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November 19, 2020

City of Burnaby
c/o Lidstone & Company
Suite 1300 – 128 Pender Street West
Vancouver, B.C.
V6B 1R8

Attention: Mr. James Yardley, Senior Lawyer

Dear Mr. Yardley:

Re: FortisBC Energy Inc. (FEI)

Project No. 1599129

**Application for a Certificate of Public Convenience and Necessity (CPCN) for
the Pattullo Gas Line Replacement Project (the Application)**

Response to the City of Burnaby (Burnaby) Information Request (IR) No. 1

On August 31 2020, FEI filed the Application referenced above. In accordance with the British Columbia Utilities Commission Order G-253-20 setting out the Regulatory Timetable for the review of the Application, FEI respectfully submits the attached response to Burnaby IR No. 1.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Commission Secretary
Registered Parties

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1. **Reference: APPLICATION: Section 1.1, Introduction**

On page 1 at lines 10-12, FEI states that the PGR Project is needed to replace the capacity provided by FEI's distribution pressure gas line affixed to the Pattullo Bridge.

On page 1 at lines 15-16, FEI says the PGR project includes a 508 mm gas line that will operate at a maximum operating pressure (MOP) of 2,070 kPa.

1.1 Please advise of the MOP of the current gas line on the Pattullo Bridge.

Response:

The current Pattullo Gas Line operates at an MOP of 700 kPa.

1.2 If the MOP of the current gas line is less than 2,070 kPa, please advise of the following:

1.2.1 why FEI is seeking to have the PGR Project include a gas line with a MOP greater than that of the current gas line on the Pattullo Bridge.

Response:

Please refer to the response to BCUC IR1 9.1.

1.2.2 whether FEI considered any alternative replacements for the current line that would operate at the same MOP as the current gas line and, if so, provide particulars of the alternative(s).

Response:

Please refer to the response to BCUC IR1 9.1.

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2. Reference: PROJECT JUSTIFICATION; Section 3.1, Introduction

On page 14 at line 8, FEI says that the Pattullo Gas Line must be decommissioned by the end of 2023.

2.1 Please provide any more recent update on the date by which the Ministry of Transportation and Infrastructure (MOTI) has asked for the removal of the existing gas line from the Pattullo Bridge.

Response:

FEI does not have any more recent updates on the date by which MoTI has asked for the removal of the existing gas line from the Pattullo Bridge.

2.2 Please produce all communications between FEI and MOTI concerning the date sought by MOTI for the removal of the existing FEI gas line.

Response:

The majority of the communications between FEI and MoTI concerning the date sought by MoTI for the removal of the existing gas line have been verbal.

Please refer to Appendix A-1 and A-2 of the Application for two letters between FEI and MoTI. Please also refer to the following letters provided in Attachment 2.2:

1. A letter from MoTI to FEI dated December 6, 2018;
2. A letter from FEI to PBR Project dated May 27, 2019;
3. A letter from FEI to MoTI dated September 10, 2019;
4. A letter from TI Corp. to FEI dated September 14, 2020; and
5. A letter from FEI to TI Corp dated October 30, 2020.

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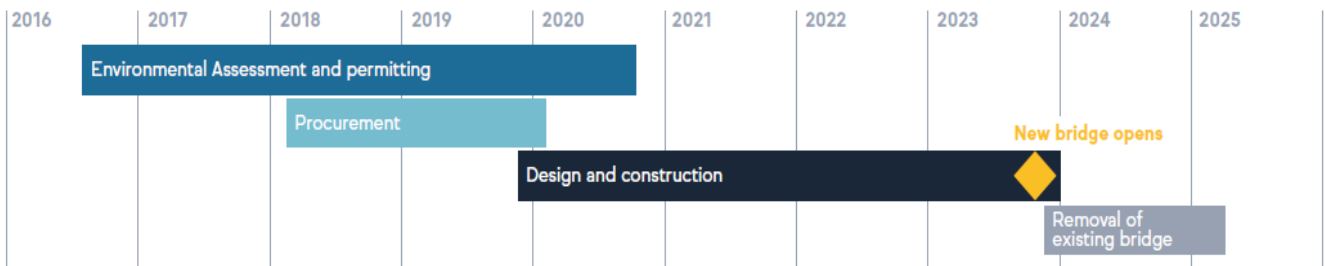
3. Reference: PROJECT JUSTIFICATION: Section 3.4; Pattullo Bridge Replacement Project

3.1 Please provide the most current construction schedule available for the New Bridge, including the date it is expected that the New Bridge will be open for traffic.

Response:

A construction schedule for the New Bridge has not been provided directly to FEI. The most current construction schedule available for the New Bridge is shown below in the timetable from the Province's website.¹

Anticipated Project timeline



3.2 Please provide a copy of the Project schedule for the New Bridge relied on by FEI at lines 18 and 19 of page 19 and, if a more recent project schedule is available, a copy of that project schedule.

Response:

Please refer to the Project schedule for the New Bridge provided in the response to Burnaby IR1 3.1.

¹ <https://engage.gov.bc.ca/app/uploads/sites/331/2020/05/TIC-PBR-COM-Spring-2020-Project-Overview-May-25-2020.pdf>.

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4. Reference: ALTERNATIVES EVALUATION: Section 4.3.1.1; Analysis of Alternative 1, and Appendix A MOT/i Correspondence

In section 4.3 .1.1 FEI refers to correspondence that FEI with MOTI in 2018 and has attached in Appendix A some of it correspondence with MOTI.

4.1 Please provide a copy of FEI's January 25, 2018 request that is referenced in MOTI's July 3, 2018 letter that is in Appendix A to the Application.

Response:

Please refer to Attachment 4.1 for a copy of FEI's January 25, 2018 request that is referenced in MOTI's letter dated July 3, 2018.

4.2 MOTI's letter of July 3, 2018 states that in January 2018, FEI made an alternative request to MOTI to install a 323 mm diameter intermediate pressure pipeline on the New Bridge. Please advise what the rationale was for seeking approval from MOTI for a 323 mm pipeline, rather than the 508 mm gas line that is sought in the current application, and provide further details about the 323 mm diameter pipeline, including its MOP and the extent to which it would be able to satisfy supply provided by the existing line affixed to the Pattullo Bridge.

Response:

Pursuant to Section 14.3 of the MoTI Utility Policy Manual² (published 1995), gas lines up to 324 mm diameter and 2070 kPa MOP are permitted on bridges that have been designed according to seismic design guidelines, provided that alternative routes or crossings are not feasible due to environmental risk or sensitivity. FEI proposed the 323 mm diameter alternative to MoTI as it met the requirements of the handbook for bridge crossing restrictions. FEI also proposed a "like for like" replacement of the existing 508 mm diameter, 700 kPa Pattullo Gas Line on the New Bridge.

The requested 323 mm diameter gas line operating at 2070 kPa MOP would meet FEI's long-term system capacity and resiliency requirements. The higher pressure, smaller diameter option was preferred as it offered higher capacity than the 508 mm diameter 700 kPa option.

Parameter	323 mm Option	508 mm Option
Pipe Outside Diameter	323 mm	508 mm
Maximum Operating Pressure	2070 kPa	700 kPa
Wall Thickness	6.4 mm	6.4 mm

² MoTI updated the Utility Policy Manual in November 2019. The new reference is Section 26.2.1(g).

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Parameter	323 mm Option	508 mm Option
Pipe Grade (CSA Z245.1)	359 MPa	290 MPa
Operating Stress	52.4 MPa	27.8 MPa
% Specified Maximum Yield Strength (%SMYS)	14.6%	9.6%

Two attributes allow the proposed 323 mm diameter alternative gas line operating at 2070 kPa MOP to have an equivalent capacity to the 508 mm diameter gas line sought in the Application:

1. The length of the bridge alternative is significantly shorter and would experience less pressure loss; and
2. The 508 mm gas line in the Application is connected to the LMIPSU gas line with a dual certified pressure of 1200/2070 kPa; therefore, FEI utilized the lower inlet pressure for capacity calculations.

Finally, the requested 323 mm diameter alternative gas line would maintain the resiliency benefit to the Metro Vancouver area currently provided by the existing Pattullo Gas Line. Please also refer to the response to BCUC IR1 5.3 for a further discussion of the resiliency benefit provided by the Pattullo Gas Line.

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**5. Reference: ALTERNATIVES EVALUATION: Section 4.2 and Section 4.4.2.3;
Scoring and Weighting**

On page 26 at lines 1-2, FEI states that it evaluated the alternatives "with a focus and priority on the solutions with the least impact".

In Section 4.4.2.3 on page 45, FEI says at lines 20-21, FEI says that weightings were determined "through collaborative discussions with FEI's subject matter experts" and at lines 23-24, that for non-financial evaluation criteria, "each overland alternative was scored by subject matter leads based on system analysis and experience of similar projects ...".

In Table 4-3 on page 46, FEI specifies the weightings given to non-financial and financial impacts.

5.1 Please identify the "subject matter experts" and "subject matter leads" referenced in section 4.4.2.3 and provide their experience and qualifications.

Response:

The Subject Matter Experts and Subject Matter Leads providing the weighting for the evaluation criteria in Section 4.4.2.3 of the Application include:

- Project Director, Major Projects (P.Eng., PMP)
- Manager, Engineering (Gas) (P.Eng)
- Manager, Environmental Programs (R.P.Bio)
- Manager, Indigenous Relations
- Manager, Community Relations
- Supervisor, Major Projects Support - Property Services (RI(BC))
- System Capacity Planning Manager (P.Eng.)
- Senior Project Engineer (P.Eng.)
- Senior Project Manager
- Corporate Communications Advisor

All of the individuals noted have extensive experience on multiple FEI projects, including the Lower Mainland Intermediate Pressure System Upgrade (LMIPSU), Coastal Transmission System Upgrade (CTS), Inland Gas Upgrade (IGU), Eagle Mountain Woodfibre LNG Pipeline (EGP) and various sustainment capital projects throughout the province. Moreover, a number of the individuals have industry experience on various similar projects outside of FEI. Where roles require accreditation (e.g. professional engineer, project management professional, registered professional biologist), the individuals maintain the appropriate professional designation.

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5.2 Please explain the basis upon which individual weightings were arrived at for the financial and non-financial weightings.

Response:

After establishing the Project objectives, FEI developed both non-financial and financial evaluation criteria and associated weightings through discussions with various internal stakeholders. These were then further broken down to sub-criteria.

Each subject matter expert reviewed the evaluation criteria and suggested a weighting based on their experience with similar projects, while remaining cognizant of the Project objectives. The combination of weightings from all subject matter experts indicated the relative importance of the criteria. The table below highlights the criteria and sub-criteria. The Project Sponsor reviewed and accepted the proposed evaluation criteria and weighting. The overall weighting is provided in Table 4-3 of the Application.

FEI conducted a sensitivity analysis, after completion of scoring the criteria, to confirm the impacts of the weightings. The results indicated no change to the preferred alternative.

Parameter	Weight	Criteria	Weight	Sub-Criteria	Weight
Non-financial	90%	System Capability	0%	Maintain full system resiliency	0%
		Environmental and Archaeological Impacts	15%	Environmental	10%
		Community, Indigenous and Stakeholder Impacts	25%	Archaeological	5%
				Land Acquisition & ROW	10%
				Public Consultation and Engagement	15%
		Schedule Impacts	60%	Project Schedule	15%
				Project Execution Certainty	20%
				Construction and Permitting	25%
Financial	10%	Financial	100%	PV of Incremental Annual Revenue Requirement	100%

5.3 Please advise if the weightings changed during the preparation of the Application, including during the "collaborative discussions" referenced at lines 20-21 and, if they did, please provide the other weightings that were considered and the rationale for any changes.

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1 **Response:**

2 The weightings did not change during the preparation of the Application. Please refer to the
3 response to Burnaby IR1 5.2.

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7 5.4 Please advise if any factors were dropped from inclusion in the non-financial
8 criteria.

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10 **Response:**

11 No factors were dropped from inclusion in the non-financial criteria. Please refer to the response
12 to Burnaby IR1 5.2.

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16 5.5 Please identify the individual elements that were considered by FEI in
17 determining the impacts reported in Table 4-5 and advise if any of those
18 individual elements received separate scoring, whether on the basis of the
19 scoring used in Table 4-4, or otherwise. For example, in Table 4-5, FEI refers in
20 "Community, Indigenous and Stakeholder Impacts" to impacts on businesses.
21 Did FEI consider as part of that or criteria or the other criteria impacts on people
22 who reside in proximity to the proposed routings, people who travel along the
23 proposed routings, or people whose travel would be affected by the construction
24 along the proposed criteria? If so, is that reflected in Table 4-50 and were those
25 factors (and any other factors), given their own scores?

26

27 **Response:**

28 The individual elements that were considered by FEI in determining the impacts reported in
29 Table 4-5 are identified in detail in Section 4.4.2.1 of the Application. Individual elements were
30 not scored separately, but rather were considered in the overall evaluation of each criterion.

31 For example, as part of the criteria "Private properties and businesses along the route corridors
32 directly impacted during construction", FEI considered the following:

- 33 • people who reside in proximity to the proposed routings;
34 • people who travel along the proposed routings; and/or
35 • people whose travel would be affected by the construction.

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- 1 A detailed evaluation of the above referenced elements will be conducted and included as part
- 2 of Section 5 of the Application for the preferred route to be filed as part of the evidentiary
- 3 update.

4

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6. Reference: ALTERNATIVES EVALUATION: Section 4.3.2.1, Alternative 2A

On page 30 at lines 21-22, FEI says that the HDD alignment for Alternative 2A would likely destabilize the structure of the existing Pattullo Bridge.

On page 31 at lines 1-5, FEI refers to risk of frac-out.

On page 31 at lines 8-9, FEI refers to conflicts with other transportation works. On page 31 at lines 6-7, FEI refers to limited workspace.

6.1 Please advise what spatial separation from the piers of the existing Pattullo Bridge would be required for the HDD alignment to not destabilize the existing structure?

Response:

As described in Section 4.3.2 of the Application, FEI engaged a drilling contractor as part of an early contractor involvement project delivery model to assess the feasibility of Alternative 2A. In Document P-00758-PIP-MEM-0002 "Proposed Alternate HDD Alignment Memo" (prepared by Kiewit/Mott MacDonald and included as an attachment to the response to BCUC IR1 7.4), Alternative 2A was considered not feasible based on expert judgement and subject matter experts' evaluation of:

- Infrastructure impediments;
- Geological conditions;
- Potential significant traffic impacts and transportation system closures; and
- Limited workspace available in the City of Surrey.

In Figure 3-5 of the report (page 12), the hydraulic fracture evaluation demonstrates a loss of drilling fluid pressure once the pilot hole advanced approximately 200 metres. The failure is caused primarily by significant uncertainty of subsurface conditions including poor geological conditions, topography changes in New Westminster and the limited depth of cover.

Relatively minor adjustments of input assumptions, such as spatial separation of the HDD alignment from the piers of the existing Pattullo Bridge, would not materially improve the likelihood of successfully completing this project alternative prior to demolition of the Pattullo Bridge.

BCUC Order G-20-15 - 2015 Certificate of Public Convenience and Necessity Application Guidelines Section 2(i) requires the applicant to identify alternatives that it deemed to be not feasible at an early screening stage, and provide the reason(s) why it did not consider them further. The BCUC Guidelines require FEI to complete the CPCN estimates from alternative selection to Project selection using the AACE recommended practices but there is no requirement in the CPCN guidelines to complete estimates at the screening phase. FEI confirms that it has satisfied the screening requirements in accordance with the AACE best

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practices and has provided the reasons in the Application for determining Alternative 2A not feasible. However, for further clarity, FEI notes that Class 5 estimates are not completed for all non-feasible alternatives, if the expert's evaluation indicate that an alternative is clearly not feasible.

6.2 Please advise if there is any reason that the drill entry point could not be located further to the south in New Westminster than what is shown by FEI for Alignment 2A so that the alignment would not pass below or beside the piers of the Pattullo Bridge.

Response:

The high elevation difference and slope over such a short length for Alternative 2A presents a significant challenge to an HDD installation as it is difficult to attain an appropriate depth of cover beneath the river (due to a short setback distance). Adjustments to the drill entry point would not have improved the likelihood of a successful project.

As discussed in the response to Burnaby IR1 6.1, FEI determined that this option was not feasible due to the combined risks of conducting an HDD in an area of subsurface conditions with significant uncertainty, very congested construction conditions, significant identified public and transportation impacts, and the consequent schedule uncertainty. Relatively minor adjustments of input assumptions (e.g., such as the HDD entry and exit location) would not materially improve the likelihood of successfully completing this project alternative prior to demolition of the Pattullo Bridge.

6.3 Please provide all reports and other investigations upon which FEI's conclusions at lines 1-5 of page 31 are based.

Response:

Please refer to the response to BCUC IR1 7.4, in particular, Document P-00758-PIP-MEM-0002 "Proposed Alternate HDD Alignment Memo" prepared by Kiewit/Mott MacDonald.

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6.4 Please identify the size and dimensions of the workspace required for Alternative 2A and identify the locations of the limited workspace discussed at lines 6-7 of page 31.

Response:

The staging area was not sufficient for this HDD operation. Improvements to the staging area would not have improved the likelihood of a successful project.

As discussed in the response to Burnaby IR1 6.1, FEI determined that this alternative was not feasible due to the combined risks of conducting an HDD in an area of subsurface conditions with significant uncertainty, very congested construction conditions, significant identified public and transportation impacts and the consequent schedule uncertainty. Relatively minor adjustments of input assumptions (e.g., such as the workspace dimensions) would not materially improve the likelihood of successfully completing this project alternative prior to demolition of the Pattullo Bridge.

6.5 Please identify the following:

6.5.1 the nature of and locations of the conflicts referenced at lines 8-9 of page 31 with Highway 17, Skytrain tunnel and railway crossings,

6.5.2 the location and duration of the transportation system closures referenced,

6.5.3 any quantitative measure available of those conflicts and closures, such as vehicles per hour that may be affected;

6.5.4 whether any investigation was undertaken of the potential to mitigate such impacts; if such an investigation was undertaken, please produce that investigation.

Response:

The staging area required for the pull string in Alternative 2A would need to cross the elevated Burlington Northern Santa Fe railway (BNSF), the TransLink SkyTrain Bridge and Highway 17. Cranes would need to be positioned every 10 to 15 metres along the section where the pipe is in the air, and would be required to hold the pipe string at proper heights to prevent overstressing the pipe as it is pulled into position. Consequently, this work would result in service disruptions for BNSF and SkyTrain. It is uncertain whether these disruptions would be permitted by the appropriate agencies.

If the pipe were strung over Highway 17, it would likely need to be closed from Old Yale Road to Nordel Way for at least three days during pipe pullback.

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1 The impacts to transportation systems were considered logistically challenging. Improvements
2 to the traffic management plan, or other system closures, would not have improved the
3 likelihood of a successful project. As such, no investigations were undertaken to mitigate these
4 impacts.

