEI has recalculated the forecast AFUDC 17 applicable to the deferral account as \$137 thousand, which is \$7 thousand higher than the \$130 18 thousand as forecast in the Application. This difference largely pertains to the AFUDC 19 applicable to 2009 through 2013, which was calculated and applied to the account in 2013. 20 Since this AFUDC calculation is a high level approximation and because this revised forecast 21 does not affect the levelized rate impact of the Project, FEI has not updated the financial 22 schedules to reflect this change. Finally, please note that actual AFUDC will be included in the 23 deferral account and will be calculated based on the actual development costs.

(\$000s)		2009		2010		2011		2012		2013		2014		Total	
Opening Balance	\$	-	\$	28	\$	260	\$	356	\$	405	\$	684			
Gross Additions - Project Development Costs	\$	40	\$	325	\$	130	\$	65	\$	250	\$	-	\$	810	
Tax Offset	\$	(12)	\$	(93)	\$	(34)	\$	(16)	\$	(64)	\$	-	\$	(220)	
AFUDC ^{1,2}	\$	-	\$	-	\$	-	\$	-	\$	94	\$	43	\$	137	
Closing Balance	\$	28	\$	260	\$	356	\$	405	\$	684	\$	727	\$	727	

Notes

¹ - AFUDC for 2009-2013 was retroactively trued-up in 2013

² - AFUDC is calculated on a monthly basis as the opening balance and one-half of the after-tax additions multiplied by the approved AFUDC rate



1 21.0 **Reference: COST ESTIMATE DETAILS**

Exhibit B-1, Section 6.1.3, p. 50

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Application Costs

The application on page 50 states: "The estimated application costs are \$50 thousand and include costs for legal review, Commission costs and Commission approved intervener costs and has been prepared assuming a Streamlined Review Process."

- 7 Please provide a breakdown of the \$50 thousand in application costs so that 21.1 8 each cost item described in the reference above is shown as a separate cost 9 item.
- 10

11 Response:

12 The estimated application costs of \$50 thousand, by separate cost item, are provided below.

Description	Amount
Publish Notice	\$ 2,000
Legal Review	15,000
Commission Costs	18,000
Intervener PACA Costs	15,000
Total	\$50,000

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- 16 17 18

21.2 If the proceeding were to be reviewed through a Written Hearing Process instead of a Streamlined Review Process, what impact would this have on the estimated application costs? Please quantify this impact and explain why the costs would increase/decrease.

20

19

21 Response:

22 If the proceeding was reviewed through a Written Hearing Process instead of a Streamlined 23 Review Process (SRP), FEI would expect that the estimated application costs would remain 24 substantially the same. In this proceeding, FEI believes that the incremental costs incurred in 25 preparing for and conducting an SRP will require a similar time investment by all parties as 26 would be the case for a Written Hearing Process. The SRP does not eliminate any procedural 27 steps necessary for Commission review. Rather, an SRP allows for a more collaborative review 28 of the evidence, and gives parties an opportunity to clarify information or ask further questions 29 and receive responses in a more expedited manner. As stated in the Commission's SRP



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 49

- 1 Policy, Guidelines and Procedures issued by Order G-37-12, in an SRP the Commission will
- 2 evaluate all or portions of an application in terms of the depth and breadth of the issues and
- 3 consider if the issues are likely to be explored within a half day to one day proceeding and thus
- 4 best disposed of through an expedited review. Further, Commission decisions following an
- 5 SRP are usually issued shortly after the proceeding, and therefore, are most appropriate when a
- 6 more expedited decision is necessary to meet operational or construction needs, as it is in this
- 7 Application.
- 8



3

1 22.0 **Reference: FINANCIAL ANALYSIS**

Exhibit B-1, Section 6.2, Table 6-4, pp. 50-51

Rate Impacts

4 The application on page 50 states: "The levelized total impact of the Project is an 5 increase of approximately \$0.81 per GJ compared to existing 2013 rates. For a typical 6 FEFN residential customer consuming an average of 140 GJ per year, this equates to 7 approximately \$113 per year. For a rate 2.1 general Commercial Service customer 8 consuming approximately 460 GJs per year, this equates to approximately \$373 per 9 year."

- Table 6-4 on page 51 of the application shows the 2015 Rate Impact (\$/GJ) to be \$1.54 10 11 per GJ.
- 12 22.1 Please confirm, or explain otherwise, that the residential customer increase of 13 \$113 per year stated above is based on the levelized rate increase.
- 14

15 **Response:**

16 Confirmed. The residential customer increase is based on the levelized rate increase per GJ 17 multiplied by average consumption of 140 GJs.

18 However, as discussed in the response to BCUC Confidential IR 1.9.2, FEI has updated the 19 total volume to 654 TJs. This change results in a reduction of the levelized rate increase from 20 \$0.81 per GJ to \$0.73 per GJ. Multiplied by an average consumption of 140 GJs, the revised 21 average increase to a residential customer is approximately \$102 per year as compared to the 22 \$113 per year as shown in the Application.

23			
24			
25			
26		22.1.1	If confirmed, please indicate what the actual rate in \$ per GJ and the
27			actual bill impact (i.e. non-levelized) would be for a residential customer
28			in each of the next 10 years starting in 2015.
29			
30	<u>Response:</u>		
31	This response	e is for B0	CUC IR 1.22.1.1 and 1.22.1.2.

32 Please refer to the table below for the forecast average annual total Project impact to FEFN's 33 customers for the years 2015 through 2024. These rate impacts are the equivalent of the "Total



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 51

Project Impact" amounts shown in Table 6-4 and do not factor in the amounts already embedded in customers' existing rates. The larger average annual impact experienced in the first three years reflects the amortization of the Muskwa River Crossing Project Costs deferral account. Please also note that FEI has updated the forecast volume to 654 TJs per year as described in the response to BCUC Confidential IR 1.9.2 which reduced the annual volumetric cost of service from what was shown on Line 33 of Schedule 10 in Appendix H1.

This analysis assumes that the 2014 total forecasted volume for the Fort Nelson service area
continues in perpetuity, whereas the actual rate impacts to customers will be determined based
on the forecasted volumes in future revenue requirement applications. Finally, the impacts

10 below are high level and are not reflective of a cost of service allocation study or any changes to

11 rate design or rate rebalancing that may be required in the future.

12 Rate Schedule 1 Residential customers

		2	2015	2	2016	2	2017	2	2018	2	2019	2	2020	2	2021	2	2022	2	2023	2	2024
	Annual Volumetric Cost of Service (\$/GJ)	\$	1.38	\$	1.29	\$	1.27	\$	0.73	\$	0.74	\$	0.74	\$	0.74	\$	0.74	\$	0.74	\$	0.74
	Average Residential Annual Consumption (GJs)	_	140		140		140		140		140		140		140		140		140		140
13	Cumulative Annual Bill Impact	\$	193	\$	180	\$	178	\$	103	\$	103	\$	103	\$	104	\$	104	\$	104	\$	104

14

15 Rate Schedule 2.1 General Commercial Service customers

		2	015	2	2016	2	2017	2	018	2	2019	2	2020	1	2021	2	2022	2	2023	2	.024
	Annual Volumetric Cost of Service (\$/GJ)	\$	1.38	\$	1.29	\$	1.27	\$	0.73	\$	0.74	\$	0.74	\$	0.74	\$	0.74	\$	0.74	\$	0.74
	Average Rate 2.1 Customers Annual Consumption (GJs)		460		460		460		460		460		460		460		460		460		460
16	Cumulative Annual Bill Impact	\$	633	\$	591	\$	586	\$	337	\$	340	\$	339	\$	340	\$	341	\$	341	\$	341

17 Rate Schedule 2.2 General Commercial Service customers

		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Annual Volumetric Cost of Service (\$/GJ)	\$ 1.38	\$ 1.29	\$ 1.27	\$ 0.73	\$ 0.74	\$ 0.74	\$ 0.74	\$ 0.74	\$ 0.74	\$ 0.74
	Average Rate 2.2 Customers Annual Consumption (GJs)	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100
18	Cumulative Annual Bill Impact	\$ 4,269	\$ 3,985	\$ 3,950	\$ 2,274	\$ 2,289	\$ 2,284	\$ 2,292	\$ 2,296	\$ 2,298	\$ 2,297

19 Rate Schedule 25 Transportation Service customers

		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Annual Volumetric Cost of Service (\$/GJ)	\$ 1.38	\$ 1.29	\$ 1.27	\$ 0.73	\$ 0.74	\$ 0.74	\$ 0.74	\$ 0.74	\$ 0.74	\$ 0.74
	Average Rate 25 Customers Annual Consumption (GJs)	6,890	6,890	6,890	6,890	6,890	6,890	6,890	6,890	6,890	6,890
20	Cumulative Annual Bill Impact	\$ 9,487	\$ 8,857	\$ 8,778	\$ 5,054	\$ 5,088	\$ 5,076	\$ 5,094	\$ 5,104	\$ 5,107	\$ 5,104

21

- 22 23
- 22.1.2 If confirmed, please indicate what the actual rate (\$/GJ) and the actual bill impact would be for a rate 2.1 general Commercial Service customer, and for all other FEFN customer rate classes in each of the next 10 years starting in 2015.
- 26 27

24



1 Response:

2 Please refer to the response to BCUC IR 1.22.1.1.

3

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- 6 The application on page 50 states: "...the net incremental impact of the total Project 7 costs (i.e. reflecting the incremental capital cost not currently included in rate base) 8 offset by the amortization of the existing Muskwa River Crossing rate base deferral 9 account is an increase on a levelized basis of approximately \$0.41 per GJ compared to 10 existing 2013 rates."
- 11Table 6-4 on page 51 of the application shows the 2015 Rate Impact (\$/GJ) to be \$0.2312per GJ.
- 13 22.2 Please provide the non-levelized rate and bill impacts for residential customers
 14 for each of the next 10 years, starting in 2015, related to the net incremental
 15 impact of the Project costs.

16

17 Response:

18 This response is for BCUC IR 1.22.2 and 1.22.3.

Please refer to the tables below for the forecast average annual net Project impact to FEFN's
customers for the years 2015 through 2024. Please note that FEI has updated the forecast
volume to 654 TJs per year as described in the response to BCUC Confidential IR 1.9.2.

The net impacts in years 1 through 3 are affected by the amortization of deferral accounts. For simplicity of analysis, FEI has assumed that the forecast credit balance in the existing rate base Muskwa River Crossing deferral account is amortized over one year in the first set of tables and over two years in the second set of tables. The credits are offset by the amortization of the Muskwa River Crossing Project Costs deferral account, which is amortized over three years.

Please note that this response assumes that the 2014 total forecasted volume for the Fort
Nelson service area continues in perpetuity, whereas the actual rate impacts to customers will
be determined based on the forecasted volumes in future revenue requirement applications.
Finally, the impacts below are high level and are not reflective of a cost of service allocation
study or any changes to rate design or rate rebalancing that may be required in the future.



Information Request (IR) No. 1

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Table 1: Amortization of Muskwa River Crossing deferral over 1 year

4 Rate Schedule 1 Residential customers

	2	2015	2	2016	2	2017	2	2018	2	2019	2	2020	2	2021	2	2022	2	2023	2	024
Annual Volumetric Cost of Service (\$/GJ)	\$	0.21	\$	0.92	\$	0.89	\$	0.36	\$	0.36	\$	0.35	\$	0.36	\$	0.36	\$	0.36	\$	0.36
Average Residential Annual Consumption (GJs)		140		140		140		140		140		140		140		140		140		140
Cumulative Annual Bill Impact	\$	29	\$	129	\$	125	\$	50	\$	50	\$	50	\$	50	\$	50	\$	50	\$	50

6 Rate Schedule 2.1 General Commercial Service customers

		2	2015	2	2016	2	2017	2	2018	2	2019	2	2020	2021	2	2022	2	2023	2	024
	Annual Volumetric Cost of Service (\$/GJ)	\$	0.21	\$	0.92	\$	0.89	\$	0.36	\$	0.36	\$	0.35	\$ 0.36	\$	0.36	\$	0.36	\$	0.36
	Average Rate 2.1 Customers Annual Consumption (GJs)		460		460		460		460		460		460	 460		460		460		460
7	Cumulative Annual Bill Impact	\$	96	\$	423	\$	410	\$	164	\$	165	\$	163	\$ 164	\$	164	\$	164	\$	164

8 Rate Schedule 2.2 General Commercial Service customers

		2	015	2	016	2	2017	2	2018	2019		2020	2021	2	2022	2	2023	2	2024
	Annual Volumetric Cost of Service (\$/GJ)	\$	0.21	\$	0.92	\$	0.89	\$	0.36	\$ 0.36	\$	0.35	\$ 0.36	\$	0.36	\$	0.36	\$	0.36
	Average Rate 2.2 Customers Annual Consumption (GJs)		3,100		3,100		3,100	_	3,100	3,100	_	3,100	3,100	_	3,100	_	3,100		3,100
9	Cumulative Annual Bill Impact	\$	650	\$	2,849	\$	2,764	\$	1,103	\$ 1,110	\$	1,098	\$ 1,102	\$	1,104	\$	1,105	\$	1,104

10 Rate Schedule 25 Transportation Service customers

		20)15	2	2016	2	017	2018	3	2019		2020		2021	2022		2023	2	2024
	Annual Volumetric Cost of Service (\$/GJ)	\$ (0.21	\$	0.92	\$	0.89	\$ 0.3	36	\$ 0.36	\$	0.35	\$	0.36	\$ 0.36	\$	0.36	\$	0.36
	Average Rate 25 Customers Annual Consumption (GJs)	6,	,890		6,890		6,890	6,8	90	6,890	_	6,890	_	6,890	 6,890	_	6,890	_	6,890
11	Cumulative Annual Bill Impact	\$ 1,	,445	\$	6,333	\$	6,144	\$ 2,4	52	\$ 2,466	\$	2,441	\$	2,450	\$ 2,454	\$	2,456	\$	2,454

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Table 2 – Amortization of Muskwa River Crossing deferral over 2 years

14 Rate Schedule 1 Residential customers

		2015		2016		2	2017		2018		2019		2020		2021		2022		2023		024
	Annual Volumetric Cost of Service (\$/GJ)	\$	\$ 0.56 \$		0.55	\$	0.90	\$	0.35	\$	0.36	\$	0.35	\$	0.36	\$	0.36	\$	0.36	\$	0.36
	Average Residential Annual Consumption (GJs)	_	140	140		140		140		140		140			140	140			140		140
15	Cumulative Annual Bill Impact	\$	78	\$	77	\$	125	\$	49	\$	50	\$	50	\$	50	\$	50	\$	50	\$	50

16 Rate Schedule 2.1 General Commercial Service customers

		2015		015 2016		2	2017		2018		2019		2020		2021		2022		2023		024
	Annual Volumetric Cost of Service (\$/GJ)	\$	0.56	\$	0.55	\$	0.90	\$	0.35	\$	0.36	\$	0.35	\$	0.36	\$	0.36	\$	0.36	\$	0.36
	Average Rate 2.1 Customers Annual Consumption (GJs)		460		460		460		460		460		460		460		460		460		460
17	Cumulative Annual Bill Impact	\$	256	\$	253	\$	412	\$	162	\$	165	\$	163	\$	164	\$	164	\$	164	\$	164

18 Rate Schedule 2.2 General Commercial Service customers

		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Annual Volumetric Cost of Service (\$/GJ)	\$ 0.56	\$ 0.55	\$ 0.90	\$ 0.35	\$ 0.36	\$ 0.35	\$ 0.36	\$ 0.36	\$ 0.36	\$ 0.36
	Average Rate 2.2 Customers Annual Consumption (GJs)	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100
19	Cumulative Annual Bill Impact	\$ 1,724	\$ 1,706	\$ 2,775	\$ 1,092	\$ 1,110	\$ 1,098	\$ 1,102	\$ 1,104	\$ 1,105	\$ 1,104



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 54

1 Rate Schedule 25 Transportation Service customers

			2015	015 2016			2017		2018		2019		2020		2021		2022		2023		2024
	Annual Volumetric Cost of Service (\$/GJ)	\$	0.56	\$	0.55	\$	0.90	\$	0.35	\$	0.36	\$	0.35	\$	0.36	\$	0.36	\$	0.36	\$	0.36
	Average Rate 25 Customers Annual Consumption (GJs)	_	6,890	6,890		6,890		6,890		_	6,890		6,890		6,890	6,890		6,890			6,890
2	Cumulative Annual Bill Impact	\$	3,832	\$	3,792	\$	6,168	\$	2,426	\$	2,466	\$	2,441	\$	2,450	\$	2,454	\$	2,456	\$	2,454



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 55

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22.3 Please provide the non-levelized rate and bill impacts for rate 2.1 general Commercial Service customers and for all other FEFN customer classes for each of the next 10 years, starting in 2015, related to the net incremental impact of the Project costs.