5 As discussed in the response to Burnaby IR1 6.1, FEI determined that this alternative was not
6 feasible due to the combined risks of conducting an HDD in an area of subsurface conditions
7 with significant uncertainty, very congested construction conditions, significant identified public
8 and transportation impacts, and the consequent schedule uncertainty. Relatively minor
9 adjustments of input assumptions (e.g., such as mitigating impacts on BNSF, the TransLink
10 SkyTrain Bridge, or Highway 17) would not materially improve the likelihood of successfully
11 completing this project alternative prior to demolition of the Pattullo Bridge. As such, no
12 investigations were undertaken to mitigate these impacts.

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7. **Reference: ALTERNATIVES EVALUATION: Section 4.3.2.2.1, Alternative 2B**

On page 32, lines 4-14, FEI specifies four factors that it says make Alternative 2B not feasible.

7.1 Please identify the type of work for which a crossing permit is required from CN Rail.

Response:

A crossing/encroachment permit is required for any underground or aerial work within CN rights of way, and as such is a required permit from CN for the Alternative 2B gas line alignment.

7.2 Please identify the basis for CN's authority to require a permit for the work.

Response:

Transport Canada regulates federal railways and non-railway operations that affect railway safety under the *Railway Safety Act* (R.S.C., 1985 c.32 (4th Suppl.)). Transport Canada's standard for pipeline crossings under railways (TC E-10, June 21, 2000) provides that no one may commence the installation of any pipe under a railway without:

- a) submitting to the railway company detailed plans of the proposed installation; and
- b) obtaining written approval from the railway company that owns, operates or has control of the railway.

As Alternative 2B crosses under the CN railway bridge, FEI would require a written approval from CN.

7.3 Please advise what spatial separation from the piers of the CN Bridge would be required for the HOD alignment to not destabilize the existing structure.

Response:

As described in Section 4.3.2 of the Application, FEI engaged a drilling contractor as part of an early contractor involvement project delivery model to assess the feasibility of Alternative 2B. In Document P-00758-PIP-MEM-0002 "Proposed Alternate HDD Alignment Memo" (prepared by Kiewit/Mott MacDonald and included as an attachment to the response to BCUC IR1 7.4),

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Alternative 2B was considered not feasible based on expert judgement and subject matter experts' evaluation of:

- Infrastructure impediments;
- Geological conditions;
- Potential significant traffic impacts; and
- Limited workspace available in the City of Surrey.

In Section 4.2.1.1 of the report (page 19), the alignment of Alternative 2B across the Fraser River passes beneath the CN Rail Bridge piers. CN indicated they would not permit any such installation underneath the bridge structure. Given that there are 10 bridge piers within the Fraser River boundary over a crossing distance of approximately 500 metres and that the piers on the south side of the crossing are regularly spaced 6 to 8 metres apart, any alignment crossing the CN Rail Bridge is not possible.

BCUC Order G-20-15, *2015 Certificate of Public Convenience and Necessity Application Guidelines*, Section 2(i) requires the applicant to identify alternatives that it deemed to be not feasible at an early screening stage, and provide the reason(s) why it did not consider them further. The BCUC Guidelines require FEI to complete the CPCN estimates from alternative selection to Project selection using the AACE recommended practices, but there is no requirement in the CPCN guidelines to complete estimates at the screening phase. FEI confirms that it has satisfied the screening requirements in accordance with the AACE best practices and has provided the reasons in the Application for determining Alternative 2A not feasible. However, for further clarity, FEI notes that Class 5 estimates are not completed for all non-feasible alternatives, if the expert's evaluation indicate that an alternative is clearly not feasible.

7.4 Please advise if there is any reason that the drill entry points could not be located elsewhere so that the alignment would not pass below or beside the piers of the CN Bridge.

Response:

Please refer to the response to Burnaby IR1 7.3. FEI and the drilling contractor examined HDD entry and exit locations at various locations within 1 kilometre of the current crossing with no success other than the potential alignment described in Alternative 2C.

As discussed in the response to Burnaby IR1 7.3, FEI determined that Alternative 2B was not feasible due to the combined risks of conducting an HDD in an area of subsurface conditions with significant infrastructure impediments, geological uncertainty, limited construction

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workspace, significant identified public and transportation impacts, and the consequent schedule uncertainty. Relatively minor adjustments of input assumptions (e.g., such as the drill entry location) would not materially improve the likelihood of successfully completing this project alternative prior to demolition of the Pattullo Bridge.

7.5. Please provide all reports and other investigations upon which FEI's conclusions at lines 4-6 of page 32 are based.

Response:

Please refer to the response to BCUC IR1 7.4, in particular, Document P-00758-PIP-MEM-0002 "Proposed Alternate HDD Alignment Memo" prepared by Kiewit/Mott Macdonald.

7.6 Please provide all reports and other investigations upon which FEI's conclusions at lines 9-10 of page 32 are based.

Response:

Please refer to the response to BCUC IR1 7.4, in particular, Document P-00758-PIP-MEM-0002 "Proposed Alternate HDD Alignment Memo" prepared by Kiewit/Mott Macdonald.

7.7 Please identify the following:

7.7.1 the conflicts with McBride Boulevard referenced at lines 11-12 of page 32,

7.7.2 the location of the traffic disruption referenced,

7.7.3 any quantitative measure available of those conflicts and closures, such as vehicles per hour that may be affected.

7.7.4 whether any investigation was undertaken of the potential to mitigate such impacts, and if there was, produce that investigation.

Response:

As described in Section 4.3.2.2 of the Application, the exit point of the HDD is located near the intersection of McBride Boulevard and E Royal Avenue in New Westminster. The new gas line

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1 would be strung and welded together along McBride Boulevard for approximately 1,293 metres,
2 requiring closure of two lanes of traffic for several months. Figure 4-4 of the Application
3 highlights the affected section of McBride Avenue.

4 As discussed in the response to Burnaby IR1 7.3, FEI determined Alternative 2B to be not
5 feasible due to the combined risks of conducting an HDD in an area of with significant
6 infrastructure impediments, subsurface conditions with geological uncertainty, limited
7 construction workspace, significant identified public and transportation impacts, and the
8 consequent schedule uncertainty. Relatively minor adjustments of input assumptions (e.g., such
9 as traffic impacts) would not materially improve the likelihood of successfully completing this
10 project alternative prior to demolition of the Pattullo Bridge. In particular, improvements to the
11 traffic management plan, or other system closures, would not have improved the likelihood of a
12 successful project. As such, no investigations were undertaken to mitigate these impacts.

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16 7.7.5 the name of the owner and the nature, location, timing and status of the
17 future development plans referenced at lines 13-14 on page 32.

18
19 **Response:**

20 The name of the owner of the parcel as referenced is legally described as PID 024-969-702, Lot
21 2 District Lot 3 Group 2 NWD Plan LMP48971. The registered owner is:

22 HER MAJESTY THE QUEEN IN RIGHT OF CANADA
23 C/O THE VANCOUVER FRASER PORT AUTHORITY
24 100 THE POINTE, 999 CANADA PLACE
25 VANCOUVER, BC
26 V6C 3T4
27 AS REPRESENTED BY THE MINISTER OF TRANSPORT
28

29 FEI understands this parcel and adjacent parcels were purchased in 2018 by the Vancouver
30 Fraser Port Authority (VFPA) in order to develop the lands into new riverfront industrial area to
31 take advantage of the location along the Fraser River for the delivery of goods. During early
32 consultation for Alternative 2B, VFPA advised FEI that they have been actively acquiring
33 properties in this area as they become available for purchase.

34 With these plans in place, VFPA was unwilling to grant a right of way to FEI for the new gas line
35 crossing at this location.

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1 **8. Reference: ALTERNATIVES EVALUATION: section 4.3 .2.3.1, Analysis of**
2 **Alternative 2C**

3 On page 33 at lines 12 to page 34, line 5, FEI lists several factors why it says Alternative
4 2C is not feasible.

5 8.1 With respect to lines 12 and 13 on page 33, please identify the following:

6 8.1.1 the location and dimensions of the workspace requirements and

7 8.1.2 the access points referenced.
8

9 **Response:**

10 The location and dimensions of the workspace requirements themselves are not the reason that
11 FEI determined Alternative 2C to be not feasible. In Section 4 of Document P-00758-PIP-MEM-
12 0002 "Proposed Alternate HDD Alignment Memo" (prepared by Kiewit/Mott Macdonald and
13 included as an attachment to the response to BCUC IR1 7.4), it is noted that a: "Pipe staging
14 area of sufficient length and in alignment with the proposed HDD is available on the north side
15 of the crossing."

16 However, as described in Section 4.3.2.3.1 of the Application, the workspace challenges are
17 associated with the "Added complexity with project coordination for workspace requirements
18 and access points for both FEI's Project and the Pattullo Bridge Replacement Project". Due to
19 the timing aspects as described in the response to Burnaby IR1 8.2, coordination directly with
20 the MoTI's bridge contractor for the limited available construction workspace and staging of the
21 two concurrent projects would have presented significant risks to FEI's successful completion of
22 the Project. It was for this reason, combined with the additional compounding impacts listed in
23 Section 4.3.2.3.1, that FEI considers Alternative 2C to be not feasible.

24
25
26
27 8.2 Please identify the nature of the change orders referenced at lines 9-10, and their
28 expected impact in terms of cost and time.
29

30 **Response:**

31 FEI worked collaboratively with the Pattullo Bridge Replacement project team prior to the MoTI's
32 issuance of its procurement documents being issued to the market in July 2018. This work
33 included identifying FEI's workspace and schedule requirements for Alternatives 2A and 2B into
34 the MoTI's Request for Qualifications documents to ensure FEI's requirements would be
35 included in the bidding proponent's proposals to the MoTI for coordination of the two projects.
36 Alternative 2C was identified by FEI in August 2019 which was near MoTI's closing date of their
37 Request for Proposals in October 2019 and as such the workspace and schedule requirements
38 for this Alternative were not considered in the MoTI's proposals received. As Alternative 2C is

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1 fully contained within the Pattullo Bridge Replacement Project footprint and the workspace and
2 schedule requirements differ from Alternatives 2A and 2B, FEI would have had to coordinate
3 and obtain the requirements directly from MoTI's design-build contractor awarded for the
4 Project. Due to this timing, MoTI communicated that it would not accept any responsibility for
5 any potential change orders put forth by their selected contractor to accommodate FEI's new
6 requirements for Alternative 2C.

7 MoTI announced the contract award on February 10, 2020. FEI would not have been in a
8 position to start discussions regarding change orders until after this date, leaving little time for
9 other options if discussions were not successful.

10 It was for this reason, combined with the additional compounding impacts listed in Section
11 4.3.2.3.1, that no specific change orders were requested or created.

12
13
14
15 8.3 Please advise when the location and size of the bridge pier foundations for the
16 New Bridge are expected to be known.

17
18 **Response:**

19 Consistent with the MoTI's project schedule (as published online), in a meeting with FEI in
20 August 2019, the MoTI indicated their preferred proponent was to be selected and announced in
21 early 2020. Upon award of MoTI's bridge contractor, detailed design of the bridge pier
22 foundations would begin. As discussed in the response to Burnaby IR1 8.2, MoTI announced
23 the contract award on February 10, 2020. FEI would not have been in a position to start
24 discussions regarding proximity of the gas line alignment for Alternative 2C as related to the
25 bridge pier foundation locations until after this date, leaving little time for other options if
26 discussions were not successful. It was for this reason, combined with the additional
27 compounding impacts listed in Section 4.3.2.3.1, that FEI considers Alternative 2C to be not
28 feasible.

29
30
31
32 8.4 Please advise when the detailed design of the HOD is expected to begin.

33
34 **Response:**

35 Based on the Class 5 schedule completed by the drilling contractor, detailed design was
36 required to start in May 2020 to meet the target installation date requested by the MoTI of
37 December 2021.

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8.5. With respect to the indigenous village site in Surrey:

8.5.1 Please provide a plan showing the location and boundaries of the site and identify the location and extent to which the pipe route would conflict with the village site.

Response:

There are known archaeological sites on either side of the HDD crossing in both the Cities of New Westminster and Surrey associated with the gas line alignment for Alternative 2C. The figure below shows in yellow shading the location and boundaries of the City of Surrey archaeological site with the location and extent to which the pipe route would conflict with the village site (Heritage resource reference DhRr-74). This figure is accurate to July 2020 and does not take into account any updates to the boundaries of the site, nor any new sites in the direct vicinity that have been discovered during recent investigations by other project proponents in the same area.



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8.5.2 Please advise if FEI has considered using micro-routing for the indigenous village site and, if it has, provide the outcome of that consideration .

Response:

Routing adjustments for the gas line alignment and drill entry and exit points were considered to accommodate known archaeological sites identified and potentially impacted by the Project, including the Indigenous village site in the City of Surrey. Although alternate routing options were considered, the extent of the archaeological sites, requirements for temporary workspace and access, as well as other physical constraints on-site, did not allow for routing that would avoid negative impacts. It was for this reason, combined with the additional compounding impacts listed in Section 4.3.2.3.1, that FEI considers Alternative 2C to be not feasible.

- 8.6 Please identify the following:
- 8.6.1 the location of the lane closures and traffic disruption on McBride Boulevard referenced at lines 1-2 of page 34,
 - 8.6.2 any quantitative measure available of the traffic disruption and closures, such as vehicles per hour that may be affected.
 - 8.6.3 whether any investigation was undertaken of the potential to mitigate such impacts, and if there was, produce that investigation.

Response:

As described in Section 4.3.2.3 of the Application and consistent to the response to Burnaby IR1 7.7.1, the entry point of the HDD is located near the intersection of McBride Boulevard and E Royal Avenue in New Westminster. The new gas line would be strung and welded together along McBride Boulevard for approximately 1,340 metres, requiring closure of two lanes of traffic for several months. Figure 4-4 of the Application highlights the affected section of McBride Avenue. It was for this reason, combined with the additional compounding impacts listed in Section 4.3.2.3.1, that FEI considers Alternative 2C to be not feasible.

Improvements to the traffic management plan, or other system closures, would not have improved the likelihood of a successful project. As such, no investigations were undertaken to mitigate these impacts.

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1

2

3 8.7 Please explain what permitting challenges are referenced at line 3 on page 34
4 and identify the following:

5 8.7.1 the entity or entities that issues the permits,

6 8.7.2 the nature of the permits,

7 8.7.3 the location of the railway crossings.

8

9 **Response:**

10 The gas line alignment for Alternative 2C would require multiple rail crossings as follows:

- 11 1. At grade BNSF rail crossing in the City of Surrey by a short HDD;
- 12 2. Above grade CN rail crossing in the City of Surrey by a track bore;
- 13 3. At grade CN rail crossing in the City of Surrey by an HDD;
- 14 4. At grade and elevated CN rail crossing in the City of New Westminster by HDD; and
- 15 5. Tunnel crossing of the TransLink Skytrain in the City of New Westminster by HDD.

16

17 The challenges that FEI encountered in early engagement discussions included an indication
18 from CN Rail that a permit for the above grade crossing in the City of Surrey would not be
19 permitted due to recent ground consolidation work conducted for seismic rehabilitation of their
20 infrastructure. CN also expressed concern of the impacts FEI's drill entry pit location may have
21 on the recently completed rehabilitation work.

22 The Transport Canada E-10 Standards Respecting Pipeline Crossings Under Railways
23 regulates requirements for installing pipelines under railways. A general condition for all
24 installations is to submit a detailed plan to the railway company and obtain written approval. In
25 this case, FEI would require a permit from CN Rail, SFR or TransLink for each crossing. It was
26 for this reason, combined with the additional compounding impacts listed in Section 4.3.2.3.1,
27 that FEI considers Alternative 2C to be not feasible.

28

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31 8.8 Please provide any assessments of the likelihood of HDD failure on the first
32 attempt and the efforts and timing that would be associated with subsequent
33 HDD attempts.

34

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1 **Response:**

2 Please refer to Document #P-00758-PIP-MEM-0002 provided in the response to BCUC IR1 7.4.
3 Relevant additional geological information for the area is provided in Golder Associates reports
4 1650596-002-R-Rev1-2000 and 1650596-025-R-Rev1-9000 (also provided in the response to
5 BCUC IR1 7.4).

6 Although these reports do not specifically address the likelihood of successfully completing an
7 HDD on subsequent attempts, they do address in detail the overall uncertainty due to the
8 geological conditions associated with an HDD under the Fraser River. If multiple HDD attempts
9 were required to complete a successful crossing, there is a very significant risk that the Project
10 would not be completed before the removal of the existing Pattullo Gas Line.

11

12

13

14 8.9 Please advise on the extent to which FEI's experience with HDD including
15 attempting more than one HDD attempt before achieving a successful HDD.

16

17 **Response:**

18 FEI has successfully completed HDD crossings of major rivers for various projects. The risk of
19 failure can be mitigated through proper local site characterization from a thorough geotechnical
20 program. Below are a list of notable HDD projects. Although the projects were all completed
21 successfully, the examples illustrate the significant cost and schedule risks associated with HDD
22 construction.

23 ***Fraser River Crossing Project (BCUC Order C-1-99)***

24 The scope of this project included installation of a 980 metre NPS 36 TP gas line across the
25 Fraser River in the proximity of the Port Mann Bridge. The initial pilot hole was successful. FEI
26 encountered a 3 metre diameter boulder during reaming, causing a one week delay and 13
27 percent additional project cost. In addition, an incomplete pipe pull resulted in a 7 metre deep tie
28 in, causing a three week delay and 12 percent additional project cost.

29 ***Fraser River South Arm Project (BCUC Order C-2-09)***

30 The scope of this project included installation of one 1,400 metre NPS 20 and one 1,400 metre
31 NPS 24 TP gas line across the Fraser River. In completing the reaming of the NPS 20 gas line,
32 the drill string parted at the bottom of the south side entry casing and was lost. The contractor
33 was required to complete additional on-land geotechnical boreholes to redesign and complete
34 the installation. In completing the pullback of the NPS 24 gas line, the pipe became lodged on
35 the south side entry casing, and severed the connection from the pullhead. The project was
36 required to excavate 17 metre below grade, install a cofferdam, dewater and install an S-bend
37 to complete the tie in. The project experienced over 22 months in delay.

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1 ***Kootenay River Crossing (Shoreacres) Project (BCUC Order C-9-10)***

2 The scope of this project included installation of one 880 metre NPS 6 TP gas line across the
3 Kootenay River. The alignment included one compound curve and a large elevation change
4 from entry to exit. The project was completed on schedule and on budget.

5 ***Muskwa River Crossing (BCUC Order C-2-14)***

6 The scope of this project included installation of one 550 metre NPS 6 TP gas line across the
7 Muskwa River. The project was completed on schedule and on budget.

8 ***FRD LTL 219 kP 1.8 Crossing (2017 Sustainment Capital)***

9 The scope of this project included installation of one 80 meter NPS 8 and one 80 metre NPS 4
10 TP gas line across Corbin Road and CN Rail Crossing near Sparwood, BC. The pilot hole for
11 the NPS 4 gas line required a second attempt due to rocks and boulders, which was completed
12 successfully. The NPS 8 gas line was not successful after two pilot hole drill attempts due to
13 rocks and boulders, and was completed utilizing down-the-hole hammer technology which
14 allows drilling through rocks and boulders. The project was delayed over 12 months and
15 incurred an 80 percent cost increase.

16 ***GRF TRA 273 kP 128.5 Crossing (2018 Sustainment Capital)***

17 The scope of this project included installation of one 300 metre NPS 10 TP gas line across the
18 Kettle River near Grand Forks. Upon inspection after gas line installation, a scratch through the
19 protective coating and gouging of the carrier pipe was detected for the 25 metre of exposed
20 pipe. After completion of an Engineering Assessment, the pipe was determined not fit for
21 service and a new HDD was completed. This caused an approximate 50 week delay and a 70
22 percent cost increase.

23

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9. Reference: ALTERNATIVES EVALUATION; section 4.3.2.4 Alternative 2D - Other Trenchless Methodologies

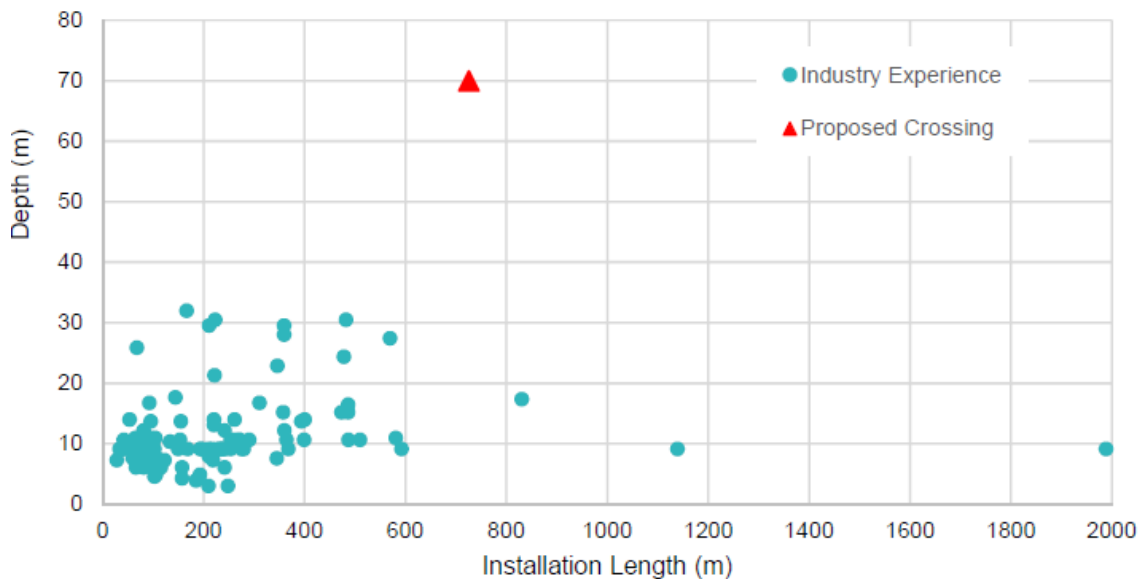
9.1 At lines 16-19 of page 34, FEI states that 750 meters depth and 70 meters length would be the longest and deepest attempts at micro-tunneling in North America. Please advise if micro-tunneling has been successful elsewhere than North America at lengths and depths that exceed those values.

Response:

Although micro-tunnel projects have been completed at lengths greater than 750 metres, based on research and discussion with industry experts, FEI is unaware of any projects worldwide similar to that of the proposed crossing. An attempt at this depth would be a world first.

To further illustrate the unprecedented nature of the suggested micro-tunnel, FEI provides the following graph from the Microtunnel Feasibility Memo³ included as in the response to BCUC IR1 7.4, Attachment 7.4.

Industry Experience Compared to Proposed Crossing
(note that this is not an exhaustive list of all microtunnel projects completed worldwide)



9.2 Please provide the source for the conclusion stated at lines 20-21 on page 34.

³ Figure 3-1 from P-00758-PIP-MEM-0005 Microtunnel Feasibility Memo prepared by Kiewit/Mott Macdonald.

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1 **Response:**

2 Please refer to the responses to Burnaby IR1 9.1 and BCUC IR1 7.4, in particular, Document P-
3 00758-PIP-MEM-0005 “Microtunnel Feasibility Memo” prepared by Kiewit/Mott Macdonald.

4 .

5

6

7

8 9.3 Please produce the geotechnical data referenced at lines 22-26 on page 34.

9

10 **Response:**

11 Please refer to the response to BCUC IR1 7.4, in particular, Document 1680596-002-R-Rev1
12 “Phase A Geotechnical Site Investigation Report” and Document 1680596-025-R-Rev1 “Phase
13 B Land Geotechnical Site Investigation Report” prepared by Golder Associates.

14

15

16

17 9.4 Please identify the contractors considered that are referenced at lines 27-28 on
18 page 34 and confirm if any contractors in North America are available within the
19 time contemplated by the Application.

20

21 **Response:**

22 FEI considered microtunnelling manufacturers, such as Herrenknecht, for procurement of the
23 microtunnel boring machine, as a specially designed machine would be required for the depth of
24 the tunnel. FEI considered contractors such as Michels Canada and Ward and Burke
25 Microtunnelling Ltd. as potential candidates to undertake the microtunnelling.

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10. Reference: ALTERNATIVES EVALUATION: Section 4.3.3.3, Analysis of Alternatives 3A and 38

10.1 With respect to lines 14-15 on page 36, please identify the length of time available for negotiations with landowners and the basis for that statement.

Response:

Consistent with AACE practices and the phase gate process, screening of alternatives is conducted at a high level aimed at determining the high level risks and showstoppers, if any, for a project. Based on FEI's initial screening and the level of project definition of Alternatives 3A and 3B, the available duration for negotiations with landowners in the Project schedule was estimated at 11 months from the time an alternative is selected as the preferred alternative.

Negotiations would start upon determination of the location and extent of the new statutory right of way and temporary working space required through the detailed design phase of the Project. Appraisal reports would be required for each property to determine the appropriate compensation payable to the property owners, requiring 6 to 8 weeks for completion depending on availability of qualified B.C. land surveyors.

As the parcels identified along this route fall within the Agricultural Land Reserve (ALR), approval from the Agricultural Land Commission (ALC) is required. The timeline for this process is discussed further in the response to Burnaby IR1 10.2.

Given the number of properties affected, required appraisals, the requirement of ALC approval, the high likelihood of expropriation, and negotiating with property owners who have been heavily affected by infrastructure projects in the past, completing all negotiations within 11 months would be very challenging.

10.2 With respect to lines 14-16 on page 36, please identify the length of time estimated that would be required for an application to the Agricultural Land Commission and the basis for that estimate.

Response:

An application to the ALC requires the submission of supporting documents with the application form. One of the required items is an authorization letter signed by the property owner granting FEI permission to act as agent on their behalf in the submission of the ALC application. Such authorization may or may not be provided to FEI by a landowner. If it is not provided and the owner is unwilling to grant right of way, FEI may have to pursue acquisition of the right of way through the expropriation process. In this event, the ALC application would follow the expropriation process and construction could not start until ALC approval is received.

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1 Information on the timing of the Agricultural Land Commission to complete their review and
2 decision of an application can be found at <https://www.alc.gov.bc.ca/alc/content/home>, which
3 states the following:

- 4 • The ALC will strive to acknowledge applications as complete and incomplete within 5
5 business days of receipt;
- 6 • The ALC will strive to communicate most of its decisions in writing (electronic or mail),
7 within 60 business days of an application being received and the majority of its decisions
8 in 90 business days. Please be advised that the 60 and 90 business day application
9 process timeline may not be consecutive given the specifics of an application; the ALC
10 may “pause” the business day timelines should any of the following be required:
 - 11 ○ A meeting with the applicant;
 - 12 ○ A site visit; or
 - 13 ○ A request for additional information (from the applicant, local government or any
14 other person considered appropriate).
- 15 • An applicant may also ask the ALC to pause the processing of an application at any
16 time;
- 17 • These business day timelines are specific to the Commission’s component of the
18 application process; it does not include time associated with the local government
19 component of the application process.
20
21

22
23 10.3 Please advise of the extent to which the pipeline can be routed along municipal
24 roadways in Richmond under Alternatives 3A and 3B and, if it cannot be so
25 routed, the reason(s) why it cannot.
26

27 **Response:**

28 By longstanding practice, FEI requires gas lines operating at transmission pressures above
29 2070 kPa to be located within dedicated rights of way (ROW). The rationale for this is to
30 maximize the safety of underground assets by controlling third-party activities in and around the
31 gas line, such as crossings and excavations. The dedicated ROW also ensures access for
32 operations and maintenance activities. As such, FEI would not consider installing Alternatives
33 3A along or under municipal roadways in Richmond.

34 FEI permits intermediate pressure gas lines operating at or below 2070 kPa within roadways.
35 These gas lines are designed to CSA Z662 Clause 12 requirements and are commonly located
36 along or under municipal roadways. As such, Alternative 3B could be installed in these
37 locations. Notwithstanding this, given the required start point and crossing location of the IP line,

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there would be limited opportunities to leverage existing municipal roadway infrastructure in Richmond.

10.4 Please identify the following:

10.4.1 the permits that are referenced at lines 20-21 on page 36,

Response:

The identified permits and duration for pre-design geotechnical investigation are noted below:

Permit	Permitting Agency	Estimated Duration (Months)
<i>Fisheries Act</i> – Request for review	Fisheries and Oceans Canada	6
<i>Heritage Conservation Act</i> Section 12.2 Site Inspection Permit	BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development - Archeological Branch	4-6
<i>Heritage Conservation Act</i> Section 12.4 Site Alteration Permit	BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development - Archeological Branch	8-12
Cultural / Heritage permits for Archaeology	Indigenous Communities	2
Marine Type Activity	Port of Vancouver	3
Project and Environmental review	Port of Vancouver	3
<i>Navigable Waters Act</i> Notification	Transport Canada	6

The basis for the required permits and estimated duration for preparation, submission and review is supported by FEI's experience from similar types of projects, discussions with permitting agencies, and publicly available data.

10.4.2 the length of time estimated for that permitting, and

Response:

Please refer to the response to Burnaby IR1 10.4.1.

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10.4.3 the basis for FEI's above answers.

Response:

Please refer to the response to Burnaby IR1 10.4.1.

10.5 Please: discuss the extent to which FEI can apply information obtained from the HDD alternatives examined for the CPCN application for the Fraser River Crossing Upgrade Project (BCUC C-02-09) to the Fraser River crossings in Alternatives 3A and 3B.

Response:

FEI cannot apply geotechnical information from the Fraser River Crossing Upgrade Project to the Fraser River crossings in Alternatives 3A (TP Gas Line with 1 Gate Station) and 3B (IP Gas Line with 1 Gate Station and 1 District Station). Accurate and comprehensive geotechnical site characterization is critical for successful HDD projects. The geotechnical conditions and construction risks encountered during the Fraser River Crossing Upgrade Project may vary significantly from those located approximately 3,700 metres upstream at the Fraser River crossing location for Alternatives 3A and 3B. As noted in the Application, even with comprehensive geotechnical data, the Fraser River Crossing Upgrade Project experienced several challenges in successfully completing the HDD, causing significant delay from the original schedule.

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11. Reference: ALTERNATIVES EVALUATION; Section 4.3.4.1, Analysis of Alternative 4.

FEI says it screened out Alternative 4 - Aerial Gas Line Crossing based on an inability to meet schedule requirements. FEI determined it could not meet schedule requirements in part because of long lead permits. The Broadway & Gaglardi Way Corridor will also require many of the permits listed in section 4.3.4.1.

11.1 Please explain why FEI believes the Broadway & Gaglardi Way Corridor will be able to meet schedule requirements despite the fact it will also require many of the same permits as Alternative 4.

Response:

Alternative 6A (Broadway & Gaglardi Way Corridor) does not require many of the same permits as Alternative 4 (Aerial Gas Line Crossing).

Alternative 4 would involve construction in and around the Fraser River and would require, at a minimum, the permits listed in Section 4.3.4.1 of the Application. For example, Alternative 4 may fall within the effects threshold under the BC *Reviewable Projects Regulation* and would likely to require an Environmental Assessment Certificate (EAC) under the BC *Environmental Assessment Act* which has a lead time of 2 to 2.5 years. There is also the potential need for a Section 11 approval under the *Water Sustainability Act* from BC Forests, Lands, Natural Resource Operations and Rural Development which has a lead time of approximately 12 to 18 months. These permits are required in the early planning stages of the Project to facilitate the geotechnical instream borehole program required to supplement the design and thus will be critical path activities. With the uncertainties in the approval durations for these critical path activities, coupled with other project uncertainties, the estimated completion date for Alternative 4 cannot be ascertained with any level of confidence to meet the stringent Project completion date. Therefore, it was eliminated from further consideration.

11.2 Please advise on the time required for the permits for the Broadway & Gaglardi Way Corridor.

Response:

The table below indicates the approximate time required to obtain the permits identified for Alternative 6A (Broadway & Gaglardi Way Corridor).

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Authority / Regulator	Statute/Regulation	Permit Name	Anticipated Review Timeline (Days)
BC Hydro	N/A	Compatible Use Letter	150
BC Oil and Gas Commission (BC OGC)	<i>Oil and Gas Activities Act</i>	Major Pipeline Permit Amendment (30 inch) including Short Term Water Use, Changes in and About a Stream	150
BC Oil and Gas Commission (BCOGC)	<i>BC Environmental Management Act</i>	Waste Discharge Authorization	180
Burlington Northern Santa Fe Railway Company (BNSF)	N/A	Utility Agreement License	90
City of Burnaby	Sewer Charge Bylaw 1961	Disposal Permit (alternative to the waste discharge permit from OGC)	180
City of Burnaby	Engineering Permit	Encroachment Permit	60
City of Burnaby	Burnaby Noise or Sound Abatement Bylaw 1979	Exemption/Variance from Noise Control Bylaw	90
City of Burnaby	Engineering Permit	Hoarding and Shoring Permit	60
City of Burnaby	Engineering Permit	Hydrant Use Permit	30
City of Burnaby	Street and Traffic Bylaw 1961	Traffic Control Permit (lane closure request)	90
City of Burnaby	Tree Bylaw 1996	Tree Removal Notification	30
City of Burnaby	Engineering Permit	Truck Route Exemption	90
City of Burnaby	Zoning Bylaw	Rezone land for PRS	180
City of Burnaby	Soil Deposit Bylaw 1971	Soil Deposit Permit	90
City of Burnaby	Soil Removal Regulation Bylaw 1961	Soil Removal Permit	90
City of Burnaby	Operating Agreement	Utility Permit	180
Fisheries and Oceans Canada (DFO)	<i>Fisheries Act</i>	Request for Review	60
Fisheries and Oceans Canada (DFO)	<i>Fisheries Act</i>	Scientific License (Fish Salvage-only Ocean going fish)	90
Fisheries and Oceans Canada (DFO)	<i>Fisheries Act</i>	Fisheries Act Authorization	540
First Nations notifications	N/A	First Nation 45 day notification	45
FortisBC	N/A	Pipeline/ROW Permit	60
Imperial Oil	N/A	Crossing Agreement	60
Local landfill	N/A	Notification/ approval	14

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Authority / Regulator	Statute/Regulation	Permit Name	Anticipated Review Timeline (Days)
Metro Vancouver	N/A	Letter of consent from Metro Van Water and Liquid Waste	14
Metro Vancouver	Sewer Use Bylaw	Waste Discharge Permit (alternative to waste discharge permit from OGC for hydrostatic test water)	90
Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD)	<i>Wildlife Act</i>	General Permit Application (fish salvage, amphibian salvage, pacific water shrew)	180
Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD)	<i>Heritage Conservation Act</i>	Heritage Inspection/Investigation Permit Section 12.2	180
Ministry of Transport and Infrastructure (MoTI)	<i>Transportation Act</i> (Highway 1)	Work notification/lane closure request and approval form H1080	60
Ministry of Transport and Infrastructure (MoTI)	<i>Transportation Act</i> (Highway 1)	Works on Highway H10020	120
Pembina Oil Pipeline	N/A	Proximity Crossing Permit	90
Pembina Oil Pipeline	N/A	30 metre Permit-Ground Disturbance Safety Permit	60
Private Landowners	N/A	Land Use Agreement	60
Shaw	N/A	Third Party Agreement	60
Technical Safety BC	N/A	Piping Registration and Approval	30
Telus	N/A	Underground Crossing Agreement	60
Translink	N/A	Third Party Agreement (crossing)	90
Trans Mountain Pipeline	Approval	Pipeline Crossing	90
WorkSafeBC	OHS Regulation	Construction Permits	30

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**12. Reference: ALTERNATIVES EVALUATION; Table 4-5, Non-Financial Evaluation
Summary of Overland Gas Line Route Corridors**

The City of Burnaby notes that there are other major infrastructure projects planned to be in construction in the Broadway & Gaglardi Way corridor at the same time as the PGR project, including the Trans Mountain Expansion Project (TMEP).

12.1 Please explain whether FEI's assessment of Alternative 6A: Broadway & Gaglardi Way Corridor includes consideration of schedule impacts for conflicts with other infrastructure projects that are planned along this same corridor at the same time, including the TMEP.

Response:

FEI follows industry best practices in the development of a Consultation and Engagement Plan specific to a project's scope of work. As such, FEI regularly meets with other infrastructure owners and associated projects within the same route corridor, including Trans Mountain for the TMEP.

For example, as part of ongoing meetings with the TMEP, both parties communicate schedule information as it becomes available in order to mitigate conflicts or enable efficiencies during construction.

At this time, FEI is not aware of any third-party infrastructure projects that would result in schedule conflicts. Should FEI become aware of any additional infrastructure projects which plan to use the same corridor as the Project, FEI would endeavor to create and maintain strong communication channels to avoid potential conflicts that could negatively impact the Project schedule.

12.2 In the event of a scheduling conflict between the TMEPO and the PGR Project in the Broadway and gaglardi Way corridor, please advise whether the TMEP or the FEI PGR project will take precedence over the other during construction and provide the basis for FEI's answer.

Response:

As discussed in the response to Burnaby IR1 12.1, FEI will communicate schedule timelines to other infrastructure projects, including the TMEP, who plan to use the same route corridor.

Should a scheduling conflict occur, FEI will work with TMEP and permitting agencies, including the City of Burnaby, to achieve an equitable solution.

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The Broadway & Gaglardi Way corridor has a significant impact to Cariboo Road which is one of the only vehicle crossings of Highway 1 in the vicinity. Due to the importance of maintaining efficient traffic over this crossing, please assume that the City of Burnaby would likely insist on restoring all lanes of traffic on a nightly basis once work has stopped.

12.3. Please advise what schedule impacts FEI assumed for delays to construction arising from restoring all lanes of traffic on Cariboo Road on a nightly basis.

Response:

FEI did not assume schedule impacts for delays to construction arising from restoring all lanes of traffic on Cariboo Road on a nightly basis as the City of Burnaby did not communicate this to be a requirement during previous consultation discussions.

12.4 Please advise how FEI's Community, Indigenous and Stakeholder Impacts assessment - considered the impacts to schools, churches, senior's center and bus routes serviced by the Broadway & Gaglardi Way corridor, and how that was reflected in the scoring for that alternative.