8 **Response:**

- 9 Please refer to the response to BCUC IR 1.22.2.
- 23.0 Reference: FINANCIAL ANALYSIS
 Exhibit B-1, Section 6.2, Table 6-4, p. 51
 Incremental Project Impact HDD Option
 23.1 Please provide the supporting schedules, including th
- Please provide the supporting schedules, including the fully functioning excel
 spreadsheets, which show how each of the Incremental Project Impact line items
 in Table 6-4 were calculated.

17 <u>Response:</u>

- The "Incremental Project impact" column of Table 6-4, reproduced below, has been restated to reflect the change to an annual forecast volume of 654 TJs as discussed in the response to BCUC Confidential IR 1.9.2 and to explain the calculation or reference for each of the line items. Please refer to Confidential Attachment 23.1 for the supporting financial schedules that reflect the incremental project impact, including the fully functioning excel spreadsheets.
- 23

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Table 6-4: Financial Analysis of the HDD Option

		Incremental Broject Impact	
	Total Project	(as compared to	
	Impact	Existing Rates)	Reference
Total Direct Cost (\$ million) - As Spent \$	5.87	2.72	Schedule 7, Line 11 (incremental = total project cost less forecast 2013 npis of \$3.049 million)
Total Deferred Cost (\$ million) - As Spent \$	0.86	0.86	Schedule 9, Line 3
AFUDC (\$million)	0.31	0.22	Schedule 6, Line 18 + Schedule 9, Line 5
Total Project Cost (\$ million) - As Spent \$	7.04	3.79	
2015 Rate impact (\$/GJ)	1.38	0.21	Schedule 10, Line 33
Levelized Rate Impact 25 Years (\$ / GJ)	0.73	0.37	Schedule 10, Line 41
Levelized Incremental Revenue Requirement (\$million)	0.2	0.1	Schedule 10, Line 23
Incremental Revenue Requirement PV 25 Years (\$million)	6.1	3.0	Schedule 10, Line 22
Net Cash Flow NPV 25 Years (\$million)	0.0	0.0	Schedule 11, Line 17
2015 Rate Base (\$million)	6.6	3.3	Schedule 5, Line 19



1 24.0 **Reference: FINANCIAL ANALYSIS**

2 3 Exhibit B-1, Section 6.2, Table 6-4, pp. 50-51; Order G-27-11, Appendix A, p. 7

4

Treatment of Project Costs

5 The 2011 TGI Fort Nelson RRA Decision states on page 7 of Appendix A: "The 6 Commission also approves, for inclusion in rate base in 2011, forecasted costs of the IP 7 Bridge Crossing of \$3,015,650 as presented in the Evidentiary Update... TGFN is 8 directed to record the full amount of the 2011 forecasted amortization on the Muskwa 9 Project such that income and rate base are reduced by the forecasted amortization for 10 regulatory purposes."

- 11 24.1 Please provide a continuity schedule in the form of a fully functioning excel 12 spreadsheet which shows the original addition of \$3,015,650 to FEFN's rate 13 base, the amounts by which the original asset has been reduced each year 14 through amortization, and the ending balance at December 31, 2013 of the 15 originally approved project capital in rate base.
- 16

17 Response:

To clarify, although the addition of \$3,115,650¹ has been included on a forecast basis in the 18 19 2012 and 2013 rate base, an actual addition to rate base has not occurred due to the fact the 20 asset is not yet in service. Through the existing Muskwa River Project deferral account, FEFN 21 has been capturing the decrease in the cost of service related to this variance for return to 22 customers, including the reduced return on rate base. That is, customers will be kept whole 23 such that FEFN will only recover the cost of service associated with the actual costs and timing 24 of the Project. The cost of service difference of \$87 thousand pertaining to the 2011 forecast 25 was already refunded to customers in 2012.

26 The following table provides the forecast continuity of the Muskwa River Crossing asset 27 embedded in the forecast rate base for 2012 and 2013 as approved by Order G-44-12. Please 28 refer to Attachment 24.1 for the fully functioning excel spreadsheet.

An additional \$100 thousand was added to the 2011 approved costs as discussed in the July 19th, 2012 Evidentiary Update to the 2012-2013 Revenue Requirement Application and approved through Commission Order G-44-12



Muskwa River Project: Forecast Rate Base (\$000s)

	 2012	2013
Gross Plant In Service		
Opening Balance	\$ -	\$ 3,116
Addition	 3,116	 -
Closing Balance	3,116	3,116
Accumulated Depreciation		
Opening Balance	-	(22)
Depreciation	 (22)	 (45)
Closing Balance	(22)	(67)
Opening Net Plant In Service	\$ -	\$ 3,093
Closing Net Plant in Service	3,095	5,040
Mid Year Rate Base	\$ 1,547	\$ 3,071

Please also show when the additional \$100,000 in project capital costs

approved as part of the 2012-2013 FEU RRA was added to rate base

and indicate whether or not any amortization has been taken on this

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10 **Response:**

11 Please refer to the response to BCUC IR 1.24.1.

additional \$100,000.

24.1.1

12 The \$100,000 was added on a forecast basis to rate base at the same time as the other project 13 costs, for a one-time forecast addition of \$3,115,650 in 2012. Thus, the forecast depreciation 14 expense of \$22 thousand in 2012 and \$45 thousand in 2013, as shown in the response to BCUC IR 1.24.1, was calculated including the additional \$100,000. 15

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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 58

24.2 Given that the original Project costs of \$3,015,650 were approved to be included in rate base, please explain whether FEFN has been recording AFUDC on these original Project costs on FEFN's Weighted Average Cost of Capital (WACC).

5 **Response:**

No, FEFN has not been recording AFUDC on the forecasted Project costs. Through inclusion in forecast rate base, FEFN has been collecting the approved 2012 and 2013 return on rate base associated with the forecast Project costs of \$3,115,650. As discussed in the response to BCUC IR 1.24.1, FEFN will return to customers the decrease in the cost of service, including the reduced return on rate base, from the variance in timing between the forecast and actual addition to rate base. The variance for 2011, including the return on rate base, has already been refunded to customers through the 2012 delivery rates.

13 As is the approved practice, the actual total Project costs will accumulate in a work in progress

14 account attracting AFUDC, and will be transferred to rate base when the project is in-service.



Page 59

1	25.0	Refere	ence:	FINANCIAL ANALYSIS
2			I	Exhibit B-1, Section 6.2, Table 6-4, pp. 50-51
3				Treatment of Project Costs
4 5 6 7		The a deferra that ha whole	pplicatior al accour ad been regardles	n on page 50 states: "Further, the Muskwa River Crossing rate base nt was first created in 2011 to capture the cost of service of the Project recovered from customers through delivery rates and hold customers ss of the delay in the Project."
8 9		The ap amorti	pplication zed com	n on page 50 also states: "The Company expects that this account will be mencing in 2015."
10 11 12 13		25.1	Please approve Order re	indicate when the Muskwa River Crossing Deferral Account was ed by the Commission. Please also provide the applicable Commission eference number.
14	Respo	onse:		
15 16	The M G-44-1	uskwa l 12².	River Cro	ossing Deferral Account was approved in April 2012 by Commission Order
17 18				
19 20 21 22 23 24 25		25.2	Please function the def amortiza closing	provide a continuity schedule for this deferral account in a fully hing excel spreadsheet which shows the original 2011 balance included in ferral account, the additions each year to the deferral account, the ation taken each year on the deferral account (if any), and the expected balance at the end of 2014.
26	Respo	onse:		
27 28 29	Please Please the se	e refer t e note th parate [o the tab hat for 20 Depreciat	ble below and Attachment 25.2 for the fully functioning excel spreadsheet. D12 and 2013 the depreciation and related CCA impacts were captured in tion Variance deferral account.
30				

² Page 123 of FEU 2012-2013 Revenue Requirements and Rates Decision



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 60

Information Request (IR) No. 1

Muskwa River Crossing Deferral Account Forecast Balance at December 31, 2014

		(\$000's)	2	2012	2	2013		2014	_		
		Opening Balance	\$	-	\$	(90)	\$	(273)			
		Opening Balance Adjustment		(87)							
		Additions		(106)		(214)		(92)			
		Тах		16		31		16			
		Amortization		87				-			
1		Closing Balance		(90)		(273)	_	(349)			
2 3											
4 5 6 7	25.3	Please confirm, or explain otherw account will match the amortization	vise on p	, that t period c	he a of th	amortiz ie Proj	zat ect	ion per capital	iod for I costs	the de	eferral
8	Response:										
9 10 11 12	Not confirmed costs of the P Therefore, it i the period ove	d. The deferral account is related project and the amounts forecast and s likely that FEFN will propose an er which the over collection from cu	l to nd ii am usto	the va nclude ortizati mers o	riar d in on occu	ice bei 2012 period irred.	twe thr of	en the ough 2 1 to 3	actua 014 de years	l timin livery to alig	g and rates. n with
13	Please also re	efer to the response to BCUC IR 1.	.24.	1.							
14 15											
16 17		25.3.1 If confirmed, please indi	cate	e what	this	amort	iza	tion pe	riod wi	ill be.	
18											
19	Response:										
20	Please refer t	o the response to BCUC IR 1.25.3									
21											



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 61

1 26.0 **Reference: ACCOUNTING TREATMENT**

Exhibit B-1, Section 6.3.2, pp. 51-52

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Deferral of Application Costs

The application on pages 51-52 states: "FEI is seeking Commission approval under Sections 59-61 of the Act for deferral treatment of Project development and application costs. FEI is seeking approval to add these deferred costs to a new non-rate base deferral account, the Muskwa River Crossing Project Costs Deferral Account, on a netof-tax basis attracting AFUDC."

- 9 26.1 Please explain why FEI believes it is appropriate to include the Application costs 10 as part of the Project Costs Deferral Account and why it is appropriate to earn a 11 rate base rate of return on the Application costs.
- 12

13 Response:

14 It is appropriate to include the Application costs with the development costs within one deferral 15 account because both are related to the same project and FEI has proposed to recover the 16 costs over the same period. Where it is appropriate, FEI minimizes the number of deferral 17 accounts for administrative efficiency.

18 Application cost deferrals have historically been included in rate base and accordingly have 19 attracted the approved return on rate base. A rate base return is required to compensate the 20 utility for amounts invested in net utility plant and other items, such as regulatory assets 21 (deferral accounts) and working capital. The treatment of deferral accounts and working capital 22 is consistent, compensating the utility for the time lag between when expenditures occur and 23 when they are recovered from customers.

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26.2 Please explain whether or not FEI considers the Application costs to be "noncapital" costs.

- 29
- 30 Response:

31 FEI did not base its recommendation for deferral account treatment on an assessment of the 32 nature of the costs being capital versus non capital. Rather, this recommendation was based on 33 FEI's usual practice for application costs. Consistent with other applications, FEI requests that 34 the costs of regulatory applications be recorded in a deferral account. Although there is no 35 difference in the rate of return afforded to capital assets as compared to deferral accounts,



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 62

including the costs in the capital asset would result in the Application costs being recovered
 over the life of the asset, which FEI considers to be an inappropriately long recovery period.

3 To respond fully to the question, FEI has reviewed US GAAP guidance related to capitalization 4 of costs as follows:

5

360-10-30 Property, Plant, and Equipment – Initial Measurement

6 Paragraph 835-20-05-1 states that the historical cost of acquiring an asset includes the 7 costs necessarily incurred to bring it to the condition and location necessary for its 8 intended use. As indicated in that paragraph, if an asset requires a period of time in 9 which to carry out the activities necessary to bring it to that condition and location, the 10 interest cost incurred during that period as a result of expenditures for the asset is a part 11 of the historical cost of acquiring the asset. Activities necessary to bring an asset to the 12 condition and location necessary for its intended use is defined as follows in the glossary 13 for section 360-10-30:

- 14The term activities is to be construed broadly. It encompasses physical15construction of the asset. In addition, it includes all the steps required to prepare16the asset for its intended use. For example, it includes administrative and17technical activities during the preconstruction stage, such as the development of18plans or the process of obtaining permits from governmental authorities. It also19includes activities undertaken after construction has begun in order to overcome20unforeseen obstacles, such as technical problems, labour disputes, or litigation.
- 21 Based on this guidance, FEI believe that Application costs could be considered capital costs.
- 22
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- 24
- 25 26.3 Please provide the levelized rate impact and the non-levelized 2015 rate impact 26 for both residential and rate 2.1 general Commercial Service customers if the 27 Application Costs were placed in a separate deferral account from the Project 28 development costs and amortized over the following time periods: (i) 1 year, (ii) 2 29 years, and (iii) the proposed 3 years.
- 30
- 31 Response:

The table below provides the total Project impacts to both residential and Rate Schedule 2.1 general commercial service customers if the Application costs were amortized over the requested time periods. The amounts shown are the total Project impacts, equivalent to those shown in Table 6-4 of the Application.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 63

- 1 As shown in the table below, the levelized rate impact does not change for any the amortization
- 2 period scenarios. Additionally, the three year amortization period scenario is the same as
- 3 proposed in the Application because placing the application costs in a separate deferral account
- 4 does not change the rate impact.³
- 5 Further, these impacts reflect the revision to the forecast volume of 654 TJs as discussed in the
- 6 response to BCUC Confidential IR 1.9.2.

	1	Year		2 Year		3 Year
	Amo	rtization	Am	ortization	Am	nortization
2015 Rate impact (\$/GJ)	\$	1.44	\$	1.39	\$	1.38
2015 Annual Bill Impact - Residential customer @ 140 GJs per year	\$	202	\$	195	\$	193
2015 Annual Bill Impact - Rate 2.1 General Commercial Service customer @ 460 GJs per year	\$	664	\$	641	\$	633
Levelized Rate Impact 25 Years (\$ / GJ)	\$	0.73	\$	0.73	\$	0.73
Levelized Annual Bill Impact - Residential customer @ 140 GJs per year	\$	102	\$	102	\$	102
Levelized Annual Bill Impact - Rate 2.1 General Commercial Service customer @ 460 GJs per year	\$	336	\$	336	\$	336

³ Please refer to BCUC IR 1.22.1.1 and BCUC IR 1.22.1.2 for the annual rate impacts over a ten year period that reflect the revision to the forecast volume as identified in the response to BCUC Confidential IR 1.9.2.



Page 64

1	27.0	Refer	ence: ACCOUNTING TREATMENT
2			Exhibit B-1, Section 6.3.2, Table 6-5, pp. 51-52
3			Muskwa River Crossing Project Cost Deferral Account
4 5 6 7		The a comm a BCI longer	pplication on page 51 states: "FEI is requesting a three year amortization period to nence in 2015. To mitigate the rate impact on customers, FEI would also agree to UC determination to include deferral costs in capital costs which would have a r amortization.
8 9 10 11		27.1	Please provide the levelized rate impact and the non-levelized 2015 rate impact for both residential and rate 2.1 general Commercial Service customers under the following scenarios for the \$769 thousand deferred costs:
12 13 14 15 16			 (i) The deferred costs are amortized over the proposed 3-year time period; (ii) The deferred costs are amortized over a 5-year time period; (iii) The deferred costs are amortized over a 10-year time period; (iv) The deferred costs are included in capital costs and depreciated accordingly.
17	<u>Respo</u>	onse:	

Information Request (IR) No. 1

The \$769 thousand in deferred costs includes both the development costs and the application costs. This response assumes both types of costs are amortized over the various scenarios presented in the question. Further, these impacts reflect the revision to the forecast volume of 654 TJs as discussed in the response to BCUC Confidential IR 1.9.2.

		Am			3 Year Amortization			5 Year Amortization		10 Year Amortization		69 Year preciation
	2015 Rate impact (\$/GJ)	\$	1.38	\$	1.17	\$	1.02	\$	0.89			
	2015 Annual Bill Impact - Residential customer @ 140 GJs per year	\$	193	\$	164	\$	143	\$	124			
	2015 Annual Bill Impact - Rate 2.1 General Commercial Service customer @ 460 GJs per year	\$	633	\$	539	\$	468	\$	407			
	Levelized Rate Impact 25 Years (\$ / GJ)	\$	0.73	\$	0.73	\$	0.73	\$	0.71			
	Levelized Annual Bill Impact - Residential customer @ 140 GJs per year	\$	102	\$	102	\$	102	\$	100			
	Levelized Annual Bill Impact - Rate 2.1 General Commercial Service customer @ 460 GJs per year	\$	336	\$	336	\$	336	\$	329			
	Levelized Rate Impact 69 Years (\$ / GJ)	\$	0.71	\$	0.71	\$	0.71	\$	0.72			
	Levelized Annual Bill Impact - Residential customer @ 140 GJs per year	\$	99	\$	99	\$	99	\$	101			
22	Levelized Annual Bill Impact - Rate 2.1 General Commercial Service customer @ 460 GJs per year	\$	325	\$	325	\$	325	\$	331			

23

24 The scenarios all have a similar levelized rate impact; however, if the analysis is extended from

25 years to 69 years, the capitalization approach will have a larger levelized rate impact than26 the other scenarios because of the financing costs that result.

FEI's proposed method of recovery of these costs is through the creation of a deferral account.Alternatively, the Commission may order FEI to include these costs in the capital costs of the



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 65

Project. Although FEFN would be agreeable to this treatment for the development costs, FEFN notes that this would result in the costs being recovered from customers over the long life of the associated assets and ultimately result in higher costs for customers as shown in the table above.

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27.2 Please discuss the pros and cons for rate-payers of the deferred costs being amortized over three years versus being added to project capital costs.

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11 Response:

Deferring and amortizing the deferred development and application costs over three years results in a faster recovery of costs such that after three years it is only the costs of actually constructing the asset that are left in rate base to be recovered from customers. Additionally, some of the amortization of these costs could potentially be offset by the amortization of the credit balanced in the Muskwa River Crossing cost of service deferral account discussed in Section 6.2 of the Application, allowing for both smoother rates in the short-term and a lower rate base balance in the long-term.

19 While the capitalization approach results in smoother rates over the long term, it inherently 20 results in the costs being recovered from customers over the long life of the associated assets 21 and ultimately results in higher costs for customers.



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Information Request (IR) No. 1

1 C. PUBLIC AND FIRST NATIONS CONSULTATION

- 2 28.0 Reference: FIRST NATIONS CONSULTATION
 - Exhibit B-1, Section 9, p. 62

Identification of Potentially Impacted First Nations

5 FEI on page 62 states:

6 "Because of the location of the Project, the only First Nation that is potentially impacted 7 is the Fort Nelson First Nation. Thus, the consultation activities are focused on 8 communications with FNFN."

- 9 "First Nations with any potential interests in the general area of the Project have been
 10 identified when the Company was first considering a pipeline crossing replacement, such
 11 as the IP Bridge Crossing Option."
- 12 "The Muskwa River is within the traditional territory of FNFN. Treaty 8 Tribal Association
 13 has also been identified for communication because FNFN is a member of this
 14 Association."
- 15 On page 63 FEI states:

16 "The Treaty 8 Tribal Association represents five First Nations in Northeastern BC. Its
17 membership consists of a council of five Treaty 8 Tribal Association Chiefs of member
18 and non-member First Nations."

"FEI will notify and communicate with Treaty 8 Tribal Association regarding the Project.
 A letter will be sent out to lands department explaining the project along with timelines."

According to the Treaty 8 Tribal Association's website, there are 8 First Nations that are signatories to the historic Treaty number 8: Doig River, Halfway River, Prophet River, Saulteau and West Moberly First Nations are member communities, and Blueberry River, Fort Nelson, and McLeod Lake First Nations are "non-member" communities.⁴

- 25 28.1 Did FEI contact any of the other seven Treaty 8 First Nations to inform them of 26 the proposed Project? If so, which communities did FEI contact and when? If 27 not, why not?
- 28

⁴ http://www.treaty8.bc.ca/communities/



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 67

1 Response:

2 The Fort Nelson First Nation has been very clear that it will be assuming the lead role with 3 respect to engagement of and consultation with the Treaty 8 Tribal Association on this Project,

4 but has suggested FEI contact the local Treaty 8 Tribal Association.

FEI contacted the Treaty 8 Tribal Association on January 9th, 2014 with a follow up call on
January 13th, 2014. If the Project is approved by the Commission, FEI will contact the lands
department of the Treaty 8 Tribal Association and notify them of the Project plans.

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- 1128.2Has FEI received confirmation from any of the seven other Treaty 8 First Nations12that they do not have aboriginal or Treaty rights in the Project area and FEI does13not need to consult with them? If not, has FEI received confirmation from the14Treaty 8 Tribal Association that FEI only needs to consult with Fort Nelson First15Nation? Please explain.
- 16

17 Response:

18 The FNFN lands department has guided FEI on which nations may have rights and claims in the

19 impacted Project area. The FNFN told FEI that correspondence regarding the Project should be

20 copied to Treaty 8 Tribal Association should FEI receive approval to go ahead with the Project.

21 Please refer to the response to BCUC IR 1.28.1 for FEI's plan.

Additionally, FEI has filed an application with the Oil and Gas Commission on January 16, 2014.

The OGC will outline to FEI which First Nation groups have claims in the area and require engagement for this Project.



Information Request (IR) No. 1

1	29.0	Reference:	FIRST NATIONS CONSULTATION
2			Exhibit B-1, Section 4.1, p. 16
3			First Nations Feedback on Options
4		FEI on page 1	6 states:
5 6 7		"The option sl the Fort Nelso risk, construct	nould deliver the solution that best suits the needs of the stakeholders and on community by taking into consideration the cost, safety, environmental ion risk, and regulatory requirements."
8 9		On page 23, estimate due,	FEI states that for the HDD Option has increased in cost since the 2010 in part, to:
10 11		"more stringe stakeholders	nt permitting requirements from OGC including higher expectations from and First Nations"
12		On page 24 F	El states that one of the challenges of the Isolated Open-Cut Option is:
13 14 15		"The construc would have a opposition by	tion disturbance area and post-construction reinstatement and remediation high likelihood of opposition by local stakeholders and a high certainty of First Nations"
16 17 18		"Communicati any river dis considered if a	on with Fort Nelson First Nations indicated that they would be resistant to turbance and DFO also directs that any in-stream options are only all other options are not feasible."
19		On page 25, v	vith respect to the Aerial Bridge Crossing Option, FEI states:
20 21 22 23 24 25 26		"The disadva stakeholders the Aerial Pip and FNFN ha bed Anothe year) and cos and certain Fi	ntage of the Aerial Bridge Crossing is potential objection by local because of the aesthetics of the structure and its size. The construction of eline bridge Crossing will impact the riparian zone adjacent to the structure we expressed strong concern of any option that will disturb the river or river er disadvantage of this option is the length of time (estimated to be one t to acquire permits, and additional efforts to manage probable stakeholder rst Nations objections."
27		On page 26 F	El states:
28 29		"The Microtur Option in term	nel Option offers many of the same advantages afforded by the HDD is of avoiding larger excavations and having less environmental impact."



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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 69

29.1 Please confirm, or explain otherwise, that FEI presented information on all the options to Fort Nelson First Nation.

4 **Response:**

- 5 FEI confirms Microtunneling, Open Cut, HDD, and Aerial Crossing options were reviewed with 6 Fort Nelson First Nation at meetings held on June 18, 2013 and October 28, 2013.
- 7 8
- 10 29.2 Please summarize Fort Nelson First Nation's concerns with respect to the 11 Isolated Open-Cut and Aerial Bridge Crossing options.
- 12

9

13 Response:

14 The FNFN expressed its concerns regarding any potential disturbance to the riparian zone. 15 Additionally, as noted in the letter included as Appendix 30.2.1 in the response to BCUC IR 16 1.30.2.1, the FNFN indicate they will not support the option of installing an aerial crossing due to 17 the greater environmental impact expected from this technique. The FNFN has also expressed 18 strong objection to the Open Cut option due to potentially negative impacts to the river and fish.

- 19

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29.3 Please explain how First Nations expectations have increased the cost of the HDD option since the 2010 estimate.

24 25 **Response:**

26 To clarify, FEI stated the additional costs were due to more stringent permitting requirements 27 from the OGC including higher expectations from stakeholders and First Nations.

28 The BC Oil & Gas Activities Act (OGAA) came into existence in October 2010. The OGAA, 29 amongst other changes, expanded consultation and notification requirements such as who must 30 be engaged and notified before an application is submitted to the OGC. Additionally, the OGAA 31 sets forth the requirements for environmental objectives for water, riparian values, wildlife and 32 wildlife habitat, old-growth forests, resource features and cultural heritage resources. The OGC 33 is required to consider these objectives when deciding whether to authorize an oil and gas 34 activity. Hence, FEI is now required to meet more stringent requirements for its OGC 35 application, which adds cost to the process.



1 As the OGAA just came into effect, the original HDD option estimate completed in November 2 2010 did not account for these more stringent requirements. 3 4 5 6 29.3.1 What are FNFN's "expectations" with respect to the HDD option? 7 Please explain. 8 9 **Response:** 10 The expectations of the FNFN are its continued involvement in the Project, and FEI to employ 11 work practices and techniques that minimize any environmental impact and to provide 12 appropriate remediation (if required) and employment opportunities if existing. 13 14 15 16 Have FNFN raised any concerns with respect to the HDD option? If so, 29.3.2 17 what are those concerns? In your response please indicate how their 18 concerns have changed since 2010. 19 20 Response: 21 The FNFN has expressed concerns regarding any potential negative impact the prepared 22 drilling footprints may have on the riparian area. The HDD option was not presented to the 23 FNFN in 2010, however, as indicated in the response to BCUC IR 1.30.2.1 FEI received a letter 24 of support for the Project from the Fort Nelson First Nation on January 8, 2014. 25 26 27 28 29.4 Please summarize Fort Nelson First Nation's concerns, if any, with respect to the 29 Microtunnel option. 30 31 **Response:** 32 The Microtunneling option was discussed with the FNFN; however, only limited technical details 33 were available at the time. Based on the information provided, the FNFN offered no opinion



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 71

regarding the Microtunneling option. If Microtunneling is the final construction method, FEI will
 update and provide further information to the FNFN accordingly.

3 4			
5			
6		29.4.1	Is there any material difference with regard to First Nation's concerns
7			between the HDD and Microtunnel options? Please explain.
8			
9	<u>Response:</u>		
10	Please refer	to the res	ponse to BCUC IR 1.29.4.


FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 72

1	30.0	Reference:	FIRST NATIONS CONSULTATION
2 3			Exhibit B-1, Section 5.6, p. 42; Section 9.3, p. 63; Sections 9.4 & 9.5, p. 64;
4 5			BC Oil and Gas Commission, "Pipeline Permit Application Manual", pp. 87-88
6			Documentation of Consultation Activities
7		FEI on page	42 states:
Q		"EEEN plane	to file the Pineline Application in January 2014. A Pineline Application is a

8 "FEFN plans to file the Pipeline Application in January 2014. A Pipeline Application is a
9 significant process with considerable technical scrutiny on the Project by the OGC.
10 Public and First Nations Consultation, archaeological requirements, design reviews,
11 environmental permits/approvals for work in and around fish bearing streams are all
12 components of the Pipeline Application."