Response:

Section 4.4.2.1 of the Application describes the individual elements that were used to evaluate overland route corridors. FEI's evaluation criteria included "Community Indigenous and Stakeholder Impacts", within which FEI considered community infrastructure along the route corridor that would be impacted during construction, including schools, hospitals, and recreation centres. This evaluation considered the volume of community infrastructure anticipated to be impacted along the route, as well as the potential level of impact. Bus routes were considered during the routing analysis, which will be included as part of Section 5 of the Application for the preferred route to be filed in the evidentiary update.

12.5 Please advise how FEI scored the impacts to the stakeholders identified in IR 12.4 in comparison to impacts to businesses.

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1 **Response:**

2 As discussed in the response to Burnaby IR1 5.5, impacts to specific stakeholders were not
3 scored separately, but were considered in the overall evaluation of each criterion.

4 FEI listed the number of businesses in Table 4-5 of the Application because of the significant
5 variation in the number of impacted businesses across the three corridors.

6

7

8

9 12.6 Please advise of the number of private landowners whose property would be
10 crossed by each of the Cape Horn Gate and Fraser Gate Corridor alternatives.

11

12 **Response:**

13 The number of private parcels whose property would be crossed by the Cape Horn Gate and
14 Fraser Gate Corridor alternatives is approximately 23 and 12 private parcels, respectively.

15

16

17

18 12.7 Please advise of the length of time expected to be needed for negotiations with
19 landowners for the Cape Horn Gate and Fraser Gate Corridor alternatives and
20 the basis for those estimates.

21

22 **Response:**

23 The length of time required for negotiations with landowners for any gas line project varies
24 widely from landowner to landowner. In a situation with an amenable landowner, FEI would
25 typically expect to acquire a new right of way within two to three months including completion of
26 an appraisal. Scenarios that may delay or extend negotiations with landowners include, but are
27 not limited to, the following:

- 28 • Landowner is not willing or able to grant right of way;
- 29 • Landowner does not agree with the appraised value of right of way;
- 30 • Landowner retains legal counsel to negotiate changes to the wording in the agreement;
- 31 • Landowner is difficult to contact; or
- 32 • Landowner is a company that requires a vote or approval by various parties.

33

34 In some instances, landowner negotiations could exceed six months or require FEI to pursue
35 expropriation to acquire the necessary land rights. If FEI is not successful in acquiring a right of
36 way within a six month time period and moves forward with expropriation, the expropriation

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process could require up to an additional year to secure the land rights to allow for construction to proceed.

12.8 Please advise on the expected duration and sequence of construction for the PGR in the Broadway and Gagliardi Way Corridor, and produce a copy of any schedule prepared to date for that work.

Response:

Attachment 12.8 provides the requested schedule. The expected duration for the Gagliardi Route construction is approximately six months including April to September 2022. The sequence of construction is broken down into five individual spreads in addition to trenchless crossings and the construction of the pressure reduction station as indicated on the schedule.

12.9 Please advise of the permitting FEI says is required from the one municipality for the Broadway & Gagliardi Way Corridor.

Response:

The Broadway & Gagliardi Way Corridor involves gas line construction and permitting within only the City of Burnaby. As described in Table 4-5 of the Application, the Cape Horn Gate Corridor and the Fraser Gate Corridor both involve gas line construction, and permitting from two municipalities. The Cape Horn Gate Corridor would involve the City of Burnaby and the City of Coquitlam, and the Fraser Gate Corridor would involve the City of Burnaby and the City of Vancouver.

FEI has an Operating Agreement with the City of Burnaby, dated April 19, 1926, originally made between the District of Burnaby and British Columbia Gas Company Limited that sets out the agreed terms on which FEI constructs and operates its natural gas lines in the streets and lanes and public places in Burnaby. As a result, FEI will seek the approval and consent from Burnaby's Engineer contemplated under Sections 2 and 3 of the Operating Agreement. FEI would also provide the City of Burnaby with its traffic management plans. In addition, FEI or its contractor may, depending on requirements specific to the work, seek permits from the City of Burnaby such as a hydrant use permit to use the city's hydrant for hydrostatic testing.

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12.10 Please advise of the length of time FEI assumes will be required for the permitting with the municipality for the Broadway and Gaglardi Way Corridor and provide the basis for FEI's answer.

Response:

FEI and the City of Burnaby have a long history of working collaboratively, including most recently on the LMIPSU Project. Consistent with that project, FEI would strive to execute a Terms of Reference Agreement with the City of Burnaby, which would include, among other things, City of Burnaby permit issuance timelines. Similar to the terms agreed to on the LMIPSU Project, FEI will be seeking agreement from the City of Burnaby that approvals for the location of the PGR gas line as required by the terms of the Operating Agreement would be issued within 15 business days of receipt of a complete submission by the City of Burnaby. FEI is also seeking the City of Burnaby's agreement to review and issue any other applicable permits related to the Project within 5 days of receipt of a complete submission to the City of Burnaby, or within 10 days for traffic permit applications that do not comply with approved Traffic Management Plans.

12.11 Please identify the third party utilities located along/near United Boulevard and how they would affect the construction of the Cape Horn Gate Corridor.

Response:

Third party utilities along/near United Boulevard include:

- Trans Mountain Pipeline
- City-owned water distribution line
- City-owned storm water line
- City-owned sanitary sewer line
- BC Hydro duct bank and overhead power lines
- Telus underground cables
- Shaw underground cables

The United Boulevard area is very congested with numerous third-party utilities mentioned above, which parallel and/or cross the proposed route. Urban open trench construction and trenchless methods could be used for construction of the proposed gas line along United Boulevard. The challenges and complexity for each method to deal with the congested third party utilities are explored below.

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1 **Open Trench:**

2 Along most sections of United Boulevard, a deep trenched single pipe installation technique
3 could be used. Crews would work to install short sections of gas line and backfill the excavation
4 as soon as possible after non-destructive examination of the welds and joint coating activities
5 are completed. The proposed gas line would be installed below all third party utilities,
6 necessitating deep excavations along with water control and disposal, as well as causing major
7 traffic disruptions. Construction crews would have to work in limited workspace areas to cut and
8 remove asphalt, excavate trenches, install shoring boxes, and cut and weld short lengths of pipe
9 to the previously installed pipe. Construction using short segments to negotiate around all third
10 party utilities would lead to low productivity, increasing the construction cost, schedule, and
11 traffic disruption.

12 **Trenchless:**

13 There are 28 identified trenchless crossings along United Boulevard and Braid Street due to
14 third party utilities and intersections during the Class 5 development from Burbridge Street to
15 Rousseau Street. Track boring construction would require receiving and launching pits within
16 the travel surface of United Boulevard. Finding appropriate locations for the pits without
17 impacting third party utilities or causing major traffic disruptions would be challenging. Several
18 water lines, sewer lines and storm water lines would require temporary relocation from the pits
19 to facilitate boring operation. Temporary relocation and permanent restoration of third party
20 utilities would lead to low productivity, increasing the construction cost, schedule, and traffic
21 disruption.

22
23

24

25 12.12 Please identify the third party utilities located along Buller Ave. and how they
26 would affect construction of the Fraser Gate Corridor.

27

28 **Response:**

29 Third-party utilities along/near Buller Avenue include:

- 30 • City-owned water distribution line
- 31 • City-owned storm water line
- 32 • City-owned sanitary sewer line
- 33 • BC Hydro overhead power line
- 34 • Telus cable wires and poles
- 35 • Shaw cable wires and poles

36

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Buller Avenue is congested with numerous third party utilities mentioned above, which parallel and/or cross the proposed route. Urban open trench construction and trenchless methods could be used for construction of the proposed gas line along Buller Avenue. The challenges and complexity for each method to deal with the congested third party utilities are explored below.

Open Trench:

Along most sections of Buller Avenue, a deep trenched single pipe installation technique could be used. Crews would work to install short sections of gas line and backfill the excavation as soon as possible after non-destructive examination of the welds and joint coating activities are completed. The proposed gas line would be installed below all third party utilities, necessitating deep excavations along with water control and disposal, as well as causing major traffic disruptions. Construction crews would have to work in limited workspace areas to cut and remove asphalt, excavate trenches, install shoring boxes, and cut and weld short lengths of pipe to the previously installed pipe. Construction using short segments to negotiate around all third party utilities would lead to low productivity, increasing the construction cost, schedule, and traffic disruption.

Trenchless:

During the Class 5 estimate development, 18 trenchless crossings were identified along Buller Avenue due to third party utilities and intersections from Gilley Avenue to Beresford Street. Track boring construction would require receiving and launching pits within the travel surface of Buller Avenue. Finding appropriate locations for the pits without impacting third party utilities or causing major traffic disruptions would be challenging. Several water lines, sewer lines and storm water lines would require temporary relocation from the pits to facilitate boring operation. Temporary relocation and permanent restoration of third party utilities would lead to low productivity, increasing the construction cost, schedule, and traffic disruption.

Each track bore operation from mobilization to restoration would require a construction window of three (3) to four (4) weeks. Excavation of the sending and receiving pits and temporary relocation of the adjacent utilities within the travelled roadway would lead to full closures of Buller Avenue during construction.

The narrow width of Buller Avenue, and the number of intersections to be crossed by trenchless methods, would require multiple trenchless and open cut trench and tie-in crews to work simultaneously. This would require full closures of Buller Avenue to traffic during the construction window.

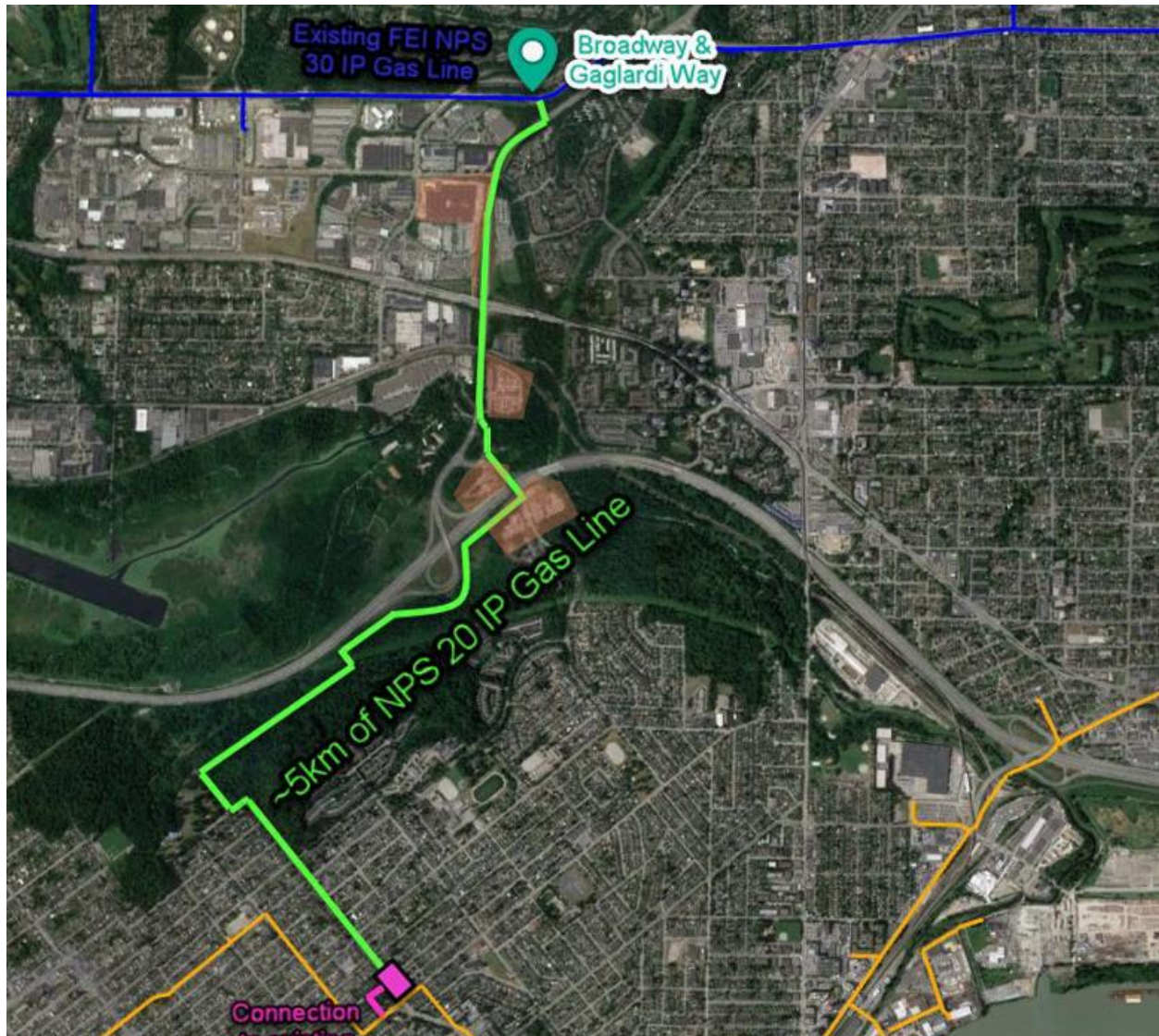
12.13 Please provide a map showing the locations of the businesses FEI says in Table 4-5 will be affected in the construction of

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- 1 12.13.1 the Broadway & Gaglardi Way Corridor,
- 2 12.13.2 the Cape Horn Gate Corridor, and
- 3 12.13.3 the Fraser Gate Corridor.
- 4

5 **Response:**

6 Below is a map of the Broadway & Gaglardi Way route Corridor, outlining potentially affected
 7 business in the orange shaded area. FEI estimates that there would be fewer than 10
 8 businesses potentially affected along this corridor. The primary access for businesses to the
 9 west of Gaglardi Way is via Production Way, which is not anticipated to be impacted by the
 10 Project.



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- 1 Below is a map of the Cape Horn Gate Corridor, outlining potentially affected businesses in the
- 2 orange shaded area. FEI estimates that there would be more than 100 businesses potentially
- 3 affected along this corridor. The primary access for businesses south of Highway 1 is United
- 4 Boulevard, with limited detour options for access.



- 5
- 6
- 7 Below is a map of the Fraser Gate Corridor, outlining potentially affected business in the orange
- 8 shaded area. FEI estimates that there would be more than 50 businesses potentially affected
- 9 along this corridor. The primary access for businesses is Marine Way, with limited detour
- 10 options for access.



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- 12.14 Please provide a map showing the location of the private lands· FEI.says in
Table 4-5 will be affected by
- 12.14.1 the Broadway & Gaglardi Way Corridor,
- 12.14.2 the Cape Horn Gate Corridor, and
- 12.14.3 the Fraser Gate Corridor.

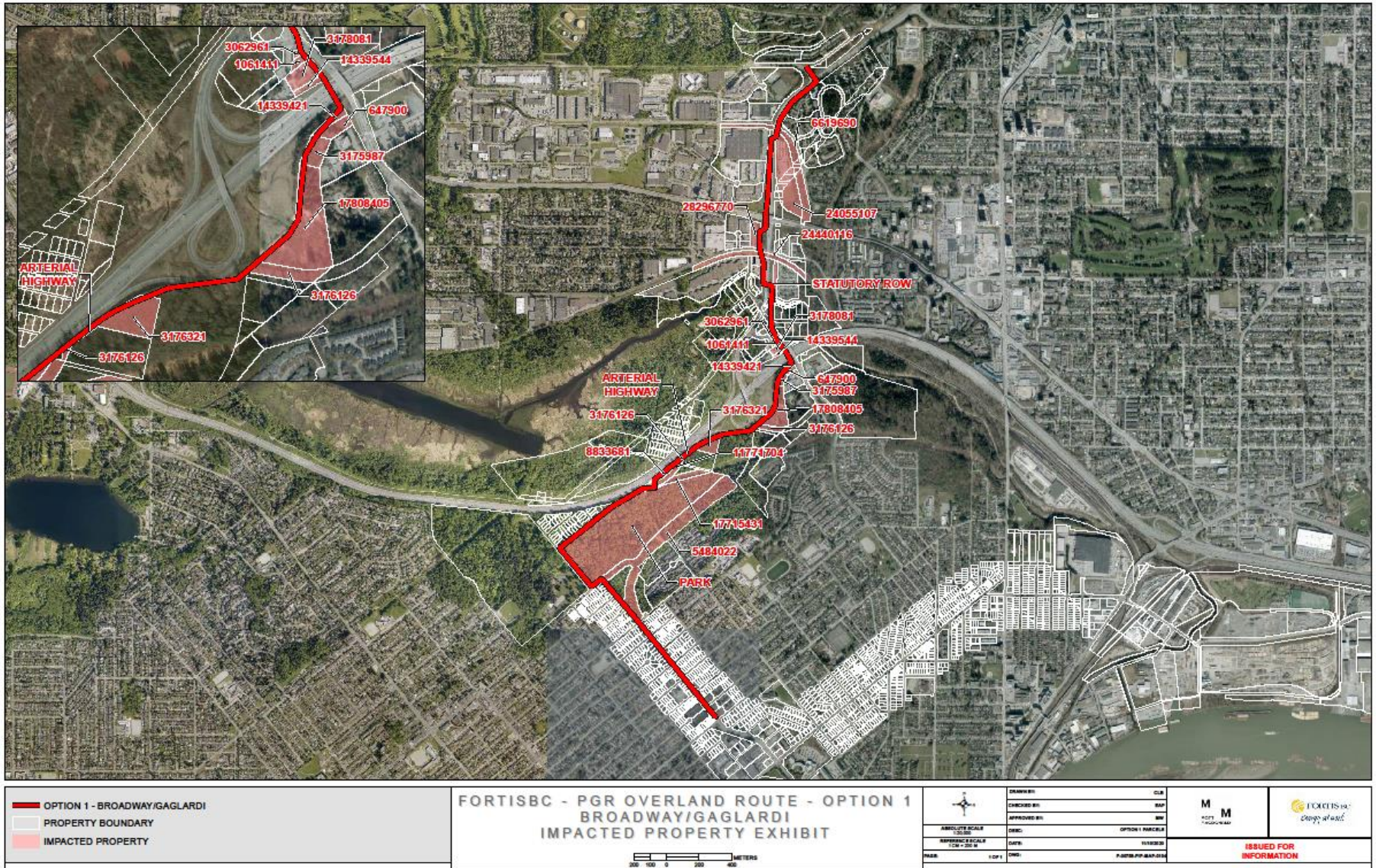
10 **Response:**

11 The requested maps are provided below, along with tables listing the private lands potentially
12 impacted by each alternative.

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Figure 1: Map Showing Potentially Impacted Private Lands on Broadway & Gagliardi Way Corridor



2

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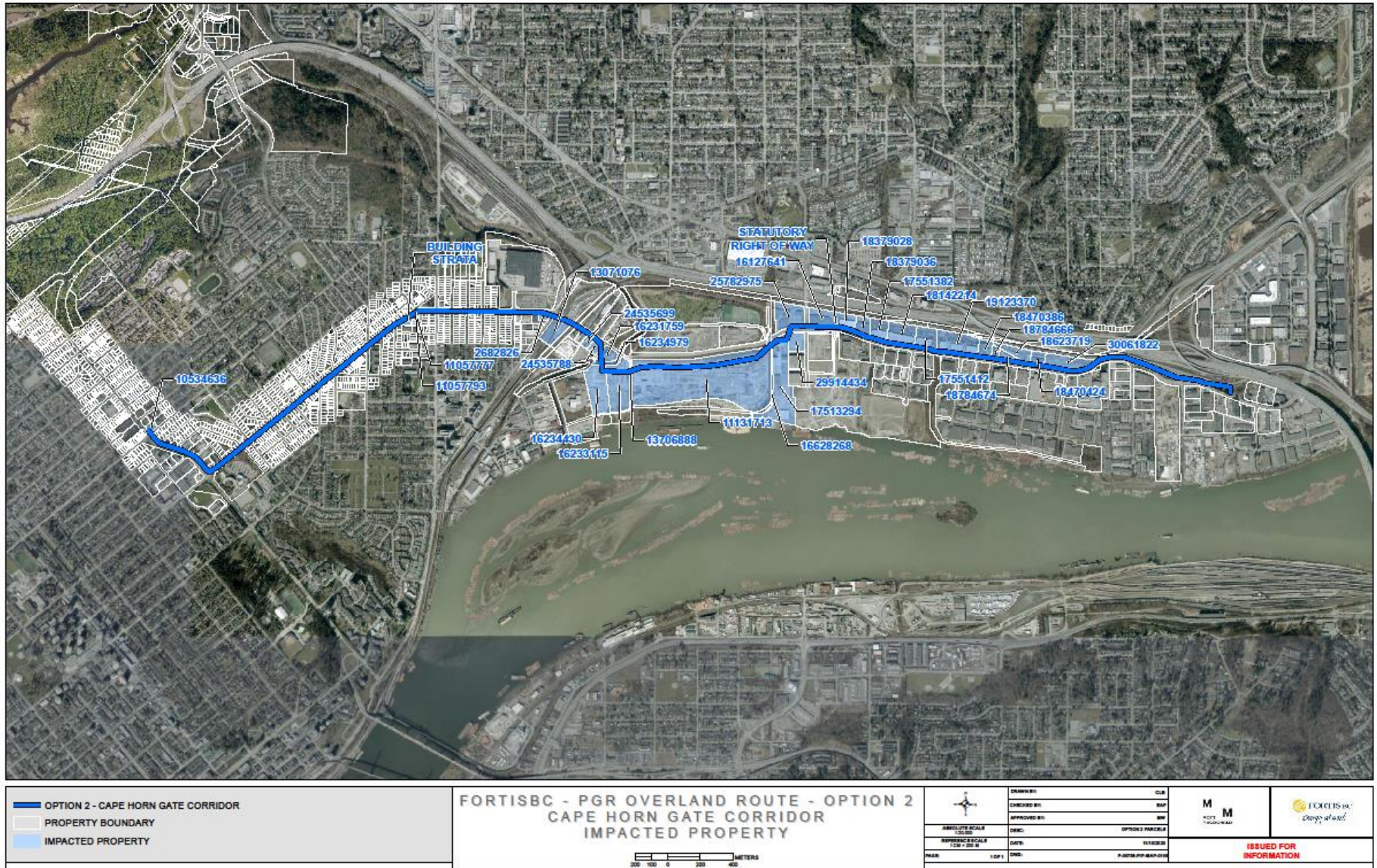
1 **Table 1: Potentially Impacted Private Lands on Broadway & Gaglardi Way Corridor**

Name	PID	Owner Type	Municipality
003178081	3178081	Federal	Burnaby, City of
Arterial Highway	0	Crown Provincial	Burnaby, City of
005484022	5484022	Crown Agency	Burnaby, City of
011771704	11771704	Crown Agency	Burnaby, City of
017715431	17715431	Municipal	Burnaby, City of
008833681	8833681	Crown Agency	Burnaby, City of
028296770	28296770	Private	Burnaby, City of
017808405	17808405	Municipal	Burnaby, City of
014339544	14339544	Crown Agency	Burnaby, City of
003175987	3175987	Crown Agency	Burnaby, City of
006619690	6619690	Municipal	Burnaby, City of
024440116	24440116	Private	Burnaby, City of
014339421	14339421	Crown Agency	Burnaby, City of
000647900	647900	Municipal	Burnaby, City of
003176321	3176321	Municipal	Burnaby, City of
Park	0	Municipal	Burnaby, City of
024055107	24055107	Municipal	Burnaby, City of
001061411	1061411	Municipal	Burnaby, City of
003176126	3176126	Crown Provincial	Burnaby, City of
003176126	3176126	Crown Provincial	Burnaby, City of
Statutory RoW	0	None	Burnaby, City of
003062961	3062961	Municipal	Burnaby, City of

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1

Figure 2: Map Showing Potentially Impacted Private Lands on Map on Cape Horn Gate Corridor



2

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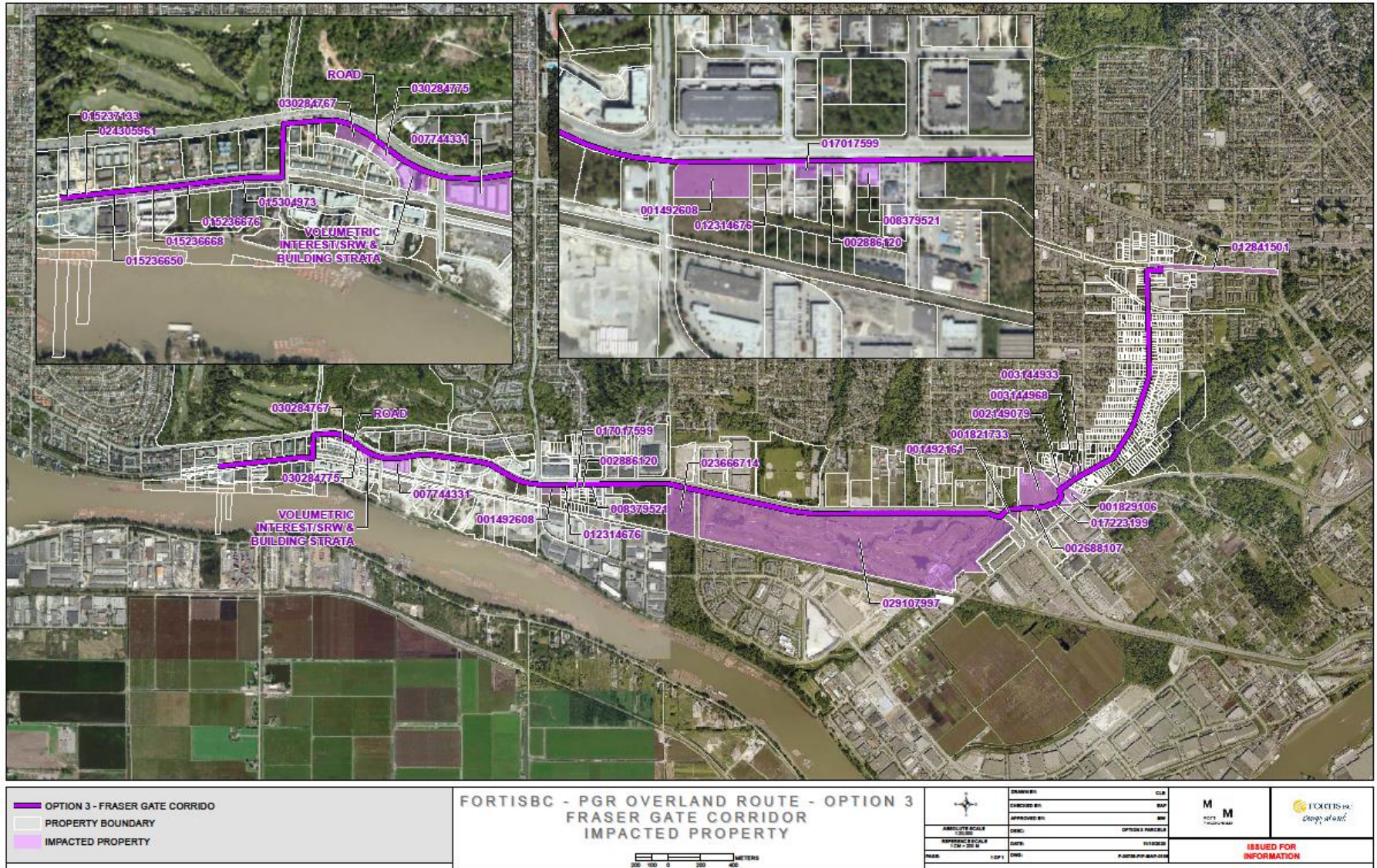
1

Table 2: Table of Potentially Impacted Private Lands on Cape Horn Gate Corridor

Name	PID	Owner Type	Municipality
017551412	17551412	Private	Coquitlam, City of
018379036	18379036	Private	Coquitlam, City of
018379028	18379028	Private	Coquitlam, City of
017551382	17551382	Private	Coquitlam, City of
030061822	30061822	Crown Agency	Coquitlam, City of
011057777	11057777	Private	New Westminster, The Corporation of the City of
Building Strata	0	Unknown	New Westminster, The Corporation of the City of
018784666	18784666	Private	Coquitlam, City of
019123370	19123370	Private	Coquitlam, City of
016231759	16231759	Private	New Westminster, The Corporation of the City of
025782975	25782975	Private	Coquitlam, City of
Statutory RoW	0	Unknown	Coquitlam, City of
002682826	2682826	Private	New Westminster, The Corporation of the City of
016127641	16127641	Private	Coquitlam, City of
013706888	13706888	Municipal	New Westminster, The Corporation of the City of
024535788	24535788	Private	New Westminster, The Corporation of the City of
018470386	18470386	Private	Coquitlam, City of
011131713	11131713	Private	Coquitlam, City of
013071076	13071076	Private	New Westminster, The Corporation of the City of
024535699	24535699	Private	New Westminster, The Corporation of the City of
018623719	18623719	Private	Coquitlam, City of
011057793	11057793	Private	New Westminster, The Corporation of the City of
018142214	18142214	Private	Coquitlam, City of
010534636	10534636	Municipal	Burnaby, City of
018470424	18470424	Private	Coquitlam, City of
018784674	18784674	Private	Coquitlam, City of
016628268	16628268	Municipal	Coquitlam, City of
017513294	17513294	Private	Coquitlam, City of
029914434	29914434	Private	Coquitlam, City of
016233115	16233115	Federal	New Westminster, The Corporation of the City of
016234979	16234979	Municipal	New Westminster, The Corporation of the City of
016234430	16234430	Federal	New Westminster, The Corporation of the City of

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1 **Figure 3: Map Showing Potentially Impacted Private Lands on Map on Fraser Gate Corridor**



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Table 3: Table of Potentially Impacted Private Lands on Map on Fraser Gate Corridor

Name	Plan Number	PID	Owner Type	Municipality
012314676	NWP1742	12314676	Municipal	Burnaby, City of
001829106	NWP69745	1829106	Private	Burnaby, City of
017223199	NWP88413	17223199	Municipal	Burnaby, City of
Volumetric Interest	EPP74422	0	Unknown	Vancouver, City of
029107997	EPP30041	29107997	Municipal	Burnaby, City of
001492608	NWP12611	1492608	Private	Burnaby, City of
017017599	NWP87886	17017599	Private	Burnaby, City of
003144933	NWP1219	3144933	Municipal	Burnaby, City of
Volumetric Interest	EPP74421	0	Unknown	Vancouver, City of
002886120	NWP1742	2886120	Private	Burnaby, City of
001821733	NWP450	1821733	Private	Burnaby, City of
008379521	NWP1742	8379521	Private	Burnaby, City of
Road	EPP65172	0	Municipal	Vancouver, City of
002688107	NWP54032	2688107	Municipal	Burnaby, City of
015237133	VAP3729RX	15237133	Municipal	Vancouver, City of
Volumetric SRW	EPP76763	0	Unknown	Vancouver, City of
Volumetric Interest	EPP74423	0	Unknown	Vancouver, City of
023666714	LMP31531	23666714	Municipal	Burnaby, City of
012841501	NO_PLAN	12841501	Crown Agency	Burnaby, City of
024305961	VAP5944	24305961	Municipal	Vancouver, City of
Volumetric Interest	EPP74424	0	Unknown	Vancouver, City of
003144968	NWP1219	3144968	Municipal	Burnaby, City of
030284775	EPP65172	30284775	Municipal	Vancouver, City of
001492161	NWP3711	1492161	Municipal	Burnaby, City of
007744331	VAP14773	7744331	Private	Vancouver, City of
015236676	VAP670A	15236676	Private	Vancouver, City of
015304973	VAP455	15304973	Private	Vancouver, City of
030284767	EPP65172	30284767	Municipal	Vancouver, City of
015236668	VAP670A	15236668	Private	Vancouver, City of
Building Strata	EPS4416	0	Unknown	Vancouver, City of
015236650	VAP670A	15236650	Private	Vancouver, City of
002149079	NWP930	2149079	Private	Burnaby, City of

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12.15 Please identify the impacts FEI says in Table 4-5 the Fraser Gate Corridor would have on the City of Vancouver.

Response:

The Fraser Gate Corridor option would include gas line construction within the City of Vancouver, mainly on East Kent Avenue and Marine Way.

Anticipated impacts identified by FEI relevant to the City of Vancouver include:

- Traffic disruptions to Marine Way, a major arterial corridor servicing Vancouver, among other municipalities. Marine Way is part of TransLink's Frequent Transit Network, meaning buses run along the corridor at least once every 15 minutes in both directions; and
- Increased traffic on surrounding streets as vehicles seek to avoid the disruption, including on Marine Drive, which is a street with a number of 4-way stop intersections. Marine Drive also has many residential complexes and direct driveways connecting to it, and adding additional traffic to it may negatively affect the neighbourhood.

12.16 Please advise if FEI has had any consultations with the City of Vancouver about the Fraser Gate Corridor and, if there have been consultations, what the outcome of those consultations has been.

Response:

As discussed in Section 4.4.2.4 of the Application, the Fraser Gate Corridor would not meet Project schedule requirements, and is therefore not feasible. As such, FEI has not consulted the City of Vancouver on the Fraser Gate Corridor.

12.17 Please provide specifics about the re-routing FEI says is available to mitigate impacts of species at risk for the Broadway & Gagliardi Way Corridor.

Response:

The majority of the proposed footprint of the Project route has been planned to stay within previously disturbed areas and roadways, as well as utilizing existing stream crossings (e.g., culverts), to avoid open trench crossings of streams and creeks and avoid impact to species at risk and their habitat. Re-routing the alignment to keep the pipe out of undisturbed greenspaces

FortisBC Energy Inc. (FEI or the Company) Application for a Certificate of Public Convenience and Necessity for the Pattullo Gas Line Replacement Project (Application)	Submission Date: November 19, 2020
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1 is feasible throughout most of the proposed alignment, with the exception of the Brunette River.
2 Riparian critical habitat for Nooksack Dace is present at the Brunette River, and routing could be
3 considered to minimize the footprint, including using existing disturbed areas and roads on the
4 east side of the Gaglardi Way overpass, to minimize the impact to riparian habitat.

5
6
7
8 12.18 Please advise if FEI has undertaken any assessment of the extent to which traffic
9 will be affected by each of Alternatives 6A, 6B and 6C, including number of
10 vehicles per hour and per day during construction.
11

12 **Response:**

13 Table 4-5 of the Application provides the results of the high-level analysis (consistent with an
14 AACE Class 5 level of definition) for each of Alternatives 6A, 6B and 6C. A detailed traffic count
15 and analysis is typically done at a later design phase of a project. As Alternative 6A was initially
16 considered to be the preferred alternative (amongst Alternatives 6A, 6B and 6C) and
17 subsequently advanced to the Class 4 estimate level of definition, FEI completed traffic data
18 collection at study intersections relevant to Alternative 6A. This data was used to develop a
19 Traffic Management Strategy, which was sent to the City of Burnaby for preliminary feedback on
20 July 27, 2020.

21

FortisBC Energy Inc. (FEI or the Company) Application for a Certificate of Public Convenience and Necessity for the Pattullo Gas Line Replacement Project (Application)	Submission Date: November 19, 2020
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13. Reference: Table 4-6 Financial Evaluation Summary

13.1 Please show how FEI considered the cost of construction logistics from available workspace and laydown areas in its cost estimates, including how much was added to the capital cost estimate for each of the options in Table 4-6 for construction logistics.

Response:

FEI did not directly identify the cost of construction logistics associated with the available workspace and laydown areas, or the cost of traffic management in its estimates for these alternatives at this stage of the estimate development.

Table 4-6 in the Application is the Financial Evaluation Summary of the AACE Class 5 Overland Gas Line Alternative cost estimates. AACE RP 97R-18 – *Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction As Applied in Pipeline Transportation Infrastructure Projects* lists a set of deliverables, as per Table 3, including preliminary project scope definition, preliminary tie-in locations, limited hydraulic design, preliminary route mapping/alignment sheets and limited discipline drawings for an estimate to be classified as Class 5. FEI confirms that it has completed the requirements to satisfy the Class 5 requirements in accordance with the AACE best practices.

13.2 Please advise if FEI included the cost of traffic management in its cost estimates.

13.2.1 If yes, please indicate how much was added to the capital cost estimate for each of the options in Table 4-6 for traffic management.

13.2.2 If no, please explain why not.

Response:

Please refer to the response to Burnaby IR1 13.1.

Attachment 2.2



16705 Fraser Highway
Surrey, B.C. V4N 0E8
www.fortisbc.com

By Email - Wendy.Itagawa@gov.bc.ca

6 December 2018

Executive Project Director
Pattullo Bridge Replacement Project
1100 – 401 West Georgia
Vancouver BC V6B 5A1

Attn: Wendy Itagawa, P.Eng

Dear Ms Itagawa:

Re: your written notice of 6 June 2017, MOTI's Chief Engineer's letter to FortisBC dated 30 October 2018 and meeting of 23 November 2018

As noted in our referenced letter to the MOTI's Chief Engineer, since receiving the written notice we have been working diligently towards the removal and replacement of the gas line and have now finalized some targeted milestones by month. These target milestones, considering the discussions we have had with your staff on a construction window in 2021, are:

Submit CPCN to BCUC	November 2019
CPCN approval (est)	September 2020
Engage contractor	March 2021
Undertake works	July-December 2021

Based on the above schedule, we kindly request that the time to remove all infrastructure of the existing Pattullo Bridge be extended to on or before December 31, 2021. As indicated in our meeting of 23 November 2018, there are uncertainties with an HDD installation under a river but we have not factored that into the timelines.

Respectfully,

A handwritten signature in blue ink, appearing to read "Joseph R. Sukhnandan", written over a horizontal line.

Joseph R. Sukhnandan
Project Director, Major Projects Development

Ec: Tracy Cooper, Pattullo Bridge Replacement Project



16705 Fraser Highway
Surrey, B.C. V4N 0E8
www.fortisbc.com

27 May, 2018 ~~2018~~ 2019

Pattullo Bridge Replacement Project
1100 – 401 West Georgia
Vancouver, BC
V6B 5A1

*Letter sent w/ incorrect
date. No need to resend
given subsequent letters
referenced within - mk.*

Attention: Wendy Itagawa, P.Eng.
Executive Project Director

Dear Ms Itagawa:

**Re: MOTI's Chief Engineer's letter written to FortisBC dated 30 October 2018 and
FortisBC's letter to yourself dated 6 December 2018**

FortisBC Energy Inc. ("FortisBC") appreciates there is a need for integrated planning and cooperation between FortisBC and the Pattullo Bridge Replacement ("PBR") Project, and look forward to continue doing so.