- 13 On page 64 FEI states:
- 14 "Under the OGC process, FEI as the Project proponent is responsible for conducting 15 preliminary discussions with the identified First Nations, and for providing documentation 16 such as Project descriptions, maps and drawings to First Nations to facilitate the OGC 17 process. On October 28th the project manager reviewed a presentation which is 18 attached as Appendix J2 with the FNFN lands department going over the proposed project in detail. FEI's engagement activities that have taken place to the filing of the 19 20 OGC application will be forwarded to the OGC for its consideration when FEI files its 21 application with the OGC in early January 2014."
- On page 87 of its Pipeline Permit Application Manual⁵ the BC Oil and Gas Commission
 (OGC) recommends keeping a log of all engagement and attempts to engage with First
 Nations, which the Oil and Gas Commission may consider in its decision making
 process. The manual provides an example template for a First Nations Engagement Log
 at page 88.
- 27 On page 63 FEI states:
- 28 "The Company's Project Manager along with the Senior Aboriginal Relations Manager
 29 have had face-to-face meetings with FNFN to ensure they are kept up to date on the
 30 Project status and the currently proposed option. Specifically,

⁵ <u>http://www.bcogc.ca/node/5833/download</u>



- On June 17, 2013, FEI's representative met with Lana Lowe, the Director of
 Land for the FNFN, and discussed the HDD Option for the pipeline crossing
 replacement.
 - On October 28, 2013, FEI's representative met with Alexis Jorgensen, the Environmental Technician for FNFN, to review the HDD project plan.
- 6 Additionally, FEI is working with the FNFN to identify employment opportunities for 7 FNFN members throughout the construction of the Project."
- 8 On page 64 FEI states: "When FEI was pursuing the IP Bridge Option, the FNFN wrote 9 a letter to FEI indicating its support of that Option. The letter is attached as Appendix K."
- 1030.1Please provide an up-to-date chronological log of all direct communication11between FEI and First Nations with respect to the proposed project and12alternatives. Organize the log by community and include face-to-face meetings,13as well as letters, email correspondence, and telephone conferences or14conversations.
- 15

5

16 **Response:**

17 FEI has maintained a log recording its communication with the interested First Nations in this 18 Project. However, the FNFN has verbally informed FEI that it would not generally be in favour 19 of a log or record of communication with the FNFN being filed. Instead, for this Project, the 20 FNFN has provided a letter, which endorses FEI's engagement process with FNFN and the 21 HDD Option, which is included as Attachment 30.2.1 in the response to BCUC IR 1.30.2.1. In 22 recognition of the FNFN's concern about the filing of the log and in the interest of maintaining a 23 good relationship with the FNFN, FEI has provided its communication log regarding this Project 24 to the FNFN to see whether it has any particular concerns about the log. As of this filing, FEI 25 has not heard back from the FNFN. FEI will provide the Commission with updated information if 26 necessary once FEI hears back from the FNFN. FEI understands and acknowledges the CPCN 27 application guidelines requesting a chronology of meetings, other communications and 28 actions. In the Application, FEI has provided the relevant information to the Commission and 29 will endeavor to continue to do so.

FEI notes that it has notified the OGC of the concern raised by the FNFN with respect to the filing of the communication log. The OGC has indicated to FEI that a blank log accompanied by the FNFN letter of support will be acceptable and will not cause any delay in the OGC's processing of the FEI permit application.

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FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 74
Information Request (IR) No. 1	

30.1.1 If possible, please provide meeting minutes of the June 17, 2013 and October 28, 2013 meetings with FNFN representatives. Alternatively, please summarize the conversation and FNFN's feedback at each of these meetings. Please provide the same for any other significant meetings or telephone conversations with FNFN about the currently proposed option.

8 **Response:**

9 Below represents a summary of the conversation and FNFN's feedback at the June 17, 201310 and October 28, 2013 meetings.

June 17, 2013 – Meeting with Lana Lowe, Director of the FNFN Lands Department, and
 Katherine Wolfenden, Manager of the Environmental Department, and introduction to Alexis
 Jorgenson, Katherine's replacement during her maternity leave.

The lack of federal approval for the proposed bridge pipeline crossing and the remaining Microtunneling, Open Cut, Aerial Crossing, and HDD options available were discussed at a high level. As FEI had very limited technical information or information on potential impacts of the various options, FEI agreed to continued notification to and discussion with the FNFN as these options continued to be fleshed out.

October 28, 2013 – Meeting with Alexis Jorgenson, FNFN Lands department. FEI staff presented a Power Point presentation that gave Project background, preferred crossing option and FEI's moving-forward strategy. FEI committed to working with FNFN employment manager to ensure temporary jobs were filled by FNFN membership where appropriate. FEI ensured Alexis that as the Project develops and goes through the application process, FEI will keep FNFN informed.

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- 2830.2Please provide copies of all project-related materials FEI sent to Fort Nelson First29Nation, Treaty 8 Tribal Association and any other First Nations including any30letters, project descriptions, maps and presentations.
- 31
- 32 Response:

In addition to the presentation to the FNFN on October 28, 2013 and provided as Appendix J2
to the Application, FEI provided a copy of a preliminary survey plan of the HDD program similar
to the drawing included as Appendix E to the Application. Please note that the version of that
survey is preliminary and is now out of date, but is included in Attachment 30.2 for reference.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 75

1 2 3 4 5 6	Further, FEI sent the FNFN a copy of the Archaeological Preliminary Field Reconnaissance Report included as Appendix I to the Application the first week of November 2013 and the Preliminary Environmental and Socio-economic Assessment included as Appendix D to the Application on January 8, 2014.
7 8 9 10 11	30.2.1 Please also provide copies of any materially-relevant reply letters or emails from Fort Nelson First Nation, Treaty 8 Tribal Association and any other First Nation, to FEI.
13 14 15	On January 8, 2014, FEI received a letter of support for the Project from the Fort Nelson First Nation. The FNFN has expressed its appreciation of FEI's engagement efforts to date. This letter has been provided in Attachment 30.2.1
16 17	
18 19 20 21 22	30.2.1.1 Has FEI received a letter in support of either the HDD or Microtunnel Option from FNFN, Treaty 8 Tribal Association or any other First Nation? If yes, please provide a copy.
23	Response:
24 25	On January 8, 2014, FEI received a letter from the FNFN stating its support of the HDD Option. For the letter, please refer to Attachment 30.2.1 provided in the response to BCUC IR1.30.2.1.
26 27	
28 29 30 31 32	30.2.1.2 Has FEI received any letters from FNFN, Treaty 8 Tribal Association or any other First Nation indicating that consultation with the respective First Nation has been sufficient to-date? If yes, please provide a copy.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission)	Page 76

2 Response:

As indicated in the response to BCUC IR 1.30.2.1, the FNFN provided a letter expressing its appreciation to FEI for engaging the FNFN. Although the letter does not specifically use the word "sufficient," it does state the following:

- 6 The Fort Nelson First Nation (FNFN) has been engaged in ongoing communication with 7 FortisBC Energy Inc. regarding the status of the proposed replacement of their pipeline 8 crossing of the Muskwa River adjacent to our reserve and within our core traditional 9 territory. FNFN would like to thank Fortis for their efforts in engaging with us, ranging 10 from providing information on the proposed development, to offering to include FNFN in
- 11 employment and archeological work.

12



Page 77

1	31.0	Refere	ence:	FIRST N	ATIONS C	ONSULT	ATION					
2				Exhibit E	B-1, Sectio	on 9						
3				Notificat	ion of CPC	CN Filing	J					
4 5 6 7 8	Respo	31.1 onse:	Did FE Commi particip	I notify ssion? ate as int	any First If yes, did terveners ir	Nations FEL als the proc	when i so infor ceeding	it filed m any ? If no	its CP First I t, why n	CN A Nations ot?	pplicatio s that t	on to the hey may
9 10 11 12 13	When pursui crossi furthe as an	FEI me ing othe ng and r discus interver	et with t er crossin that FEI sed with ner as pa	he FNFN ng options may have the FNFI art of the B	I on June due to the to file a C N the role o BCUC proc	18, 2013 lack of F CPCN ap of the BC cess.	5, the Fi Federal plicatior UC and	NFN w approv with tl the op	as advi al requi ne BCU tion for	sed th red to C. At the FN	at FEI initiate t this mee IFN to p	would be he bridge eting, FEI participate
14 15	On Oo be filir	ctober 2 ng an ap	8 th , 2013	3, the Con 1 with the	npany verb BCUC.	ally infor	med the	e FNFN	lands o	departr	ment tha	at it would
16 17												
18 19 20 21 22	Respo	31.2 onse:	Please Treaty	confirm t 8 Tribal A	hat FEI has Association.	s provide	d a cop	y of Or	der G-2	07-13	to FNFI	N and the
23 24	A cop	y of Ord	ler G-20	7-13 has	been forwa	irded the	FNFN a	and the	Treaty	8 Triba	al Assoc	ciation.



Information Request (IR) No. 1

32.0 Reference: FIRST NATIONS CONSULTATION

Exhibit B-1, Section 7.1, pp. 53-54; Section 9, p. 65; Appendix D, pp. 9 & 29

3 4

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Identification of First Nation Impacts and Concerns

5 On page 53 FEI states:

6 "The [preliminary environmental] assessment is based on a desk-top review of available 7 information, previous studies completed by Environmental Dynamics Inc. (EDI), and 8 Dillon's field studies to determine the biophysical characteristics supported within the 9 Project Area."

"Based on this preliminary assessment, the overall environmental risk is low and any
potential environmental impacts from the Project can be mitigated through standard
environmental protection and mitigation measures."

13 On page 54 FEI states:

"Site-specific mitigation strategies will be developed in the detailed engineering design
phase to protect known valued components and mitigate or offset any potential negative
impacts to these components during the construction phase of the Project.
Environmental specifications and a detailed Environmental Management Plan will be
prepared by Dillon and FEI."

- 19 Page 9 of Appendix D states:
- 20 "Dillon has conducted further environmental background reviews and assessments, as
 21 well as ground truthing exercises (2013) at the Project site.
- 22 Page 29 of Appendix D states:
- "Given the proximity of the Project to semi-mature forests and fish habitat, the potential
 for adverse impacts to occur to the natural environment is considered moderate."
- 25 On page 65 FEI states:
- "No significant concerns, with the exception of the mitigation and avoidance of
 archaeological and heritage sites and the request for restoration, have been raised as of
 October 29, 2013."



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32.1 Please confirm, or explain otherwise, that First Nations did not participate in Dillon's field studies or ground-truthing exercises for the preliminary environmental assessment.

5 **Response:**

- No, First Nations were not notified in advance of Dillon's field studies or ground-truthing
 exercises for the preliminary environmental assessment for the following reasons.
- The environmental assessment report was drafted based on desk top information;
- 9 The actual site work was very short in duration; and
- The proposed environmental impact would be minimal and contained within a very small area.
- However, the FNFN was involved in the selection of the archaeological firm Archer CRM who
 completed the archaeological work. In addition, FNFN representatives were directly involved in
 the Preliminary Field Reconnaissance Assessment completed by Archer CRM.
- The FNFN was provided with a copy of the archaeological assessment report during the first week of November 2013 and a copy of the preliminary environmental report on January 7, 2014. Further, FNFN will be included in the Project construction process to monitor construction activities for potential archaeological finds, and FEI remains committed to ensuring that the FNFN is included in employment opportunities that this Project, if approved, brings to Fort Nelson.
- 21
- 22
- 23
- 2432.2Did FEI provide FNFN and Treaty 8 Tribal Association with the results of Dillon's25Preliminary Environmental Assessment? If not, why not. If yes, please describe26any feedback or comments that FEI received about the findings in the27assessment.
- 28
- 29 <u>Response:</u>

30 As noted in the response to BCUC IR 1.32.1, a copy of FEI's Preliminary Environmental 31 Assessment Report has been provided to the FNFN on January 7, 2014. As it has only very 32 recently been provided to FNFN, no comments have been received regarding the findings in the

33 assessment.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 80

Given that the Preliminary Environmental Assessment states: "the potential for

adverse impacts to occur to the natural environment is considered moderate",

please explain how FEI concludes that "the overall environmental risk is low".

As FEI moves forward with the next phase of environmental work required to facilitate Project permitting, FEI will continue dialogue with the FNFN and Treaty 8 Tribal Association. In addition, the Oil and Gas Commission is likely to consult with the FNFN and Treaty 8 Tribal Association as part of FEI's pipeline permit application.

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12 **Response:**

32.3

Although the potential for adverse environmental impacts to occur to the natural environment is considered moderate, the implementation of environmental protection and mitigation measures during construction results in a low overall environmental risk. As stated by FEI on page 54 of the Application, "Site-specific mitigation strategies will be developed in the detailed engineering design phase to protect known valued components and mitigate or offset any potential negative impacts to these components during the construction phase of the Project."

- 19
- 20
- 21
 22 32.4 Has FNFN or Treaty 8 Tribal Association raised any concerns regarding the
 23 proposed HDD option, or the alternative Mictrotunneling option since October 29,
 24 2013? If yes, please describe and explain how FEI intends to address the
 25 expressed concerns.
- 25 26

27 **Response:**

FNFN has not raised any further concerns regarding the options noted above since October 29,
2013. Please also refer to the response to BCUC IR 1.30.2.1.

30

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- 31
 - 32.5 Please describe any feedback or input that FEI received from FNFN and Treaty 8
- 33 32.5 Please describe any feedback or input that FEI received from FNFN and Treaty 8
 34 Tribal Association regarding mitigation of environmental impacts. If applicable,
 35 please explain how FEI has incorporated such feedback.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 81

2 **Response:**

Presently, no feedback or input has been received regarding the mitigation of environmental
impacts. Please refer to the response to BCUC IR 1.32.1.

5			
6			
7			
8		32.5.1	Does FEI intend to consult FNFN during the development of site-
9			specific mitigation strategies or the Environmental Management Plan?
10			If not, why not?
11			
12	Response:		
13	Yes, as FEI	moves for	prward with the next phase of environmental work required to facilitate

14 Project permitting, FEI will continue dialogue with and provide necessary information to the 15 FNFN.

16



Information Request (IR) No. 1

1	33.0	Refere	ence:	FIRST NATIONS CONSULTATION
2				Exhibit B-1, Section 9, p. 65; Section 5.7, p. 45;
3 4				BC Oil and Gas Commission, "Pipeline Permit Application Manual", pp. 53 - 57
5				Sufficiency of Consultation
6		On pa	ge 65 F	El states:
7 8 9		"FEI Projec potent	l believe t is ap ial inter	es that the level of First Nation engagement undertaken at this stage of the propriate given only one First Nation, FNFN, was identified to have a est in the Project area, and no aboriginal rights and title are affected."
10 11		Pages respor	53-5 nsibilitie	7 of the Pipeline Permit Application Manual describe the applicants' s with respect to First Nations consultation.
12 13		In Tab during	le 5-3 c OGC p	n page 45 FEI rates the "mitigated likelihood" of "delay due to FN response ermitting" as 4, and the "Mitigated Impact" as 2.
14 15 16 17	Respo	33.1 onse:	Please for Firs	e confirm, or explain otherwise, that FEI has met the OGC's requirements st Nations notification and consultation.
18 19 20	The C and h consul	ompany as prov t with th	y has m vided th ne affec	et the OGC's requirement to notify and engage the affected First Nations e OGC with the required Project information that the OGC can use to ted First Nations.
21 22				
23 24 25 26 27 28	Respo	33.2	Given please Nation	that FEI believes that the level of First Nation engagement is appropriate, e explain why FEI has rated the mitigated likelihood of delay due to First s' response as 4.
29	At the	time th	hat the	risk workshop was conducted (September 10, 2013), a rating of 4 was
30	determ	nined ir	n consi	deration of the likelihood of delay due to FN response during OGC

31 permitting. Since completion of the risk workshop, FEI has continued liaison with the local Fort

32 Nelson First Nations, who have recently indicated support for the HDD crossing alternative and,



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 83

- 1 therefore, this has reduced the likelihood of delay as originally considered. Please also refer to
- 2 the response to BCUC IR 1.30.2.1.