As the Ministry of Transportation and Infrastructure ("MoTI") has not approved FortisBC's request to construct a replacement natural gas line on the new Pattullo Bridge, we are continuing to investigate the feasibility of horizontal directional drill ("HDD") alternatives and overland upgrade alternatives. Regardless of the construction method selected, each alternative involves varying levels of uncertainty and risk. These risks include, but are not limited to, regulatory approvals, addressing stakeholder concerns, reaching agreement with the municipalities, and the usual construction risks. These risks have the potential of delaying the construction of the new gas line and subsequent decommissioning of the existing gas line.

FortisBC would like to bring to your attention that FortisBC is sending Translink notice that FortisBC disagrees with certain aspects of the notice that Translink provided FortisBC on June 6, 2017. We have copied you with a letter to Translink that sets out our position. FortisBC will continue to work diligently towards construction of a new HDD gas line by the target milestone date of December 31, 2021, assuming no delays, and will keep the PBR Project team informed of FortisBC's progress. FortisBC will inform you of its target milestone for an overland option in the event that this option becomes FortisBC's preferred option.

FortisBC appreciates the assistance that the Province can provide FortisBC in reducing risk of delays beyond the target milestone date for the replacement of the gas line. We look forward to finalizing the Memorandum Of Understanding that sets out the assistance that the Province is presently offering to FortisBC. We will advise you as we become aware of opportunities for further assistance by the Province.

We look forward to continuing to meet with the Pattullo Bridge Replacement Project team on an ongoing basis as we progress towards our respective regulatory and project milestones.



16705 Fraser Highway
Surrey, B.C. V4N 0E8
www.fortisbc.com

Respectfully,

A handwritten signature in blue ink, appearing to read "J. Sukhnandan", written over a faint, larger signature.

Joseph R. Sukhnandan

Project Director, Major Projects Development

Cc: Translink, Sany Zein, Vice President, Infrastructure Management and Engineering

By Email – Wendy.Itagawa@gov.bc.ca

10th September 2019

Ministry of Transportation and Infrastructure
Pattullo Bridge Replacement Project
1100-401 West Georgia
Vancouver, BC
V6B 5A1

**Attention: Wendy Itagawa, P.Eng.
Executive Project Director**

Dear Ms. Itagawa,

Re: August 28 2019 meeting with Pattullo Bridge Replacement (PBR) Project team, TI Corp and Ministry of Transportation and Infrastructure (MoTI) regarding FortisBC gas line on Pattullo Bridge

This letter is to follow up on our recent meeting regarding the replacement of the FortisBC gas line currently attached to the Pattullo Bridge. As discussed in the meeting, FortisBC has completed additional analysis for the two horizontal directional drill (HDD) alternatives identified in the 2017 Options Study Report.

This analysis concluded that the two HDD alternatives are not feasible because there are significant risks to constructing the new gas line and as such, FortisBC is no longer targeting the December 2021 completion date for relocation of the gas line, previously communicated to various stakeholders including the PBR Project team. As detailed and referenced in the draft report attached, these factors include: the high risk of a hydraulic fracture event and mud loss into the Fraser River; the proximity of the alignments to existing bridge piers; and significant concerns from key rights holders to issue the necessary authorizations for an HDD crossing that could lead to possible settlement of their infrastructure.

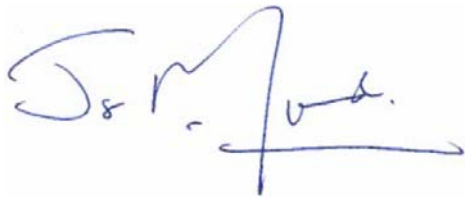
As a result of the above, FortisBC is now pursuing a new HDD alignment and other alternative solutions to meet the capacity needs of the approximate 30,000 customers that rely on the existing Pattullo gas line should the weather temperature fall below -1 degree Celsius. As such, FortisBC will continue to advance the investigations of these alternative solutions and will proceed towards filing of a Certificate of Public Convenience and Necessity (CPCN) application to the British Columbia Utilities Commission. However, it is important to note that this new HDD alignment could face similar risk factors as the two previous alignments and prove not feasible. Moreover, the other alternatives would require significant stakeholder engagement due to the complexity and coordination required for construction in urban areas. As a result, FortisBC advises that meeting the MoTI's current Pattullo Bridge decommissioning schedule of 2024 is challenging. FortisBC anticipates advising the PBR Project team by Q1 2020 on the preferred solution and the target completion date.

The analyses conducted thus far have led FortisBC to conclude that currently the only gas line replacement option that meets the existing Pattullo Bridge decommissioning schedule with certainty is to construct the replacement gas line on the new Pattullo Bridge. Additionally, FortisBC's early engagement indicates that the on bridge option is the least impactful to the community, First Nations and the environment.

As noted in the letter received from the MoTI Chief Engineer in October 2018, the Ministry denied FortisBC's previous request to attach the gas line to the new bridge due to the lifeline criteria and noted that other alternatives were available to FortisBC. Given the two original HDD alternatives are no longer feasible and the other alternatives do not provide schedule certainty to meet MoTI's Pattullo Bridge decommissioning, which is currently scheduled for 2024, FortisBC is seeking a reconsideration of the decision to disallow the replacement gas line on the new Pattullo Bridge. To facilitate the reconsideration, FortisBC proposes that MoTI and FortisBC pursue an independent third party to determine if the gas line could be designed to attach to the new Pattullo Bridge in a manner that meets MoTI's lifeline criteria. FortisBC would fund this third party review, and work collaboratively with MoTI to identify a mutually agreeable firm and scope of work. In the meantime, FortisBC will continue to advance investigation of alternatives in preparation for a CPCN filing, in parallel with the third party review mentioned above.

We appreciate the collaboration and coordination to date between the FortisBC and the Pattullo Bridge Replacement teams, and remain committed to the success of both projects. We look forward to meeting at your earliest convenience to discuss this proposal, and work towards a solution that will meet MoTI's bridge replacement timelines.

Respectfully,



Joseph R. Sukhnandan
Project Director, Major Projects Development

Ec: Amanda Farrell, President & CEO, TI Corporation
Sany Zein, VP, Infrastructure Mgmt & Engineering, Translink
Kevin Volk, Assistant Deputy Minister, Major Projects – Infrastructure & Properties
Development

Attachment: Pre-FEED HDD Alignment Route Evaluation (Draft)



Technical Memo

Project:	Pattullo Gas Line Replacement Project		
Our reference:	514100039-MMD-00-P0-MO-PP-0001	Your reference:	000758-P-150-001-0001
	Rev B		
Prepared by:	D. Delaloye, P.Eng.	Date:	August 1, 2019
Approved by:	P. Procter, P.Eng.	Checked by:	G. Duyvestyn, P.Eng.
Subject:	Pre-FEED HDD Alignment Route Evaluation		

1 Overview

This Technical Memo formally documents information provided in an email sent by Peter Kiewit Sons ULC (Kiewit) to FortisBC Energy Inc. (FortisBC) on July 22, 2019. The email summarized a July 18, 2019 conference call held between FortisBC, Kiewit and Mott MacDonald, where challenges presented by the Pre-Front End Engineering Design (Pre-FEED) horizontal directional drilling (HDD) alignments were discussed.

This memo follows the sequence of discussions presented during the July 18, 2019 call. Google Earth images of the Pre-FEED alignments, which cross the Fraser River between New Westminster and Surrey, are provided prior to discussing challenges associated with each crossing. A brief summary of the reviewed geotechnical conditions contained within information provided by FortisBC is also presented. From these summaries, the geotechnical and geometrical challenges associated with each crossing are discussed in detail.

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

2 Design Requirements for a Successful HDD Crossing

Several factors must be considered to provide a constructible HDD alignment for a given crossing. The main factors requiring careful consideration typically include:

- Crossing features and any associated site constraints (including requirements from third parties);
- Topographical changes along the alignment;
- Required depth of cover along the alignment to resist required drilling fluid pressures;
- Appropriate setback distance from crossing features to attain proper installation depth;
- Geometric constraints associated with the HDD installation process;
- Presence of high-risk geotechnical materials and their anticipated behaviours; and
- Staging area requirements at the HDD entry, exit and pipe stringing locations.

Each of these factors are briefly discussed below. It is the intent of these discussions to provide justification on what is required for a successful HDD installation.

2.1 Crossing Features and Site Constraints

Several features are crossed by the Pre-FEED HDD alignments, and depend on the HDD entry and exit locations and alignment. The features crossed may include, but are not limited to:

- Bridge piers associated with the Pattullo Bridge within the Fraser River;
- Bridge piers associated with the Canadian National Railway (CN) Rail Bridge within the Fraser River;
- CN Rail Bridge swing bridge support structures;
- CN Rail Bridge structure on south side of the Fraser River;
- Skytrain tunnel on the north side of the crossing;
- Skytrain bridge on the south side of the crossing;
- CN rail lines on the north side of the Fraser River;
- CN rail lines on the south side of the Fraser River;
- Local roads and highways; and
- Existing utilities.

Given that there are 10 bridge piers within the Fraser River boundary over a crossing distance of approximately 500 m and that the piers on the south side of the crossing are regularly spaced 6 to 8 m apart, selection of an alignment that avoids these piers using the proposed HDD entry and exit locations is not possible. It is not industry standard to construct an HDD installation under bridge piers. Of note, the DP DN 580 provided in the Pre-FEED study is located either directly beneath or in close proximity to two of CN's bridge piers and below one of the Pattullo Bridge piers. While the TP/IP DN 323.9 alignment does not cross directly beneath the CN bridge piers, it is located directly beneath two Pattullo Bridge piers and in close proximity to a third.

2.2 Topography Changes

The ground surface in the vicinity of the Pre-FEED alignments on the south side of the Fraser River is relatively flat at approximately El. 2.4 m. Beneath the Fraser River, the mudline (river bottom) fluctuates from 0 to 20 m in depth, with the deepest portion of the river bottom near its northern edge.

For the TP/IP DN 323.9 alignment, the ground surface on the north side of the river slopes upward at approximately 15 degrees for a distance of 110 m and gains elevation from El. 0 m to 30 m. Beyond this point, the ground surface becomes more gentle as it continues to climb at approximately 6 degrees.

Similar ground surface slopes are observed for the DP DN 580 crossing alignment of the Fraser River.

The proposed northern HDD entry locations for the Pre-FEED alignments are El. 36 m and El. 44 m, respectively. The proposed southern HDD entry location for both options is El. 2.4 m. The resulting difference in elevation is approximately 34 and 42 m respectively for TP/IP DN 323.9 and DP DN 580. HDD installations with these magnitudes of elevation differences have been completed to date but are relatively uncommon. HDD alignments with elevation differences of this magnitude possess increased installation risks that typically include:

- Managing and controlling drilling fluid flow;
- Bore instability due to a lack of drilling fluid support within the portion of the HDD alignment above the elevation of the lower elevation side; and
- Drilling fluid flushing through the bore when the bore drains to the lower side of the installation (southern location).

Additional baker tanks may be needed to allow for quick collection and storing of the volume of fluid that may flush to the lower elevation side. Bore instability caused by a lack of supporting drilling fluid can be mitigated through the installation of large diameter casing pipe to bridge and support the ground between the high and the low sides of the HDD installation. Installation of long casing sections may result in difficulties removing the casing pipe upon completion of HDD operations. A casing installation strategy is typically detailed as the design matures and additional geotechnical conditions are characterized.

Higher drilling fluid pressures are required when HDD installations are advanced from the higher side of a crossing. This is due to the greater hydrostatic component of the drilling fluid pressure associated with the higher elevation of the HDD entry.

2.3 Depth of Cover

The depth of cover for a given HDD installation is dependent on several factors, which include:

- Anticipated geotechnical materials and their behaviour;
- Presence of preferential drilling fluid flow pathways;
- Design bending radius of the product pipe;
- Need for temporary casing;
- Presence of existing utilities and/or structures including clearance requirements; and
- Overall installation length.

The most important factor in determining the appropriate depth of cover for a given HDD installation is the material properties of the overlying geotechnical material and the resistance that it provides against the required installation-induced bore fluid pressures necessary to remove the cuttings. Another important factor in establishing the proper installation depth is the ability to maintain bore stability over the course of the installation. Ensuring bore stability is accomplished by designing the HDD alignment to bore through geotechnical materials favourable to HDD operations. Favourable materials include compact sands and dense clays and silts with low gravel and cobble contents.

Controlling and maintaining drilling fluid flow within the bore is critical to the success of an HDD installation. Installation risks significantly increase when slurry circulation is not maintained within the HDD bore. The flow of drilling fluid follows the path of least resistance. As long as the bore is located within favorable geotechnical materials at a sufficient installation depth along the entire alignment and the contractor adheres to good HDD drilling practices, a stable flow pathway can be created between the drill bit and the HDD entry or exit locations such that maintaining drilling fluid flow within the bore should not be difficult to achieve.

Conversely, if the bore is located within unfavorable geotechnical materials (low strength to resist the required drilling fluid pressures, permeable that permit for drilling fluid flow away from the bore), significant difficulties can be expected to occur during an installation. These difficulties can sometimes be mitigated with a greater depth of cover.

The required depth of cover for an HDD installation can be verified by performing a hydraulic fracture evaluation to determine required and allowable drilling fluid pressures for the installation. This evaluation follows the procedure commonly referred to as the Delft Geotechnics Method that is outlined in Appendix B of the Army Corps of Engineers 1998 Report CPAR-GL-98 and 2002 Report ERDC/GSL TR-02-9 (Guidelines for Installation of Utilities Beneath Corps of Engineers Levees Using Horizontal Directional Drilling). To account for assumptions with geotechnical properties assigned to various geological units along the HDD alignment, as well as typical heterogeneity within the units themselves, it is common with the Delft method to apply a factor to the maximum theoretical formation pressure produced. The factor essentially serves as a factor of safety to decrease the allowable drilling fluid pressure for an installation. Refer to Section 3.1.2 for further details on hydraulic fracture analysis for the Pre-FEED alignments.

The required drilling fluid pressure is a function of two components: the hydrostatic column of drilling fluids above a point in question and the drilling fluid flow component necessary for drilling fluids to flow from the point in question back to the drill rig. The allowable drilling fluid pressure is a function of the strength of the overlying geotechnical materials above a point in question. For a successful HDD installation, the required drilling fluid pressure should be well below the allowable drilling fluid pressure.

2.4 Setback Distance

The setback distance refers to the distance between the HDD entry location and a critical feature, such as the edge of the Fraser River. Insufficient setback distances from features impact the ability to attain proper depth of cover beneath the feature and can dramatically increase the hydraulic fracture risk for a given installation. A hydraulic fracture (inadvertent drilling fluid return) refers to the event where drilling fluids migrate up through the geotechnical materials (rather than flowing within the HDD bore) and pond on the ground surface or at the bottom of the river. If the setback distance is too close to a critical feature and proper depth cannot be maintained, it may not be possible to complete the HDD installation from the requested location without significant installation risks.

2.5 Geometric Constraints

The geometry of an HDD installation needs to consider many different factors that include:

- The product pipe requirements (pipe diameter, grade, maximum allowable operating pressure, wall thickness, and allowable bend radius);
- Site topography and bathymetry data;
- Casing pipe requirements and drill and intersect installation strategy;
- Geotechnical materials and their anticipated behaviour; and
- Site constraints associated with existing above and below ground structures.

HDD installations are typically designed with entry angles between 8° and 18° (from horizontal), although steeper entry angles have been used where insufficient setback distance or steeply sloping ground exists for a given alignment. Given the 15 degree ground surface slope on the north side of the Fraser River, the HDD entry angle on this side of the crossing will need to be steeper than what is considered more traditional of an HDD installation. This steeper angle is required to attain the appropriate depth of cover at the edge and below the north side of the Fraser River.

The HDD entry location on the south side of the crossing has a lower bore angle than the northern HDD entry location, as shown on the Pre-FEED alignments. This angle was likely selected in consideration of the product pipe diameter, the equipment necessary to transition the pipe into the bore, and the stresses induced as the pipe is forced over the break-over location as it enters the HDD bore. Note that while steeper exit angles allow for greater installation depth near the exit location, they increase the length of the break-over section of the product pipe where the product pipe is transitioned from laying on the ground, up and into the air, and into the HDD bore.

Vertical curvature is inherent to all HDD installations, while horizontal curvature is dependent on the constraints specific to the HDD alignment. While utilizing a horizontal curve within an HDD installation is feasible, it increases the complexity of the scope of design and construction. It also increases the stress, and therefore the risk, to the pipe and the overall installation. Steering concurrently in both the horizontal and vertical planes (a compound curve) is not a standard industry practice and can lead to complex radii and a reduction in the overall bending radius that the pipe will be subjected to. The Pre-FEED alignments incorporate straight alignments eliminating the risks associated with horizontal curvature.

For a drill and intersect installation (where individual pilot bores are drilled from each side of the crossing and meet within a targeted intersection location), the horizontal tangent in the middle of the HDD installation must be adequately sized to provide the ability to steer the individual pilot bores together while staying within the allowable tolerances of the product pipe. A sufficient horizontal tangent length allows for steering of the individual pilot bores to meet within a single plane as opposed to requiring a contractor to intersect while steering in both the vertical and horizontal planes. Within the HDD industry, the industry standard for an appropriate horizontal tangent is approximately 135 to 150 m. For more challenging installations and in installations where long lengths of casing pipe are required (i.e. greater than 50 m), this horizontal tangent length may need to be increased.

2.6 Geotechnical Materials

As discussed earlier, successful HDD installations require placement within geotechnical materials deemed to be favorable to an HDD installation and include materials that can be conditioned and stabilized during the drilling process as well as those that provide sufficient strength to resist drilling fluid pressures required to complete the installation.

Sands, silts, and clays typically don't present significant challenges to an HDD installation. These materials are often described as good to excellent materials in terms of feasibility. However, when these soils exist in a very soft to soft (cohesive soil) or very loose to loose (granular soil) state, they may not provide sufficient strength to resist the required fluid pressures necessary to complete an HDD installation. Within these soft/loose materials, the required drilling fluid pressures can exceed the soil strength, resulting in the formation of a hydraulic fracture through the overlying soils and ponding of drilling fluids at the ground surface. This risk of hydraulic fracture can only be mitigated by locating the HDD bore within more favorable geotechnical materials that provide greater resistance to induced drilling fluid pressures, or by using casings to provide an open pathway for drilling fluid flow.

The borehole log for BH17-01, contained in the Pattullo Bridge Replacement Project Phase B Marine Site Investigation Report, describes the top 7 to 8 m of sediment beneath the Fraser River as sands with a “very loose to loose” density. This soil density provides very little to no resistance to oppose required drilling fluid pressures for the HDD installation.