FortisBC Energy Inc. (FEI or the Company) – Fort Nelson Service Area Application for a Certificate of Public Convenience and Necessity (CPCN) to Construct and Operate a Transmission Pressure Pipeline Crossing of the Muskwa River (the Application)	Submission Date: January 16, 2014
Response to British Columbia Utilities Commission (BCUC or the Commission) Information Request (IR) No. 1	Page 84

1	34.0	Refer	ence:	PUBLIC CONSULTATION
2				Exhibit B-1, Appendix J
3				Project Expected Cost
4 5 6		In Apj Muskv docum	pendix 、 wa River nent, Fo	J, FEI provided a PowerPoint presentation, dated October 2013, on the r proposed pipeline replacement project to Fort Nelson residents. In that rtis states:
7 8 9		"Fortis Muskv Apper	sBC has wa Rivei ndix J)	s researched available techniques to construct the pipeline across the r. The project is expected to cost approximately \$5 million." (Exhibit B-1,
10 11 12		34.1	Please approx	e discuss what FEI means with regard to "the project is expected to cost cimately \$5 million."
13	<u>Respo</u>	onse:		
14 15 16 17 18	At the crossin the tin FEI ha audier	time c ng was ne. At ad more nces at	of the pr expected the prese e up-to-o those pr	inting of the presentation, FEI had the understanding that the proposed ed to cost about \$5 million. This was based on preliminary information at sentations to the Fort Nelson Council and residents in late October 2013, date information and accordingly informed the Mayor, Councilors, and the resentations that the Project costs would likely exceed the \$5 million.
19 20				
21 22 23 24 25 26	Respo	34.2 onse:	Please that re be \$7 i	e confirm, otherwise explain, that during the community information session sidents were informed by FEI that the Total Project Costs are expected to million.
27	Please	e refer t	o the re	sponse to BCUC IR 1.34.1.

Attachment 9.1



WYO-BEN, INC.

MATERIAL SAFETY DATA SHEET



NFPA FIRE HAZARD IDENTIFICATION SYSTEM

I. PRODUCT IDENTIFICATION								
Trade Name(s): EXTRA	A HIGH YIELD BENTO	NITE						
Generic Name(s): Wyon	ning (Western) Bentonite; 1	Bentonite Clay	(CAS No. 1302-78-9)					
Chemical Name(s): Sodi	ium Montmorillonite (CA	AS No. 1318-93	-0)					
Manufacturer: WY Address: P.O Bill	7 O-BEN, INC. D. Box 1979 lings, Montana 59103		Telephone Numbers: Information: (406) 652-6351 EMERGENCY: (406) 652-6351					
	II.	HAZARDOUS	S INGREDIENTS					
Ingredient	CAS NO.	%	Hazard					
Crystalline Silica (SiO ₂) as Quartz	14808-60-7	See Note	Low concentrations of crystalline silica (SiO_2) in the form of quartz may be present in airborne bentonite dust. See Section VI for discussion of health hazard.					
Note: Although the ty the 10 μ respira bentonite source other use specifi	Note: Although the typical quartz content of western bentonite is in the range of 2 to 6% most of the quartz particles are larger than the 10 μ respirable threshold size. The actual respirable quartz concentration in airborne bentonite dust will depend upon bentonite source, fineness of product, moisture content of product, local humidity and wind condition at point of use and other use specific factors.							
		III. PHYSI	CAL DATA					
Boiling Point (°F): NA			Specific Gravity (H ₂ O=1): 2.45-2.55					
Vapor Pressure (mm. Hg): NA		Melting Point: Approx. 1450°C					
Vapor Density (Air = 1):	NA		Evaporation Rate (Butyl Acetate = 1): NA					
Solubility in Water: Inso	bluble, forms colloidal susp	ension.	pH: 8-10 (5% aqueous suspension)					
Density (at 20° C): 55 lb	os./cu.ft. as product.							
Appearance and Odor: E	Bluegray to green as moist s	solid, light tan to	o gray as dry powder. No odor.					
	IV.	FIRE AND EX	XPLOSION DATA					
Flash Point: NA			Flammable Limits: LEL: NA UEL: NA					
Special Fire Fighting Pro	cedures: NA							
Unusual Fire and Explosit	ion Hazards: None. Produ	ct will not supp	ort combustion.					
Extinguishing Media: No	one for product. Any medi	a can be used for	or the packaging. Product becomes slippery when wet.					
		V. REA	СТІVІТУ					
Stability: Stable								
Hazardous Polymerization: None								
Incompatibility: None								
Hazardous Decompositio	on Products: None							
NA = Not Applicable ND = Not Determined								

Y	VI. HEALTH HAZARD INFORMATION							
 Routes of Exposure and Effects: Skin: Possible drying resulting in dermatitis. Eyes: Mechanical irritant. Inhalation: <i>Acute</i> (short term) exposure to dust levels exceeding the PEL may cause irritation of respiratory tract resulting in a dry cough. <i>Chronic</i> (long term) exposure to airborne bentonite dust containing respirable size (≤ 10 µ) quartz particles, where respirable quartz particle levels are higher than TLV's, may lead to development of silicosis or other respiratory problems. Persistent dry cough and labored breathing upon exertion may be symptomatic. Ingestion: No adverse effects. 								
Permissible Exposure Limits: (for air contaminants) Bentonite as "Particulates not otherwise regulated" OSHA PEL (8hr. TWA) ACGIH TLV								
Total du	st	15mg/m^3	ND					
Respirat	ole dust	5mg/m^3	ND 0 1mg/m ³					
Crystannie Quartz (respirable)		0.111g/111	0.111g/111					
Carcinogenicity: Bentonite is not listed by A humans for the carcinogenicity of inhaled co detected in all industrial circumstances studi external factors affecting its biological activit 9 th Report on Carcinogens – 2000). ACGIH	Carcinogenicity: Bentonite is not listed by ACGIH, IARC, NTP or OSHA. IARC, 1997, concludes that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica from occupational sources (IARC Class 1), that carcinogenicity was not detected in all industrial circumstances studied and that carcinogenicity may depend on characteristics of the crystalline silica or on external factors affecting its biological activity. NTP classifies respirable crystalline silica as "known to be a human carcinogen" (NTP 9 th Report on Carcinogens – 2000). ACGIH classifies crystalline silica, guartz, as a suspected human carcinogen (A2).							
Acute Oral LD ₅₀ : ND	Acute Derm	al LD ₅₀ : ND	Aquatic Toxicology LC ₅₀ : ND					
Skin: Wash with soap and water un Eyes: Flush with water until irritatio Inhalation: Move to area free from o existing respiratory illnes	Emergency and First Aid Procedures: Skin: Wash with soap and water until clean. Eyes: Flush with water until irritation ceases. Inhalation: Move to area free from dust. If symptoms of irritation persist contact physician. Inhalation may aggravate existing respiratory illness.							
VI	I. HANDLING A	ND USE PRECAUTI	ONS					
Steps to be Taken if Material is Released or up to avoid generating airborne dust. Avoid	Spilled: Avoid brousing water. Produ	eathing dust; wear respi	rator approved for silica bearing dust. Vacuum d.					
Waste Disposal Methods: Product should be	disposed of in acc	ordance with applicable	local, state and federal regulations.					
Handling and Storage Precautions: Use N airborne bentonite dust levels exceed PEL/T slippery if wetted.	IOSH/MSHA resp LV's. Clean up sp	pirators approved for s pills promptly to avoid	ilica bearing dust when free silica containing making dust. Storage area floors may become					
VIII. IN	DUSTRIAL HYC	GIENE CONTROL M	EASURES					
Ventilation Requirements: Mechanical, gene	eral room ventilation	on. Use local ventilation	n to maintain PEL's/TLV's.					
Respirator: Use respirators approved by NIC	OSH/MSHA for sil	ica bearing dust.						
Eye Protection: Generally not necessary. Pe	ersonal preference.							
Gloves: Generally not necessary. Personal p	preference.							
Other Protective Clothing or Equipment: No	one							
	IX. SPECIA	L PRECAUTIONS						
Avoid prolonged inhalation of airborne dust.								
DEPARTMENT OF TR	ANSPORTATIO	N HAZARDOUS MA'	FERIAL INFORMATION					
Shipping Name: NA (Not Regulated)		Hazard Class: NA						
Hazardous Substance: NA		Caution Labeling: N	A					
Date Prepared: March 15, 2001			Doc #: 4300-00					

All information presented herein is believed to be accurate, however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances. No warranty or guarantee, expressed or implied is made by WYO-BEN, INC. as to this information, or as to the safety, toxicity or effect of the use of this product.



Material Safety Data Sheet Soda Ash

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	Soda Ash								
Chemical Name	Sodium Carbon	ate, Anhydrous							
Synonyms	Disodium carbo	nate, carbonic a	cid, disodium salt						
Chemical Formula	Na ₂ CO ₃								
Molecular Weight	105.99								
CAS Number	497-19-8								
Grade Names	Technical grade	e soda ash, High	Purity grade soda ash						
General Use	Glass manufacturing, chemical manufacturing, pulp and paper, water treatment and pH control, soap and detergent manufacturing, coal treatment, emission control, iron exchange resin regeneration.								
Manufacturer	OCI Chemical Corporation 1800 West Oak Commons Ct Suite 100 Marietta, GA 30062								
Emergency Telephone Numbers	3								
	For emergencies involving a spill, leak, fire or exposure, contact:								
	United States CHEMTREC (800) 424-9300 Canada CANUTEC (613) 996-6666								
General or Product Information	OCI Chemical C	(800) 865-1774							

2. COMPOSTION / INFORMATION ON INGREDIENTS

Chemical Name	CAS Number	ENIECS Number	Concentration
Sodium Carbonate	497.19-8	207-838-8	99.8 % by wt.

3. HAZARDS IDENTIFICATION

Emergency Overview

White, odorless, granular solid Exposure may cause irritation to eyes, skin, and respiratory tract Product is non-combustible Reacts with acids to form carbon dioxide gas and heat

Potential Health Effects

Inhalation

May cause upper respiratory tract, lung, and irritation to mucus membranes

Eye Contact

May cause sever irritation, redness, or swelling.

Skin Contact

May cause itiching, redness, or swelling.

Ingestion

May cause gastrointestinal irritation, nausea, vomiting, or diarrhea.

Chronic Exposure

Product does not contain any ingredient designated by IARC, NTP, ACGIH, or OSHA as probable or suspected human carcinogens.

4. FIRST AID MEASURES

Eye Exposure

Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Seek immediate medical attention.

Skin Exposure

In case of contact, immediately wash with plenty of soap and water for at least 5 minutes. Seek medical attention if irritation develops or persists. Remove contaminated clothing and shoes. Clean contaminated clothing shoes before re-use

Inhalation

Remove victim from immediate source of exposure and assure that the victim is breathing. If breathing is difficult, administer oxygen, if available. If victim is not breathing, administer CPR (cardio-pulmonary resuscitation). Seek immediate medical attention.

Ingestion

If victim is conscious and alert, give 1-2 glasses of water to drink. Do not give anything by mouth to an unconscious person. Seek immediate medical attention. Do not leave victim unattended.

5. FIRE FIGHTING MEASURES

Flash Point

Not Applicable

Extinguishing Media

Not combustible. Use extinguishing method suitable for surrounding fire

Special Fire Fighting Procedures

Firefighters should wear full protective clothing and self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Not combustible

Hazardous Decomposition Materials Carbon Dioxide

6. ACCIDENTIAL RELEASE MEASURES

Evacuation Procedures and Safety

Ventilate closed spaces before entering. Wear appropriate protective gear for situation. See Personal Protection information in Section 8.

Containment of Spill:

Follow procedure described below under Cleanup and Disposal of Spill.

Cleanup and Disposal of Spill:

Scrape up and place in appropriate closed container (see Section 7: Handling and Storage). Collect washings for disposal. Decontaminate tools and equipment following cleanup. Clean up residual material by washing area with water. Avoid creation of dusty conditions.

Environmental and Regulatory Reporting:

Do not flush to drain. If spilled on the ground, the affected area should be scraped clean placed in an appropriate container for disposal. Prevent material form entering public sewer system or any waterways. Large spills should be handled according to a predetermined plan. For assistance in developing a plan contact with the Technical Service Department using the Product Information phone number in Section 1.

7. HANDLING AND STORAGE

Minimum/Maximum Storage Temperatures: Not Available

Handling

Do not get in eyes. Do not breathe dusts. Avoid direct or prolonged contact with skin.

Storage

Store in an area that is cool, dry, well-ventilated.

8. EXPOSURE CONTROL AND PERSONAL PROTECTION

Introductory Remarks:

These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. While developing safe handling procedures, do not overlook the

need to clean equipment and piping systems for maintenance and repairs. Waste resulting from these procedures should be handled in accordance with Section 13: Disposal Considerations.

Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

Exposure Guidelines:

Exposure limits represent regulated or recommended worker breathing zone concentrations measured by validated sampling and analytical methods, meeting OSHA requirements. The following limits (AGGIH, OSHA and other) apply to this material, where, if indicated, S=skin and C=ceiling limit:

PARTICULATES NOT (OTHERWISE REGUL	ATED RESPIRABLE FRACTIO	N
	Notes	TWA	STEL
OSHA		5 mg / cu m ³	NA

Engineering Controls:

Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures.

Respiratory Protection:

When respirators re required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the latest OSHA standard (29 CFR 1910.134) and/or ANSI Z88.2 recommendations.

Under normal conditions, in the absence of other airborne contaminants, the following devices should provide protection from this material up to the conditions specified by OSHA / ANSI: Airpurifying (half-mask / full-face) respirator with cartridges / canister approved for use against dusts, mists and fumes.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product Information phone number in Section 1 for its exact specifications.