Soils containing gravels and larger size particles (cobbles) range from marginally acceptable to unacceptable in terms of HDD feasibility, depending upon the percentage of gravels by weight and particle size. Soils with a low percentage of gravel do not tend to pose any significant challenges to an HDD installation. However, soils with a high percentage of gravel (i.e., greater than 40 to 50 percent) may pose significant challenges to an HDD installation. Challenges associated with gravels include:

- Excessive raveling/bore instability;
- Ineffective cuttings removal;
- Steering difficulties; and
- High installation loads/stresses or a stuck product pipe situation.

Only those particles that can be suspended within the drilling fluid can be removed from the bore. In general, gravel-sized particles less than approximately 12 mm to 19 mm can be removed from the bore, provided good HDD practices are followed. Particles greater in size than 19 mm typically cannot be suspended by the drilling fluid and tend to settle out and accumulate along the bottom of the bore. The risks associated with accumulation of larger particles within the bore increase with greater bore diameter due to the increase in the surface area of exposed soil materials in the crown of a larger bore. When gravels are observed near the HDD entry and exit locations, temporary casing can be installed to support the bore and provide a stable and open flow pathway for drilling fluid flow back to either side of the installation.

2.7 Staging Areas

Staging areas are required on each side of an HDD installation to stage equipment necessary for the installation, which includes:

- Drill rig;
- Stacks of drill pipe;
- Operator control cabin;
- Tooling trailers;
- Crane or excavator;
- Separation plant;
- Mud tanks and mud pumps;
- Water storage tanks;
- Sump pit; and
- Office and support trailers.

In addition to the entry and exit staging areas, a staging area is also required for fabricating sections of the pipe string, and preferably the entire pipe string when possible, prior to installation. The pipe staging area must be aligned directly parallel with the HDD installation for at least 25 m to allow for proper alignment of the product pipe into the bore to lower the risk of hard contact of the pipe and the bore/casing pipe wall. The minimum radius the staging area can curve after this point is based on the allowable pipe stress.

The available space for the break-over section of the product pipe (section of pipe immediately behind its entry location where it is elevated off the ground) must allow for transitioning the product pipe into the proper orientation to enter the ground while maintaining appropriate bending radii (in the vertical and horizontal planes) to ensure the product pipe is not over-stressed during its installation. Typical break-overs occur within one plane (vertical) where the pipe is picked up into the air and curved into an alignment that meets the exit geometry of the HDD installation. If a horizontal curve is required within the pipe string area, it is typically located behind the vertical section to avoid complications with a compound curve.

DRAFT - FOR DISCUSSION ONLY

3 TP/IP DN 323.9 - Route A

TP/IP DN 323.9, referred to herein and within the Pre-FEED report as Route A, consists of two HDD installations identified as A1 and A2 (see Figure 3-1). These options involve installing a 323.9 mm diameter (NPS 12) natural gas pipeline operating at transmission/intermediate pressure.



Figure 3-1: Route A1 and A2– From Pre-FEED Study

3.1 Route A1 Discussion

Route A1 shown in the Pre-FEED study consists of a 1,062 m long installation beneath the Fraser River with a minimum depth of cover of approximately 23.3 m. The location of the minimum depth of cover beneath the river occurs on the north side of the crossing in the vicinity of the shoreline. The Pre-FEED study proposed casing on both sides of the installation and a drill and intersect strategy to complete the installation. The horizontal tangent in the middle of the HDD installation is approximately 367 m. The proposed HDD installation crosses beneath several railroad tracks, the Fraser River, Front Road, Central Valley Greenway, a Sky Train tunnel, and the approach road to the Pattullo Bridge. A copy of the Pre-FEED study plan and profile of Route A1 is provided in Figure 3-2. Route A1 crosses beneath several Pattullo Bridge piers as shown in Figure 3-3.

The water depth of the Fraser River ranges from approximately 0 to 20 m based on the available geotechnical reports and borehole logs.



DETAIL PLAN
SCALE = 1:5000

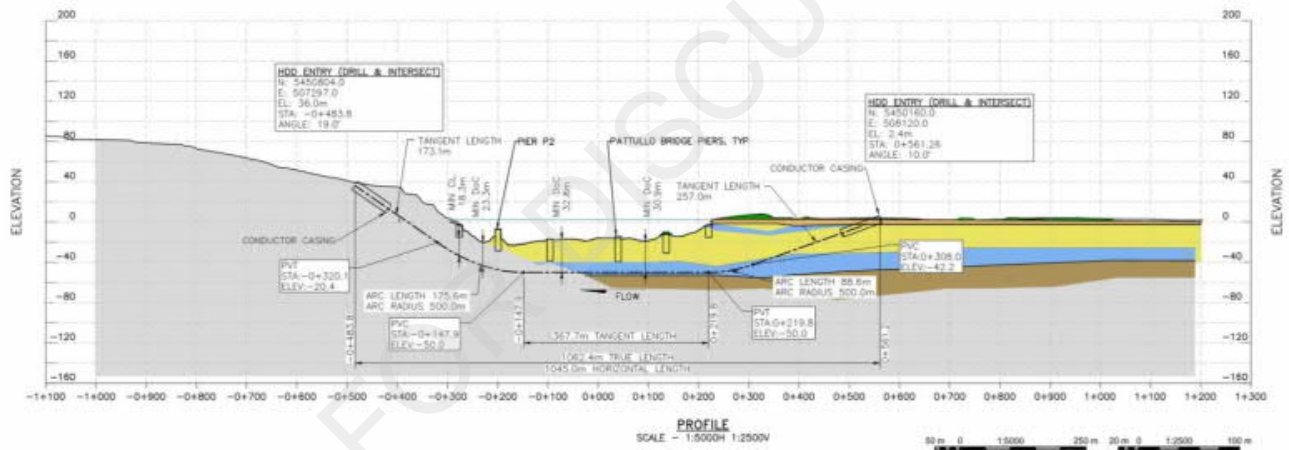


Figure 3-2: Route A1 Plan and Profile – From Pre-FEED Study

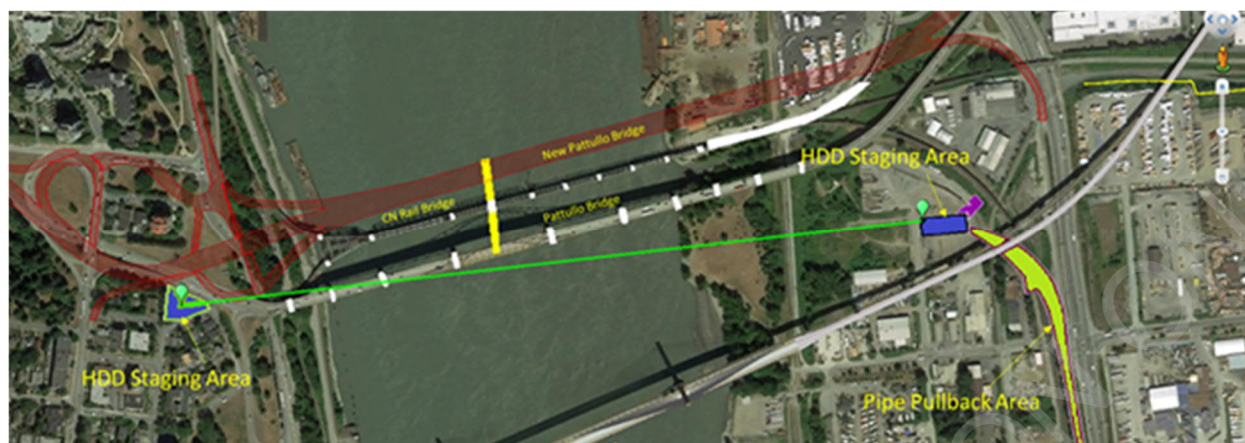


Figure 3-3: Route A1 and Conflict with Pattullo Bridge Piers

3.1.1 Anticipated Geotechnical Conditions

Geotechnical conditions on the north side of the crossing are depicted from information contained within the following two onshore geotechnical reports completed as part of the Pattullo Bridge Replacement Project:

- Phase A Geotechnical Site Investigation Report – Golder Associates - dated July 16, 2018; and
- Phase B Land Geotechnical Site Investigation Report – Golder Associates - dated July 13, 2018.

Refer to the actual reports for detailed soil and bedrock characterization. A brief description of the anticipated site conditions on the north side of the crossing follows.

Geotechnical conditions on the north side can be characterized by Borings BH16-01, NW BH17-02, and NW BH17-01. These borings indicate geotechnical materials that consist of fill, overlying glacial till deposits and bedrock materials. The fill materials are typically 2 to 3 m thick and consist of cobbles, gravels, sands, and silts of varying percentages. The glacial till materials are described as consisting of various layers and thicknesses of silty clay, clayey silt, sands, silts, and gravels and cobbles. Many inferred cobbles and to a lesser extent, boulders were noted from the borehole logs. Bedrock materials consist of mudstone and sandstone. Bedrock was noted at a depth of 88 m below ground surface in Boring NW BH17-01, corresponding to approximately EL. -72 m.

Geotechnical information is available from three marine boreholes (Borings BH17-01, BH17-03, and BH17-04) completed in the Fraser River as part of Golder Associates Phase B Marine Geotechnical Site Investigation Report dated July 16, 2018. Refer to the actual report for detailed soil and bedrock characterization.

Boring BH17-01 was completed on the north side of the Fraser River. Boring BH17-03 and BH17-04 were completed on the south side of the Fraser River. Each boring indicates a mixture of very loose to loose sand ranging in thickness from approximately 4 to 7 m immediately below the river bottom. Soils containing gravel, sand, silt and clay of varying thicknesses occur beneath these sands. Bedrock consisting of mudstone, sandstone and matrix supported conglomerate units were encountered at depths of 37 and 60 m in Borings BH17-01 and BH17-03 (corresponding to El. -57 and -70 m respectively). Boring BH17-04 was terminated prior to encountering bedrock.

Geotechnical conditions on the south side of the crossing are depicted from information contained within the following two onshore geotechnical reports completed as part of the Pattullo Bridge Replacement Project:

- Phase A Geotechnical Site Investigation Report – Golder Associates - dated July 16, 2018; and
- Phase B Land Geotechnical Site Investigation Report – Golder Associates - dated July 13, 2018.

Refer to the actual reports for detailed soil and bedrock characterization. A brief description of the anticipated site conditions on the south side of the crossing follows.

The geotechnical conditions on the south side can be characterized by Borings BH16-02, BH16-03 and SUR BH17-06. These borings suggest the anticipated geotechnical materials consist of fill, overlying silty peat, organic silt, sands, silty clays, gravel and cobbles, and bedrock. The fill materials consist of silty gravel with cobbles and range in thickness up to 3 m. BH 16-03 was terminated at El. -79 m prior to encountering bedrock and BH16-02 encountered sandstone bedrock at El. -91.5.

3.1.2 Identified Challenges associated with Route A1

The following challenges are identified:

- River bottom sediments consist of very loose to loose sands for a depth of approximately 7 m below river bottom (based on Boring BH 17-01). This loose material presents risks associated with containing and managing drilling fluid flow due to the low resistance/strength offered by the soil. This presence of this material will dictate a deeper installation depth to allow for better drilling fluid management and control.
- Layers of gravels and cobbles were noted from the borehole logs within the soil materials on the north side of the proposed installation. These layers were noted at various depths and locations. Gravels and cobbles can present challenges to an HDD installation depending on their size, percentage of the soil, relative density, and percentage of fines (silt and clay) with the gravel materials. Unfortunately, these materials are not well documented within the existing geotechnical reports, as they are mostly inferred from drilling reaction. Better characterization will be needed during subsequent geotechnical investigations to properly evaluate their risk and potential mitigation measures.
- The proposed northern HDD entry location presented in the Pre-FEED study is situated approximately 200 m from the northern shoreline of the Fraser River at El. 38 m. The low point elevation of the Fraser River mud line approximately 260 m away from the HDD entry location is approximately El. -20 m. This represents a decrease of 58 m in the ground surface / mud line profile and a downward slope of 16 degrees from ground surface to mud line. This high elevation difference and slope over such a short length presents a significant challenge to an HDD installation as it is difficult to attain an appropriate depth of cover beneath the river due to such a short setback distance.
- The Pre-FEED design has approximately 23.3 m of cover beneath the river mud line at a distance of approximately 260 m from the HDD entry location (Figure 3-4). As stated above, the upper 7 m of soils beneath the mud line are very loose to loose and will not provide much if any resistance to the required drilling fluid pressures. The more competent materials below the top 7 m provide insufficient resistance relative to the required drilling pressure as shown on Figure 3-5.

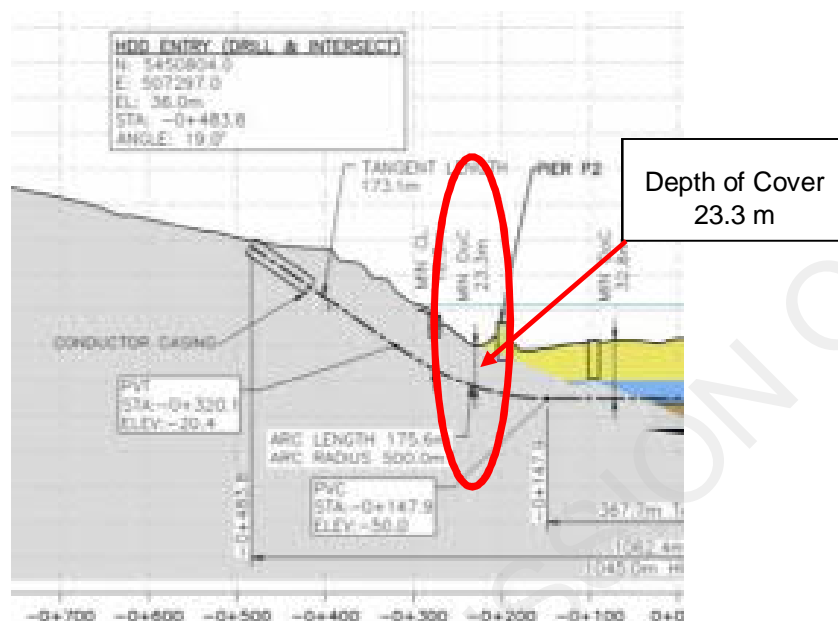


Figure 3-4: Minimum Depth of Cover beneath Fraser River (Route A1) – From Pre-FEED Study

- Maintaining full drilling fluid returns to either side of the crossing is critical to an HDD installation to properly condition the bore and remove a sufficient volume of cuttings to accommodate the product pipe. When drilling fluid flow cannot be maintained to either side of the HDD installation, difficulties can occur leading to tight hole conditions, damaged pipe coatings, or a stuck pipe condition. In addition, if drilling fluid pressures cannot be adequately resisted, all drilling fluids pumped downhole may end up migrating to the bottom of the Fraser River where containment is not likely possible.
- Mott MacDonald completed a hydraulic fracture evaluation for the Pre-FEED study proposed HDD alignment (pilot bore phase) for different drilling approaches. The results of the evaluation were based on:
 - Drilling entirely from the north side to the south side - see Figure 3-5;
 - Drilling entirely from the south side to the north side - see Figure 3-6; and
 - Drill and intersect strategy with an intersection location at approximate STA of 0+000 - see Figure 3-7.
- The lines on the charts provided in Figures 3-5, 3-6, and 3-7 represent the following:
 - The dashed green line represents the ground surface profile as estimated from the HDD alignment provided in the Pre-FEED study.
 - The black solid line represents the proposed Pre-FEED HDD profile.
 - The blue solid line with solid blue triangles represents the required drilling fluid pressure based on HDD industry typical values for drilling fluid pump rate, mud properties, and bore diameter.
 - The red solid line with solid red diamonds represents the maximum theoretical allowable drilling fluid pressure based on the Delft Geotechnics approach.
 - The brown solid line represents the recommended allowable drilling fluid pressure limit (based on a factor of 2.0 applied to the strength component associated with the maximum theoretical allowable drilling fluid pressure).
 - The dashed purple line represents the total overburden stress.

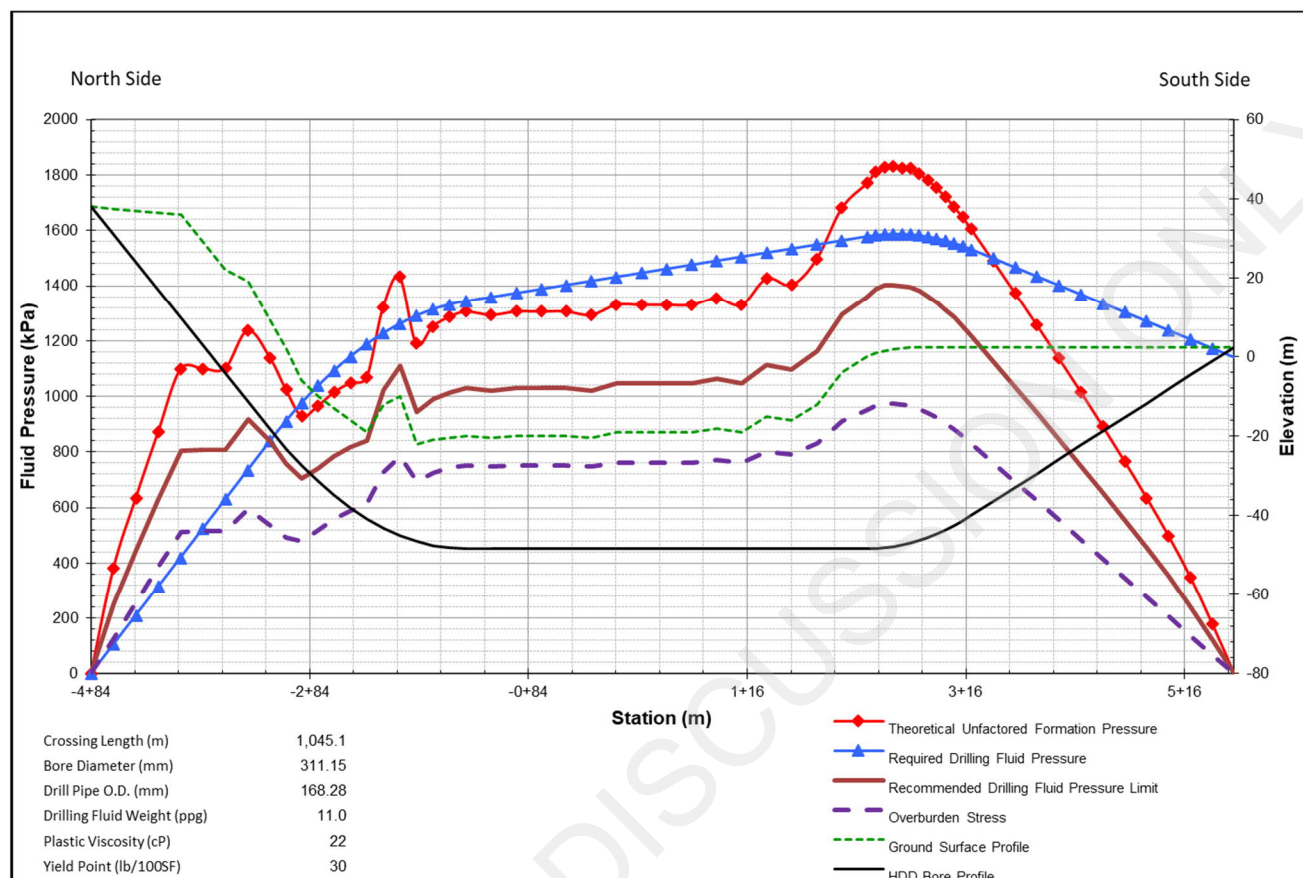


Figure 3-5: Mott MacDonald Hydraulic Fracture Evaluation of Route A1 - Drilled from North Side to South Side of the Crossing

- As illustrated in Figure 3-5, required drilling fluid pressures exceed the recommended drilling fluid pressure (the blue solid line crosses above the brown solid line) (and the maximum theoretical allowable drilling fluid pressure – red solid line) as the pilot bore is advanced from the north side beneath the Fraser River. Based on this evaluation, full drilling fluid losses would be expected once the pilot bore is advanced approximately 200 m. It is important to note that once drilling fluid losses occur, they may not be able to be restored. Hence, all drilling fluids may migrate up into the Fraser River environment. Further, it may not be possible to remove cuttings from the bore resulting in difficulty passing tooling through the bore and installing the product pipe. The only way to mitigate this risk is to attain more depth of cover beneath the Fraser River or decreasing the starting elevation of the HDD installation on the north side of the crossing. Hence, it is not possible to complete the entire HDD installation from the south side at the given installation depth.