Physical Appearance: White granules solid.

Odor: Odorless

pH: 11.3 (1% solution)

Specific Gravity: 2.53 g/ml at 20°C (68 F) Melting Point Range: 851°C (1564 F)

Boiling Point Range: Not Available

Vapor Density: Not Available

Molecular Weight: 105.99

10. STABILITY AND REACTIVITY

Chemical Stability:

This material is stable under normal handling and storage conditions described in Section 7.

Conditions To Be Avoided:

Extreme Heat; Hygroscopic; protect from moisture. Mixing of acid and sodium carbonate solutions could cause CO2 evolution.

Materials / Chemicals To Be Avoided:

Aluminum Fluorine Humid Air Moisture Sulfuric Acid Acids Magnesium Phosphorus Pentoxide

Decomposition Temperature Range: 400°C (752 F)

The Following Hazardous Decomposition Products Might Be Expected: Decomposition Type: Thermal Carbon Dioxide

Hazardous Polymerization Will Not Occur. Avoid The Following To Inhibit Hazardous Polymerization: Not Applicable

11. TOXICOLOGICAL INFORMATION

Acute Eye Irritation:

Toxicological Information and Interpretation Eye - Eye Irritation, 25 mg/Kg, Rabbit. Severely Irritating; Muscle contraction or spasticity.

Acute Skin Irritation:

Toxicological Information and Interpretation Skin – 500 mg/24 hour Skin Irritation, Rabbit. Mildly Irritating.

Acute Dermal Toxicity:

LD₅₀. Rabbit: >2000 mg/kg

Acute Inhalation Toxicity:

Toxicological Information and Interpretation LC₅₀ - Lethal Concentration. 50% Of Test Species, 2300 mg/cu m/2hr, rat.

Acute Oral Toxicity: Toxicological Information and Interpretation LD₅₀ - Lethal Dose 50% Of Test Species, 4090 mg/kg, rat.

Chronic Toxicity:

This product does not contain any substances that are considered by OSHA, NTP, IARC or ACGIH to be "probable" or "suspected" human carcinogens.

No additional test data found for product.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information: No data found for product.

Chemical Fate Information:

No data found for product.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different form federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

Container Handling and Disposal:

Rinse containers before disposal.

EPA Hazardous Waste – NO

14. TRANSPORTATION INFORMATION

Transportation Status:

US Department of Transportation

DOT Shipping Name: NOT REGULATED

15. REGULATORY INFORMATION

FEDERAL REGULATIONS

TSCA Inventory Status: All ingredients of this product are listed on the TSCA Inventory.

SARA Title III Hazard Classes:

Fire Hazard	- NO	
Reactive Hazard		- NO
Release of Pressure	;	- NO
Acute Health Hazard	d - YES	
Chronic Health Haza	ard	- NO

STATE REGULATONS:

This product does not contain any components that are regulated under California Proposition 65.

16. OTHER INFORMATION

National Fire Protection Association Hazard Ratings - NFPA(R):

- 2 Health Hazard Rating - Moderate
- 0 Flammability Rating - Minimal
- 0 Reactivity Rating - Minimal

National Paint & Coating Hazardous Materials Identification System - HMIS(R):

- 2 Health Hazard Rating - Moderate
- 0 Flammability Rating - Minimal
- 0 Reactivity Rating - Minimal

Certified to ANSI/NSF 60 – Soda Ash Dense Bulk: This product is certified ANSI/NSF 60 when used in treatment of drinking water at maximum dosage of 100 mg/L.

Reason for Revisions:

Change and / or addition made to Section 1, 2, 11 and 16.

CANADIAN WHMIS REGULATIONS

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS: H=2 F=0 R=0

Key Legend Information:

NAV	- Not Available
NAP	- Not Applicable
ND	- Not Determined
ACGIH	- American Conference of Governmental Industrial Hygienists
OSHA	- Occupational Safety and Health Administration
TLV	- Threshold Limit Value
PEL	- Permissible Exposure Limit
TWA	- Time Weighted Average
STEL	- Short Term Exposure Limit
NTP	- National Toxicology Program
IARC	- International Agency for Research on Cancer
WHMIS	 Workplace Hazardous Materials Information System

Disclaimer:

The information herein is given in good faith but no warranty, expressed or implied, is made.



WYO-BEN, INC.

MATERIAL SAFETY DATA SHEET



NFPA FIRE HAZARD IDENTIFICATION SYSTEM

I. PRODUCT IDENTIFICATION							
Trade Name(s): I	UNI-DRILL®						
Generic Name(s):	Liquid Viscosifier and	Fluid Loss Control	Agent				
Chemical Name(s): Cellulose ether with p	proprietary suspendi	ng agent				
Manufacturer:WYO-BEN, INC.Address:P.O. Box 1979Billings, Montana 59103				elephone Numbers: Information: (406) 652-6351 EMERGENCY: (406) 652-6351			
		II. HAZAR	DOUS II	NGREDIENTS			
Ing	gredient	CAS No.	%	Hazard			
Petroleum Dis	stillate (mineral oil)	64742-47-8	55	Mild eye irritant, dizziness, nausea due to vapors (Sec. VI)			
The specific chem accordance with 2	nical identity of this mate 29 CFR Part 1910, 1200	erial is being withhe (i) in the event of m	ld as a tra edical en	de secret. It will be provided to a treating health professional in hergency.			
		III. PI	HYSICA	L DATA			
Boiling Point (EF): 424 - 460° F		S	Specific Gravity (H ₂ O=1): 0.97			
Vapor Pressure (n	nm. Hg): ND		Ν	Melting Point: ND			
Vapor Density (A	ir = 1): ND		E	Evaporation Rate (Butyl Acetate = 1): ND			
Solubility in Wate	er: ND		p	pH: 6.9			
Density (at 20E C): 8.1 lbs./gal.						
Appearance and C	Odor: Off-white viscous	liquid with mild ver	ry slight _l	petroleum-like odor.			
		IV. FIRE AN	ND EXPI	LOSION DATA			
Flash Point: >185	5° F (closed cup)			Flammable Limits: LEL: ND UEL: ND			
Special Fire Fight becomes extremel	ing Procedures: Water f ly slippery when mixed w	og or spray may be with water.	used to c	ool containers. Avoid using water on product. Product			
Unusual Fire and	Explosion Hazards: Nor	ne					
Extinguishing Me	edia: CO ₂ , dry chemical,	foam.					
		V.]	REACT	IVITY			
Stability: Stable.							
Hazardous Polym	erization: Will not occu	r.					
Incompatibility: S	Strong oxidizing agents.						
Hazardous Decon	nposition Products: The	rmal decomposition	may pro	duce CO ₂ , and, possibly, CO.			
NA = Not Appl	licable ND = Not D	etermined					

VI. HEALTH HAZARD INFORMATION

Routes of Exposure and Effects: Eyes: Slight to moderate eye irritant. Skin: Prolonged or repeated skin contact tends to remove skin oils possibly leading to irritation and dermatitis. Inhalation: Vapors unlikely except at high temperatures. High vapor concentrations may cause mild mucous membrane irritation, headache, dizziness, nausea or unconsciousness in extreme cases. Ingestion: May cause indigestion. May have laxative affect due to mineral oil if ingested in larger amounts.									
Permissible Exposure Limits:OSHA TWAACGIH TLVMFRS RECOMMENDED(for air contaminants)5 mg/m3ND400 ppm(for mineral oil mist)									
Carcinogenicity: Not listed by NTP, IARC or OSHA.									
Other Health Effects: A component has caused kidney inju	ry in male rats only. No	o comparable hazaro	d for injury is known in humans.						
Acute Oral LD ₅₀ : ND	Acute Dermal I	LD ₅₀ : ND	Aquatic Toxicology LC ₅₀ : ND						
Emergency and First Aid Procedures: Eyes: Flush with clear water for 15 minutes or until irritation stops. Seek medical attention if irritation continues. Skin: Wash with soap and water. Seek medical attention if irritation continues. Inhalation: Remove from exposure, give oxygen if symptoms are severe. Ingestion: Give two glasses of water and induce vomiting if subject is conscious. Seek medical attention if illness or adverse symptoms develop.									
	VII. HANDLING	AND USE PRECA	AUTIONS						
Steps to be Taken if Material is Release immediately. Flush area with large vol product, or its solutions, to enter watery	ed or Spilled: Contain s umes of water after rem vays.	spill and absorb wit oving absorbent to	h inert material such as sand or earth. Clean up area thoroughly remove remaining product. Do not allow						
Waste Disposal Methods: Product show	uld be disposed of in acc	cordance with appli	cable local, state and federal laws.						
Handling and Storage Precautions: An Empty containers should be returned to clothing before reuse.	void high temperatures a a drum reconditioner of	and open storage sy r disposed of in an o	ystems to minimize vapors. Do not reuse containers. environmentally safe manner. Launder contaminated						
VI	II. INDUSTRIAL HY	GIENE CONTRO	DL MEASURES						
Ventilation Requirements: Mechanical	ventilation recommend	ed for enclosed wor	k spaces.						
Respirator: Normally not needed at am with organic vapors.	bient work temperatures	s. Where necessary	use NIOSH/MSHA respirator approved for use						
Eye Protection: Use splash goggles or	face shield when eye co	ntact may occur.							
Gloves: Use chemical resistant gloves,	if needed, to avoid prol	onged contact with	skin.						
Other Protective Clothing or Equipme would result in prolonged or repeated s	nt: Use chemical resist kin contact.	ant clothing, if nee	eded, to avoid contaminating regular clothing which						
	IX. SPECIA	AL PRECAUTION	NS						
Caution: Product becomes very slipper	ry when mixed with wat	er.							
DEPARTMENT O	OF TRANSPORTATIC	ON HAZARDOUS	MATERIAL INFORMATION						
Shipping Name: Petroleum products, I	N.O.S.	Hazard Class:	Combustible Liquid						
Hazardous Substance: Not applicable		Placard: Comb	ustible/1268						
Cautionary Labeling: None		Shipping Desci liquid, UN1268	ription: Petroleum products, N.O.S., combustible , PG III						
Note: This product is not regulated by DOT when shipped domestically by highway or rail in non-bulk packages.									

Date Prepared: August 30, 2001

All information presented herein is believed to be accurate, however, it is the user's responsibility to determine in advance of need that the information is current and suitable for their circumstances. No warranty or guarant **age of press** or implied is made by WYO-BEN, INC. as to this information, or as to the safety, toxicity or effect of the use of this product.

Attachment 14.5

JACOBS ASSOCIATES

Risk Score:	Score 12 to 25 Score 5 to 11 Score 1 to 4	-/Concultante	Risk Category: T = Tunnel & Shafts E = Environment/Community/Permit C = Contractual/Schedule/Market Formation	Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Potential Impact of Occurrence: 1 - Very Low (<\$10K or <1 wk) 2 - Low (\$10K-50K or 1-2 wks) 3 - Moderate (\$50K-500K or 2-4 wks) 4 - High (\$500K-\$1M or 1-3 mths) 5 - Very High (>\$1M or >3 mths)	RISK REGISTER FOR THE FORTIS' MUSKWA RIVER CROSSING						REGISTER EDIT LOG Issued:		
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Risk Score (Mitigated)	Contingency Estimate	Remarks
203	E	HDD	Remote location causes delays during construction	Replacement equipment or materials sources far from project site; limited local accommodations imported labour	Project is delayed if replacement equipment, parts, material or workers are needed; possible immigration issues if workers are foreign; difficulty getting specialized equipment to site (long lead time)	5 4	C/S	20	Ensure contractor has experience working at remote sites; identify and plan for special project needs that have long lead times; require the contractor to have spare equipment on site or within region.	Identify sources for replacement parts, equipment, etc. so that delay can be minimized; arrange for air drops to site when needed; make sure contractor mobilizes spare equipment to site as required.	5	3 15		
104	т	HDD	The gravel stratum is deeper than indicated in the Geotechnical Report.	Geologic variability beyond that encountered in the exploration program, misinterpretation of available data	Higher risk of hydro fracture and/or hole collapse for an HDD crossing; a longer washover casing is required; washover casing is difficult to install	5 4	C/S	20	Baseline anticipated geologic conditions; ensure adequate exploration is conducted; extend the crossing so gravel layer is thinner	Use washover casing; pre-excavate the gravels and replace with sand; excavate starter trench to drill from; monitor cuttings for evidence of gravels monitor ground surface/river bottom for evidence of hydro fracture	4	3 12		
105	т	HDD	Damage to pipe coating	Gravels abrasive during pullback; coating not adequate to resistant abrasion; partial closure of hole causes additional friction; insufficient hole swabbing	Pipe vulnerable to corrosion due to the loss of the coating; might need to add cathodic protection	5 4	С	20	Thicken the pipe coating based on known geological conditions and require bore swabbing to be carried out just prior to pulling pipe into hole	Monitor hole and maintain pressure to keep hole open; ensure adequate swabbing conducted prior to pipe installation.	4	3 12		
115	т	HDD	Difficulty installing casing	Gravel more compact than expected; improper selection of materials and equipment;	Delay in casing installation; misaligned casing; casing not as deep as needed to extend through the gravels; requires drilling through the gravel layer	4 3	S	12	Obtain adequate geological information to inform selection of materials and equipment; identify successful strategies that worked in comparable ground types; Identify response plans if initial attempts are unsuccessful: have	Pre-excavate a trench and place in an oversized casing into the gravels before installing the washover casing; have response method equipment/tools available to respond to issues that may come up during installation	4	3 12		
202	E	HDD	Delay due to First Nations slow response to permission issues	First Nations disinterested in project and do not respond or act in timely manner.	Project is delayed and adds costs to the project due to the need to protect existing crossing for next spring freshette.	5 4	S	20	Consult with First Nations early in the process and provide information session with a forum to ask questions; obtain the necessary involvement and permissions; address their concerns and get buy- in from FNs to avoid delay.	Public outreach to First Nations in order to keep them informed on the progress of the work that effect their interests such as fishing and access to boat ramp?	4	2 8		
207	E	HDD	Northern climate presents unforeseen logistical challenges	Equipment/materials not tested for use in cold climate; not adequate heating for equipment/personnel; Shorter days means more night work; Contractor inexperienced in northern climate	Increased need for heaters and lighting; Equipment may not perform as well or fail to work and need replacement; Methods may not work in frozen ground.	4 3	S	12	Ensure contractor has worked in northern climate and plans to use compatible equipment. Identify and plan for climate related logistical needs.	Have adequate heater, generators, lighting available etc. as well as back ups for critical equipment.	4	1 4		

JACOBS ASSOCIATES

Risk Score:	Score 12 to 25 Score 5 to 11 Score 1 to 4	/Concultante	Risk Category: T = Tunnel & Shafts E = Environment/Community/Permits C = Contractual/Schedule/Market Fo	Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Otential Impact of Occurrence: - Very Low (<\$10K or <1 wk) - Low (\$10K-50K or 1-2 wks) - Moderate (\$50K-500K or 2-4 wks) - High (\$500K-\$1M or 1-3 mths) - Very High (>\$1M or >3 mths)										REGISTER EDIT LOG Issued:
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Impact M)	tisk Score Mitigated)	Contingency Estimate	Remarks
305	С	HDD	Limited availability of additional construction materials	Construction materials not available locally;	Delay due to lead-time; additional construction materials must be flown in or trucked in; increased costs due to increased transport	4 3	S	12	Identify and complete design to allow contractor time for long lead time items; require the Contractor to bring additional construction materials not available locally	Choose a contractor and method that uses commonly available materials; make sure Contractor brings additional construction materials - including extra drill steel, shaft support elements, casing.	4	2	8		
106	т	HDD	Hole collapse	Loss of drilling mud; inadequate drilling fluid pressure; non- cohesive soil behavior; above groundwater table; casing not extended far enough; drilling mud not developing filter cake	Unable to pass pipe through hole; loss or breakage of tools; redrilling of hole needed	4 4	C/S	16	Specify percentage of overbore of hole, requirement for drilling mud control procedures and specify use of drilling mud additives to ensure stable hole; require the testing of the drilling mud	Ensure starter casings are extended to intended depth and correct elevations; provide an inspector to enforce specifications; test the drilling mud two or three times a day; modify the drilling mud based on the ground conditions	3	3	9		
108	Т	HDD	Hydro fracture/inadvertent return occurs during excavation	Very low ground cover; pre- existing fractures to the surface; machine operator error; high slurry pressure causes hydro fracture to the river; alignment overlain by gravels or highly permeable materials	Loss of face control; greater inflow of water; loss of slurry to the river	5 3	C/S	15	Limit face pressures under river; use deep tunnel profile to provide adequate cover; specify experienced/qualified operators; require Contractor to develop a contingency plan which addresses procedures for frac-out occurrence; require Contractor to use a drilling mud engineer to design drill fluid and circulation system for HDD; require a washover casing through known, highly permeable materials (e.g. gravels and cobbles).	Monitor slurry pressure carefully during construction; provide experienced drillers/operators; inspector to enforce specifications and requirements; implement Contractor's contingency plan for frac out; use slurry mixes with higher viscosity	3	3	9		
102	т	HDD	Area designated for pipe lay down is not sufficient to accommodate Contractor's pipe lay down/pullback operations during HDD construction	Selected site does not allow enough space for pipe lay down; work areas includes private property or requires permission from third parties; areas selected for lay down is covered with trees	Need to acquire additional easements during construction which results in delays; shorter sections are pulled which requires stoppages for welding/fusion during pullback; staging area must be cleared of trees	5 4	C/S	20	Include sufficient area for pipe laydown and pullback operations with the selection of the alignment during design; obtain needed permissions in advance of construction; clear the site of trees and vegetation now;	Clear the laydown area of trees and vegetation now well in advance of the construction	2	3	6		
109	т	HDD	Steering/alignment problems during excavation	Non-uniform geologic conditions (ex. voids, boulders); inexperienced operators; soft or loose ground conditions; miss programming of the machine's guidance system; inadequate HDD tracking system; selected machine/equipment is not appropriate for ground conditions	HDD bore deviates from bore path and requires redrilling; tunnel extends outside of right-of-way; possibility for conflict with existing gas pipeline; does not intercept exit casing	3 5	C/S	15	Specify experienced/qualified operators; use state-of-the-art guidance/tracking system that is appropriate for water crossings; develop an alignment correction plan; specify tolerances which are achievable with HDD; pressure pipeline so grade is not critical; require spot checks of the alignment	Ensure guidance system is programmed to actual machine dimensions and conditions; do spot checks on the pilot hole alignment; review qualifications of the operators inspection to enforce specifications; review Contractor's work plan for maintaining line and grade and contingency plan if the bore deviates	2	3	6		

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Risk Score:	Score 12 to 25 Score 5 to 11 Score 1 to 4	Concultante	Risk Category: T = Tunnel & Shafts E = Environment/Community/Permit C = Contractual/Schedule/Market Fo	Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Potential Impact of Occurrence: 1 - Very Low (<\$10K or <1 wk) 2 - Low (\$10K-50K or 1-2 wks) 3 - Moderate (\$50K-500K or 2-4 wks) 4 - High (\$500K-\$1M or 1-3 mths) 5 - Very High (>\$11M or >3 mths)										REGISTER EDIT LOG Issued:
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Impact	Risk Score (Mitigated)	Contingency Estimate	Remarks
111	т	HDD	Over mining/over excavation causes large settlements which damage existing nearby facilities, utilities, and other improvements	Mixed face conditions or cohesionless materials; inappropriate means and methods (not compatible with ground conditions); improper operation; sudden unexpected changes in ground conditions; hole collapses	Large ground movements, surface settlement, and/or sinkholes occur; damage to overlying structures, utilities, or other improvements	3 4	C/S	12	Where practical, locate the tunnel zone to avoid or minimize mixed ground conditions (e.g. place in the deeper hard silts); develop geotechnical instrumentation monitoring program to monitor and detect potential ground movements early; require experienced operator; ensure ground conditions are well characterized to reduce risks associated with unexpected changes in ground conditions; where practical, locate the tunnel zone to avoid overlying structures; deepen the	Monitor advance rate and theoretical volume of spoils and compare with the measured volume of spoils during mining; monitor geotechnical instrumentation and adjust excavation based upon the results of the monitoring; maintain continuous face support; perform preconstruction survey to document the condition of all existing structures in proximity to the alignment	2	3	6		
112	Т	HDD	Tunnel advance rates lower than estimated	Overly optimistic advance rate estimate; machine not compatible with ground conditions; inexperienced operators; contractor does not use multiple shifts per day; contractor does not have enough miners/crews; machines/equipment are not maintained; longer downtime than anticipated for repairs/maintenance; pipe changeovers take longer than	Completion date is not met; claims for relief of schedule requirements	3 4	S	12	Carefully evaluate and re-evaluate advance rates and revise the schedule if needed; start construction earlier, require multiple shifts; base estimate on 5-day work week and allow 6 days of work if necessary; require an experienced contractor and work force; specify machine requirements; require spare parts on site; evaluate sensitivity of extended pipe changeovers; use a longer iacking shaft	Enforce specifications; incorporate maintenance into schedule; require a 6-day work week when necessary; make sure equipment is maintained on a regular basis; jack longer sections of casing; use Permalok instead of welding	2	2	4		
113	т	HDD	Issues with pipe pull-back	Partial collapse of hole; incomplete flushing of hole;	Pipe stuck in hole; pipe break;	3 4	S	12	Specify percentage of overbore of hole, require drilling mud control procedures and specify use of drilling mud additives to ensure stable hole	Inspector to enforce specifications. Ensure contractor overbores hole for pullback; uses appropriate mud and mud additives.	2	3	6		
118	т	HDD	Mechanical issues; equipment breakages	Equipment malfunction, ground more abrasive than anticipated; variable ground conditions beyond equipment capability(boulders); poor maintenance; poor operation.	Drill string breaks, swivel breaks, tool breaks; need to fish out the missing pieces which takes time	3 3	C/S	9	Specify qualified and experience drillers; baseline anticipated geologic conditions; ensure adequate exploration is conducted; require new equipment	Adjust approach to excavation and operation based on performance and conditions encountered; use new drill steel; check for cracks in the drill steel; develop a contingency plan is drill steel breaks; identify sources for potential replacement parts prior to breakages	2	2	4		
119	т	HDD	Difficulties and failure of hydro-static testing of gas pipe	Remote site with poor infrastructure, lack of proper equipment and contractor supervision	Delay in commissioning due to failure or delays in hydro-static tests	3 3	S	9	Specify the minimum qualification for the key site personnel and equipment. Require a methods statements and submission of equipment specification to be used for hydrostatic testing; use HDD so gas pipeline can be pre-tested before installation	Use HDD method; inspector to enforce the specification and review submittals to ensure successful testing results	2	2	4		

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Risk Score:	Score 12 to 25 Score 5 to 11 Score 1 to 4	Concultante	Risk Category: T = Tunnel & Shafts E = Environment/Community/Permi C = Contractual/Schedule/Market Fr	Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Potential Impact of Occurrence: 1 - Very Low (<\$10K or <1 wk) 2 - Low (\$10K-50K or 1-2 wks) 3 - Moderate (\$50K-500K or 2-4 wks) 4 - High (\$500K-\$1M or 1-3 mths) 5 - Very High (>\$1M or >3 mths)										REGISTER EDIT LOG Issued:
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Impact	Risk Score (Mitigated)	Contingency Estimate	Remarks
120	Т	HDD	Challenges in coordination o cathodic protection with design	Non-standard pipe configuration or installation methods;	Delays in design; need for special materials and/or fittings;	3 3	C/S	9	Use HDD method to allow pipe to be pulled into the bored hole and encased in hardened drilling mud; use a casing so gas pipeline can be installed on casing spacers and any coating protected by the installation	Use trenchless method to install the pipeline; add cathodic protection if required	2	3	6		
206	E	HDD	Unplanned discharges of contaminated water into the river	Failure of water treatment plant; too much construction water for treatment plant to handle; too much construction water combined with surface water	Citations; fines; higher construction costs; claims	3 4	C/S	12	Water treatment provisions, specify site drainage, storm water pollution prevention plan (SWPPP) requirements; require modular treatment plant	Inspector to enforce specifications and SWPPP; control the amount of construction water generated; maintain the treatment plant	2	3	6		
209	E	HDD	Water quality restrictions imposed by permits	Additional construction water treatment is required	Water treatment process takes longer; more chemicals needed to treat contaminated construction water; increased inspection, documentation, and coordination	3 3	C	9	Meet with stakeholders early to reduce possibility of changes; require flexibility with the water treatment plant; require back-up filtration system be on standby for immediate deployment;	Use modular treatment plant to be able to expand plant size as needed; monitor groundwater for contamination	2	2	4		
210	E	HDD	Construction traffic impacts regular traffic in vicinity of site	Trucks entering existing roadway; more traffic in general	Accidents; injuries; back-up of truck movements and delays	3 3	С	9	Add signal/signs to allow trucks to gain access to local roads; use flag men; add a merging lane; restrict truck traffic to designated times of the day; develop a traffic control plan; require contractor submittal for trucking	Implement traffic control measures; increase level of traffic control if access remains difficult and/or unsafe	2	2	4		
211	E	HDD	Construction impacts to nearby businesses/ community members	Construction activities conflict with nearby businesses and make access to businesses difficult; construction traffic	Complaints; claims and disputes resulting from decrease in business; noise citations; safety hazards to customers; temporary business closures required; increases congestion and noise; interruption of access to river	2 4	S	8	Locate shafts and HDD entry/exit points to avoid areas of community use; be proactive in keeping community informed of planned construction and potential impacts	Implement public outreach initiatives during construction to keep community informed; ensure construction activities do not extend beyond easements; establish contractor parking areas; schedule activities to minimize impacts to community	2	3	6		

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Risk Score:	K Score: Risk Category: Likelihood of O. Score 12 to 25 T = Tunnel & Shafts 1 - Very Unlikely (<10% Score 5 to 11 C = Contractual/Schedule/Market Fo 3 - Possible (31-50%) Score 1 to 4 - Likely (51-80%) 5 - Very Likely (>80%)			Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Potential Impact of Occurrence: 1 - Very Low (<\$10K or <1 wk) 2 - Low (\$10K-50K or 1-2 wks) 3 - Moderate (\$50K-500K or 2-4 wks) 4 - High (\$500K-\$1M or 1-3 mths) 5 - Very High (>\$1M or >3 mths)									
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Risk Score (Mitigated)	Contingency Estimate	Remarks
212	E	HDD	Impacts to birds and nesting areas and other wildlife	Wildlife habitat disturbed by construction	Project delayed, new environmental mitigation measures required; claim by contractor	2 4	C/S	8	Incorporate environmental recommendations into contract, develop contingency plan; select alternative alignment with less impact; have biologist visit site now and look for birds and nesting areas; stop birds from nesting in construction areas	Have biologist on the site during construction; monitor site before construction begins and take corrective action; provide inspector and contractor (site personnel) training; implement contingency plan if required	2 2	2 4		
213	E	HDD	Impacts to local vegetation	Vegetation disturbed by construction	Project delayed, new environmental mitigation measures required; claim by contractor	2 4	C/S	8	Incorporate environmental recommendations into contract, develop contingency plan; select alternative alignment with less impact; start site clearing now	Start site clearing and preparation now; implement contingency plan if required	2 2	2 4		
215	E	HDD	Construction traffic damages existing roadways and facilities used for access and/or staging	Loaded trucks and increased volume of construction traffic; minimal access and single access route; facilities and pavements more vulnerable to damage than assumed	Increase repairs needed to road surface; roads repaved during construction; roads repaved after construction	3 2	С	6	Align site access to minimize construction traffic on existing roads; understand that some damage is unavoidable and include provisions for repair in Contract Documents; identify and avoid shallow utilities to	Inspector to enforce specifications; provide full-time inspection; make sure trucks are covered, lined, and not overloaded; drivers comply with posted signs	2 2	2 4		
216	E	HDD	Fire on construction site	Flammable materials stored on site; ignition source is present; equipment overheat; adjacent trees catch fire	Fire damages equipment and materials; fire prevents access to site by workers; smoke stops work; project delayed; remob of supplies; increased erosion; increased dust	3 2	C/S	6	Require adequate water supply on site for fire fighting, meet with local fire fighters during design and prior to construction; develop safety plan and procedures; require weed abatement and trimming of trees around staging areas	Follow safety plan and procedures; provide safety training; isolate flammable materials; provide full-time inspection; complete weed abatement around work sites; remove trees and overhanging branches around work sites	2 2	4		
304	С	HDD	Limited availability of specialized equipment	Large number of HDD/MTBM, shaft projects into construction at the same time; limited local equipment	Delay while waiting on equipment; use of less-preferred equipment to maintain schedule; cost related to increased transport distances to maintain schedule	3 4	S	12	Allow a certain degree of construction method flexibility, do not prescribe a method other than use of an appropriate trenchless technology. Develop a design for both HDD and microtunneling and include cost contingencies in the case where a higher cost method is chosen.	Choose a contractor who can demonstrate equipment availability has experience with remote locations and can mobilize his crews and equipment quickly.	2 3	6		

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Risk Score:	Score 12 to 25 Score 5 to 11 Score 1 to 4	c/Concultante	Risk Category: T = Tunnel & Shafts E = Environment/Community/Permit: C = Contractual/Schedule/Market Formation	Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Potential Impact of Occurrence: 1 - Very Low (<\$10K or <1 wk) 2 - Low (\$10K-50K or 1-2 wks) 3 - Moderate (\$50K-500K or 2-4 wks) 4 - High (\$500K-\$1M or 1-3 mths) 5 - Very High (>\$1M or >3 mths)									REGISTER EDIT LOG Issued:
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Risk Score (Mitigated)	Contingency Estimate	Remarks
101	т	HDD	Erosion/scour by the river will exposes the new pipeline	Shallow cover over the pipeline beneath the river banks or channel; high river flow volumes/velocities cause scour	Reduces cover and pipeline is exposed; increases the risk of damage to the pipeline; requires replacement of the pipeline; requires additional measures to protect the pipeline	5 5	С	25	Select vertical alignment with adequate depth to avoid river scour concerns; add rip-rap or similar slope protection to the river banks above trenchless crossings	Construct pipeline deep enough to avoid scour issues; add rip-rap or other slope protection measures to the river banks and channel	1	5 5		
107	т	HDD	Impacts to existing gas pipeline crossing	Existing pipeline was not properly located/marked; new alignment is too close to existing crossing	Damage occurs to the existing pipeline during excavation, drilling, or grouting	3 5	C/S	15	Accurately locate and identify existing pipe before construction; locate new pipeline with sufficient clearance from existing pipe	Confirm all utilities in the work area are accurately located and identified in the field. Ensure any special measures for working in proximity to in-place utilities are communicated to all parties and properly executed.	1	4 4		
110	т	HDD	Construction requires utility relocations	Existing utilities identified during design near proposed shaft or HDD entry/exit locations;	Additional costs for relocation and longer schedule associated with relocation work or working around utilities left in place; increased risk of damaging existing utilities; increases the number of project stakeholders; additional permits required	3 4	C/S	12	Select shaft or HDD entry/exit points to minimize conflicts with existing utilities; place higher priority on avoiding "critical" utilities or utilities that would have more cost/schedule impacts if relocation is required; include specifications which address utility relocation	Construct pipeline crossing on alignment that avoids other utilities; include sufficient time in schedule to allow for utility relocation; include utility stakeholders in construction monitoring, project meetings, and discussions where appropriate.	1	3 3		
114	т	HDD	Encounter ground conditions with higher than anticipated cobble and boulder content during drilling	Geologic variability beyond that encountered in the exploration program, misinterpretation of available data	Drill rig has difficult time drilling through actual ground conditions; higher risk of hydro fracture and/or hole collapse for an HDD crossing; slower advance rates; HDD can not excavate through the boulders and are unable to advance; washover casing is difficult to install	3 4	C/S	12	Baseline anticipated geologic conditions; ensure adequate exploration is conducted; develop plan to install washover casing; require the use of starter trench	Adjust approach to drilling operation; monitor cuttings for evidence of cobbles/boulders; monitor advance rates and tool use; use a starter trench through the gravels, cobbles, and boulders	1	4 4		
116	т	HDD	Overhead wires or trees conflict with construction	Shafts and HDD entry/exit points are located too close to overhead wires or trees; alignment crosses beneath tower supports	Overhead wires and trees are a safety issue difficult to work around and slow down construction; equipment must be se back from wires and trees; wires create safety issues; equipment strikes wires and causes injury or damage to utility; cranes or other equipment have restricted movement with the presences of trees	3 4 t	C/S	12	Communicate with owners of OH wires and understand required set backs for construction equipment; locate shafts and HDD entry/exit points to provide sufficient clearance from overhead wires and trees; require trees to be trimmed and removed to allow space for	Ensure Contractor is complying with clearance requirements; make sure trees are trimmed and removed from site	1	4 4		
117	т	HDD	HDD drive encounters obstruction (e.g. buried object or large boulder)	Undocumented structures exist along selected alignment; known existing structures are not accurately located or extend beyond anticipated locations; large boulder encountered.	Drill is unable to advance; requires the HDD drill steel to be pulled back and new hole started; construction delays and additional costs associated with new drill hole; requires abandoning alignment and selecting new alignment	2 5	C/S	10	Conduct exploration program to explore areas of known objects and boulders (e.g. pot-holing, "probing", geophysical methods, etc.); perform detailed research of existing structures which could conflict with	Confirm contractor complies with specifications; implement contingency plans	1	4 4		
121	т	HDD	River widening impacts new pipeline	River is widened (e.g. by erosion or by design) and the banks are set back further	Widening reduces cover near the banks and the pipeline is more susceptible to exposure/damage; widening work strikes pipeline; widening makes access shafts closer to the river banks and exposes the shafts	2 4	С	8	Design crossing with sufficient depth to avoid damage from widening; set entry and exit points back from the bank; set shafts locations back from the banks; communicate appropriate authorities to understand current and future widening plans and design crossings with this in mind	Risk involves pre-construction mitigation measures; monitor river width; add rip rap to the banks if necessary	1	4 4		

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Risk Score:	Score 12 to 25 Score 5 to 11 Score 1 to 4	Concultante	Risk Category: T = Tunnel & Shafts E = Environment/Community/Permits C = Contractual/Schedule/Market Formation	Likelihood of Occurrence: 1 - Very Unlikely (<10% chance) 2 - Unlikely (10-30%) 3 - Possible (31-50%) 4 - Likely (51-80%) 5 - Very Likely (>80%)	Potential Impact of Occurrence: 1 - Very Low (<\$10K or <1 wk) 2 - Low (\$10K.50K or 1-2 wks) 3 - Moderate (\$50K-500K or 2-4 wks) 4 - High (\$50K-\$1M or 1-3 mths) 5 - Very High (<\$1M or >3 mths)				RISK REGISTER FOR THE FORTIS' MUSKWA RIVER CROSSING						
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelinood Impact	Risk Score (Mitigated)	Contingency Estimate	Remarks	
122	Т	HDD	Frac out to existing boreholes	New pipeline alignment too close to exploration boreholes; boreholes not adequately grouted up.	Loss of drilling fluid/slurry; loss of face control;	2 3	S	6	Confirm the location of alignment relative to boreholes; confirm that proper grouting methods were used in decommissioning; select horizontal alignment not in line with the borings	Monitoring fluid pressure when drilling/mining passed the borehole locations	1 3	3			
125	т	HDD	Encounter more hazardous materials in ground or groundwater than anticipated	Inadequate amount of environmental sampling; data not representative of actual conditions; misinterpretation of available data; existing pipeline is leaking	Spoil is considered contaminated and must be trucked to designated muck disposal site; construction workers to wear additional PPE; groundwater treatment is more extensive than anticipated	1 5	C/S	5	Check records for leaks from the existing pipeline; perform groundwater and environmental testing; define contamination boundary; use allowance for hazardous material disposal in schedule of values (bid sheet);	Set up allowance based bid/pay item for handling and disposal of haz waste; require safety plan to address hazardous material in the muck; provide additional PPE for employees; monitor tunnel environment on a regular basis	1 3	3			
126	т	HDD	Systemic settlements cause damage to existing nearby facilities, utilities, and other improvements.	Systemic settlements from tunnel excavation are larger than anticipated; facilities more vulnerable than assumed; lubrication and grouting not properly conducted	Damage to overlying structures, utilities, or other improvements	1 5	С	5	Evaluate systemic settlements from tunneling; require lubrication and grouting to minimize annular collapse; increase the depth of the alignment; locate alignment in relatively dense/stiff soils; implement measures to protect existing	Enforce the grouting/lubrication requirements outlined in the specifications; ensure geotechnical instrumentation is monitored as specified; adjust excavation procedures if excessive movements are detected; maintain continuous	1 3	3			
127	т	HDD	Damage to known existing utilities and structures during shaft and/or tunnel excavation	Failure to accurately locate known utilities, structures, and structural supports (e.g. piles); inaccurate as-builts; ground movements caused by construction	Life/safety hazard depending upon utility/structure; damage to existing utility/structure; claims and repair costs	1 5	C/S	5	Coordinate with utility agencies and adjacent owners to show approximate location of existing utilities and structures on plans; research lateral and vertical extent of structures and their foundation elements; pothole suspected utilities; establish alignment away from or below suspected utilities; establish special measures when working in proximity to known utilities	Coordinate locating structures and utilities with appropriate agency; allocate time and efforts to field locate portions of structures that interfere with tunnel alignment; Ensure any special measure for working in proximity to in-place utilities are communicated to all parties and properly executed.	1 3	3			
204	E	HDD	Flooding due to heavy rains	Poor site drainage; no flood protection measures constructed (e.g. berm around shaft or HDD rig); inadequate project planning to account for storm occurrence	Water tops shaft and floods tunnel; equipment is damaged by flood water; access to shaft is difficult; down time to repair damage; difficult site preparation (mud/debris)	3 5	C/S	15	Consider storm occurrence during project planning; integrate allowances and contingency planning into contract; place drill rig on elevated ground; require storm water protection around shafts or drill rig;	Try to avoid work during major storm and rain season; monitor weather systems and take appropriate actions if stormy weather is likely; have sandbags available on site during rainy season to construct a berm if	1 2	2			
214	E	HDD	Additional noise constraints are imposed to protect neighbors	Back-up alarms; no sound walls/barriers; loud generators or other equipment	Poor relationship with neighbors; noise complaints and citations	23	С	6	Determine noise requirements; be pro-active noise mitigation measures during design; require that mufflers be in working order; use gantry to replace crane; use extra quiet generator; contractor may need to rearrange equipment to reduce noise direction; monitor/baseline preconstruction noise levels to compare with those during	Continue outreach during construction; inspector to enforce specifications and ensure contactor compliance, agree additional measures as appropriate	1 2	2			

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Risk Score:	Hisk Score: Hisk Category: Likelinood of Occurrence: Potential impact of Occurrence T = Tunnel & Shafts T = Tunnel & Shafts 1 - Very Unlikely (<10% chance) 1 - Very Low (<\$10K or <1 wk) Score 12 to 25 E = Environment/Community/Permits 2 - Unlikely (10-30%) 2 - Low (\$10K-50K or 1-2 wks) Score 5 to 11 C = Contractual/Schedule/Market Fo 3 - Possible (31-50%) 3 - Moderate (\$50K-500K or 2-4 wks) C = Contractual/Schedule/Market Fo 5 - Very Likely (51-80%) 4 - High (\$50K-\$1M or 1-3 mths) Score 1 to 4 5 - Very Likely (>80%) 5 - Very High (>\$1M or >3 mths)						RISK REGISTER FOR THE FORTIS' MUSKWA RIVER CROSSING								
Risk Register No.	Risk Category	Option applicable to	Hazard/Risk Scenario	Potential Cause	Potential Consequences	Likelihood Impact	Cost/ Schedule Impact	Risk Score (Unmitigated)	Design Phase Measures to Minimize/Eliminate Risk of Occurrence	Construction Measures to Mitigate or Reduce Consequence of Occurrence	Likelihood	Risk Score (Mitigated)	Contingency Estimate	Remarks	
217	E	HDD	Uncover historical or archaeological/cultural artifacts during construction	Site is located within area of historical/archaeological interest	Inspection/recovery delay shaft excavation/ entry-exit point preparation	1 4	C/S	4	Check historical records; allow archeologists access to site before construction to ensure there are no issues; select an alignment that avoids potential areas; use a trenchless installation method for the crossing	Provide full-time inspection and detailed logging of delay to support delays associated with discovery; provide updates of construction activities to archaeologists	1	4 4			
218	E	HDD	Need to treat and discharge more contaminated water than anticipated	More contamination than expected; concentrations higher than anticipated;	Water treatment process takes longer; more chemicals needed to treat contaminated water	1 4	С	4	Test groundwater at shaft and crossing locations during the exploration phase to establish baseline levels; conduct testing of construction water; specify treatment	Use modular treatment plant to be able to expand plant size as needed; monitor groundwater for contamination	1	2 2			
219	E	HDD	Air quality emissions (dust) impact neighbors	Increased dust complaints by neighbors; complaints by others	Unhappy neighbors; increased complaints; citations; fines	2 2	C/S	4	Require dust control measures (e.g. laborer to hose down dust, water trucks, and vehicle wash down).	Continue outreach during construction; inspector to enforce specifications and ensure contactor compliance, agree additional measures as appropriate	1	2 2			
302	С	HDD	Shortage of operators during construction	Large number of HDD/MTBM projects into construction at the same time; small labor pool	Inexperienced operators are running the HDD/MTBM; HDD/MTBM goes off line and grade more frequently; HDD/MTBM gets stuck or bound; over excavation due to operator error	3 4	S	12	Avoid schedule conflicts with other large HDD/MTBM projects; get project out to bid sooner; allow the contractor to pay a higher wage for experienced HDD/MTBM operator	Use experienced drillers and operators.	1	3 3			

Attachment 20.1

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)

Attachment 24.1

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)
Attachment 25.2

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)

Attachment 30.2



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REVISION	VN LAND TOTAL 0.50ha 1.24ac 0.50ha 1.24ac 0.50ha 1.24ac 0.05ha 1.24ac 0.05ha 1.38ac 0.05ac 1.93ac	GHWAY TOTAL 0.26ha 0.64ac 0.02ha 0.05ac 0.28ha 0.69ac	Market Mark

Attachment 30.2.1



Fort Nelson First Nation Lands Department RR#1 Mile 295 Fort Nelson, B.C., V0C 1R0 Phone: 250-774-6313 Fax: 250-774-6317 <u>Cynthia.Burke@fnnation.ca</u> or <u>Alexis.Jorgensen@fnnation.ca</u>

January 8th, 2013

FortisBC Inc Bob Gibney Suite 100 1975, Springfield Road Kelowna, BC V1Y 7V7

Re: Proposed New Pipeline Crossing of the Muskwa River

Dear Mr. Gibney,

The Fort Nelson First Nation (FNFN) has been engaged in ongoing communication with FortisBC Energy Inc. regarding the status of the proposed replacement of their pipeline crossing of the Muskwa River adjacent to our reserve and within our core traditional territory. FNFN would like to thank Fortis for their efforts in engaging with us, ranging from providing information on the proposed development, to offering to include FNFN in employment and archeological work.

We understand that Fortis wishes to create a new crossing using the technique of horizontal directional drilling and that this option is the most cost effective, and poses the least environmental risk, of those being considered. Because of this, and as a result of FortisBC's ongoing engagement with us, FNFN supports this option and has no objection to the project as currently proposed. However, FNFN is very concerned about the safety of our lands and waters in the face of development in our traditional territory, and will not support the option of installing an aerial crossing due to the greater environmental impact expected from this technique.

If you have any questions, or wish to discuss this project further, please contact myself or Cynthia Burke at 250-774-6313 or via email <u>alexis.jorgensen@fnnation.ca</u>, or <u>cynthia.burke@fnnation.ca</u>

Sincerely,

Alex's Jongemen

Alexis Jorgensen Environmental Technician Fort Nelson First Nation Lands Department