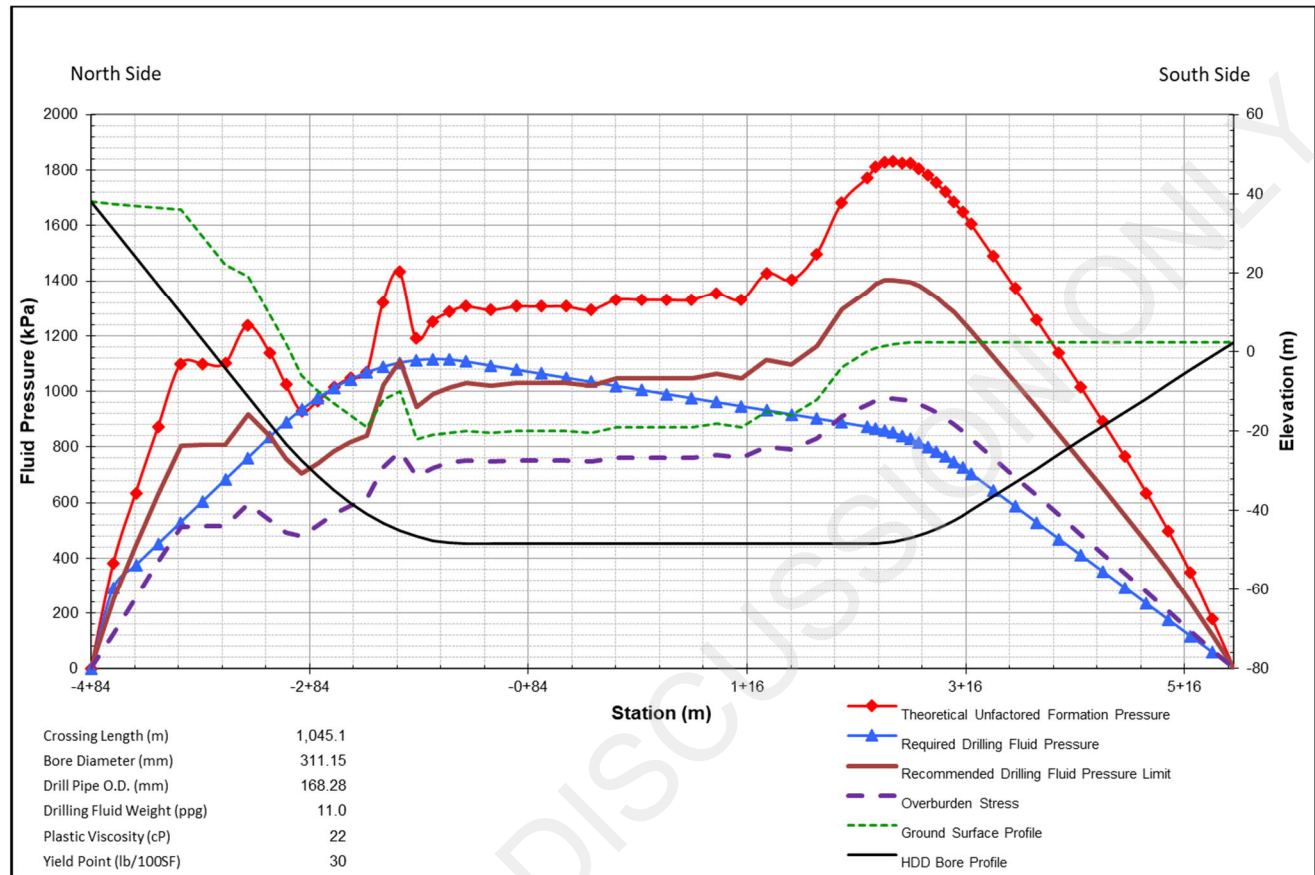


Figure 3-6: Mott MacDonald Hydraulic Fracture Evaluation of Route A1 - Drilled from South Side to North Side of the Crossing

- As illustrated in Figure 3-6, required drilling fluid pressures exceed the recommended drilling fluid pressure (and the maximum theoretical allowable drilling fluid pressure) as the pilot bore is advanced from the south side midway beneath the Fraser River. Based on this evaluation, full drilling fluid losses would be expected once the pilot bore is advanced approximately 560 m.

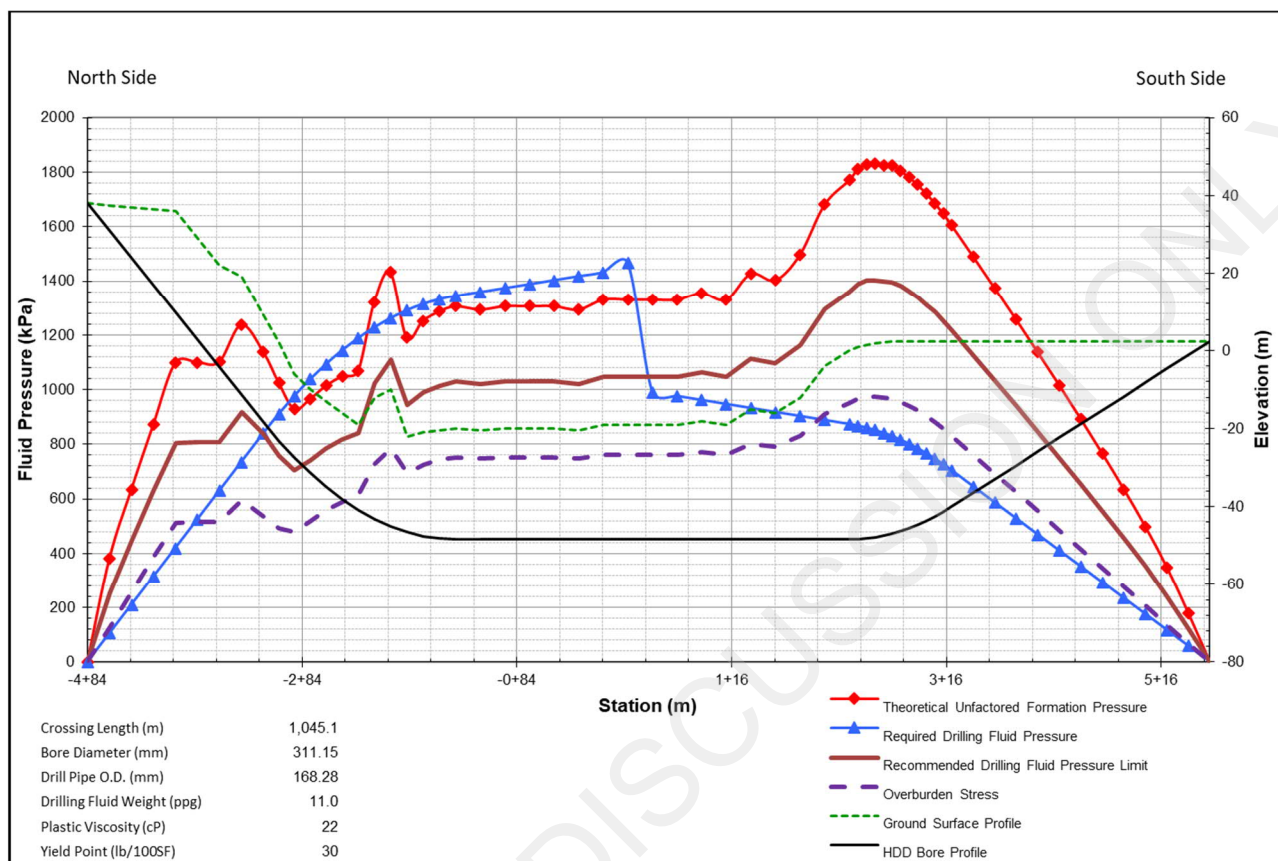


Figure 3-7: Mott MacDonald Hydraulic Fracture Evaluation for Route A1 - Drill and Intersect Scenario

- As illustrated in Figure 3-7, the required drilling fluid pressures exceeds the recommended drilling fluid pressure (and the maximum theoretical allowable drilling fluid pressure) as the pilot bore is advanced from the north side beneath the Fraser River. Based on this evaluation, full drilling fluid losses would be expected once the pilot bore is advanced approximately 200 m. Hence, it is not possible to complete the entire HDD installation using the drill and intersect installation strategy at the given installation depth.
- Several assumptions are built into the evaluation and calculation of the maximum theoretical allowable drilling fluid pressure. One of these assumptions involves an open bore pathway between the drill bit and the HDD entry location. If this pathway is restricted in any way, the required drilling fluid pressures will spike significantly with full drilling fluid losses to the overlying geotechnical materials.
- For Route A1, the HDD entry locations are fixed. Hence, to attain a greater depth of cover, either the bore geometry, ground surface elevation or a combination of both would need to be modified.
- Neither modifying the bend radius (which is not recommended) nor steepening the HDD entry angle lowers the hydraulic fracture risk to an acceptable level, as sufficient depth of cover cannot be attained beneath the northern section of the Fraser River.
- To reduce the risk to an acceptable level, lowering the HDD entry elevation of the north side would be needed. Based on a very preliminary assessment, a 20 m deep pit would need to be excavated to allow for a lower launch of an HDD installation. To stage HDD equipment this pit would need to be approximately 30 m wide by 35 m long (but may require a larger foot print). It is important to note that staging HDD

operations from a pit is not typical and can present added and significant logistical challenges (e.g., pumping HDD drilling mud vertically 20 m using trash pumps resulting in significant delays and decreased production rates). Mitigation of the hydraulic fracture risk using a pit would need to be further vetted.

- The pipe staging area is shown on the south side of the Route A1 crossing. This staging area is not deemed to be sufficient for an HDD operation as shown. The pipe staging area has an immediate curve at the HDD entry location on the south side with a bend radius of approximately 177 m (as measured in Google Earth). As discussed in Section 2.7, at least 25 m of staging area parallel to the entry location is required. A radius of 177 m is not sufficient for the product pipe to curve simultaneously in the vertical and horizontal planes.
- The tightest breakover radius for the 323 mm pipe would likely be in the 200 m range for a single plane (either vertical or horizontal but not both simultaneously) based on previously HDD experience. A full pipe stress evaluation would be necessary to confirm this assumption. Regardless, when the pipe is forced to be bent in the vertical and horizontal planes simultaneously, the individual curve radii need to be increased such that the compound curve radius does not exceed this approximate 200 m limit. The actual vertical and horizontal radii would need to be approximately 300 m to achieve a compound radius of 200 m. For the given pipeline, individual bend radii of 330 m would provide some flexibility with the placement of cranes. A Google Earth sketch of each of these radii are shown in Figure 3-8.



Figure 3-8: Pipe Staging Bend Radii shown at south side of Pre-FEED alignments (Route A1 in green)

- Based on a pipe bend radius of 330 m, the pipe staging area will need to cross the elevated railway, Skytrain bridge, and the Simon Fraser Perimeter Road (SFPR) which will be logistically challenging. Cranes, positioned every 10 to 15 m along the breakover section where the pipe is in the air, would need to hold the pipe at proper heights to prevent overstressing of the product pipe as it is pulled into this orientation and into the ground. A detailed 3D model and stress analysis is required to ensure that pipe can physically be staged through this area. If the pipe is strung over the SFPR, it will likely need to be closed for at least 3 days during pipe pullback. Conflicts with the Skytrain bridge and elevated railroad would need to be further evaluated.

- Pipe string staging areas with 90-degree horizontal deflections are not considered HDD industry standard for steel product pipes and present additional challenges.
- Beneath the Fraser River, the HDD alignment crosses below or beside several piers of the Pattullo Bridge as shown in Figure 3-3. HDD construction under or in close proximity to bridge piers can result in settlement and loss of function. It is important to note that placement of a gas pipeline beneath a bridge foundation is not considered HDD standard practice. FortisBC would need to understand this and the risks/impacts that such an undertaking could bring to the project.

3.2 Route A2 Discussion

Route A2 shown in the Pre-FEED study consists of a 391 m long installation beneath the South Fraser Perimeter Road with a maximum depth of cover of approximately 25 m. The Pre-FEED study proposed casing on both sides of the installation and a drill and intersect strategy to complete the installation. The horizontal tangent in the middle of the HDD installation is approximately 65 m. The alignment crosses beneath several railroad tracks (including a pile supported railroad bridge, South Fraser Perimeter Road, and the Sky Train bridge). A copy of the Pre-FEED study plan and profile of Route A2 is provided in Figure 3-9.

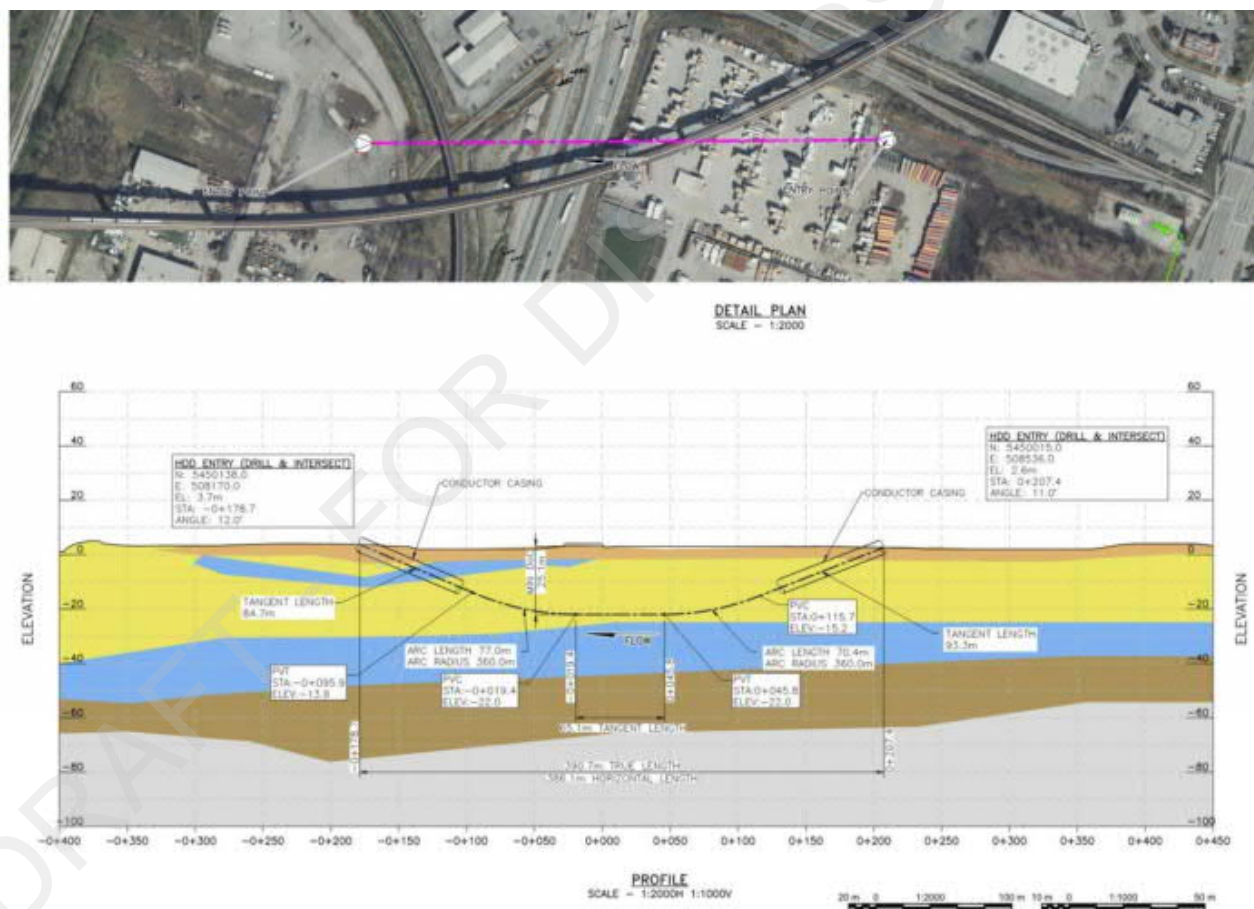


Figure 3-9: Route A2 Plan and Profile – From Pre-FEED Study

3.2.1 Anticipated Geotechnical Conditions

The anticipated geotechnical conditions for Route A2 are similar to those on the southern portion of Route A1. Refer to Section 3.1.1 for further details.

3.2.2 Identified Challenges associated with Route A2

The following challenges are identified:

- The Pre-FEED study proposed casing on both sides of the installation and use of the drill and intersect installation strategy for the Route A2 installation. The horizontal tangent width of 65 m is not considered sufficient for intersecting the two individual pilot bores. Based on HDD industry standards, the horizontal tangent would need to increase to approximately 135 to 150 m. An increase of this length does not appear to be possible for the installation given the site constraints associated with this crossing.
- The pipe staging area has been identified on the south side of the installation within the FortisBC property. This staging area is not aligned with the HDD alignment and will present significant challenges associated with staging the pipe and transitioning the pipe into the HDD alignment. Additional staging area (across the railroad) would be required to stage the pipe on the south side of the crossing. This railroad is active and permission to stage the product pipe across may not be possible. For this alignment to work, the pipe string may need to be stage on the south side of the crossing. Depending on the exit location for the Route A1 installation, this additional length may not be possible.
- The design radius of 360 m for the 323.9 mm diameter product pipe is tighter than HDD industry standards. This smaller radius may result in increased pull loads or scarring of the pipe during installation. HDD industry standard design bend radius is closer to 389 m.
- The Route A2 alignment passes beneath an elevated, pile supported railroad bridge. It is not clear whether sufficient depth would be attained by the HDD bore to prevent damage/settlement to this bridge. Based on Fortis's discussions with CN, CN will not permit an HDD installation at the intended installation depth beneath their structure, as it is understood that other approach structures in this area have experienced settlements.

4 DP DN 508 - Route B

DP DN 508, referred to herein and in the Pre-FEED study as Route B, consists of a single HDD installation across the Fraser River (See Figure 4-1). This involves installing a 508 mm diameter (NPS 20) natural gas pipeline operating at a distribution pressure.

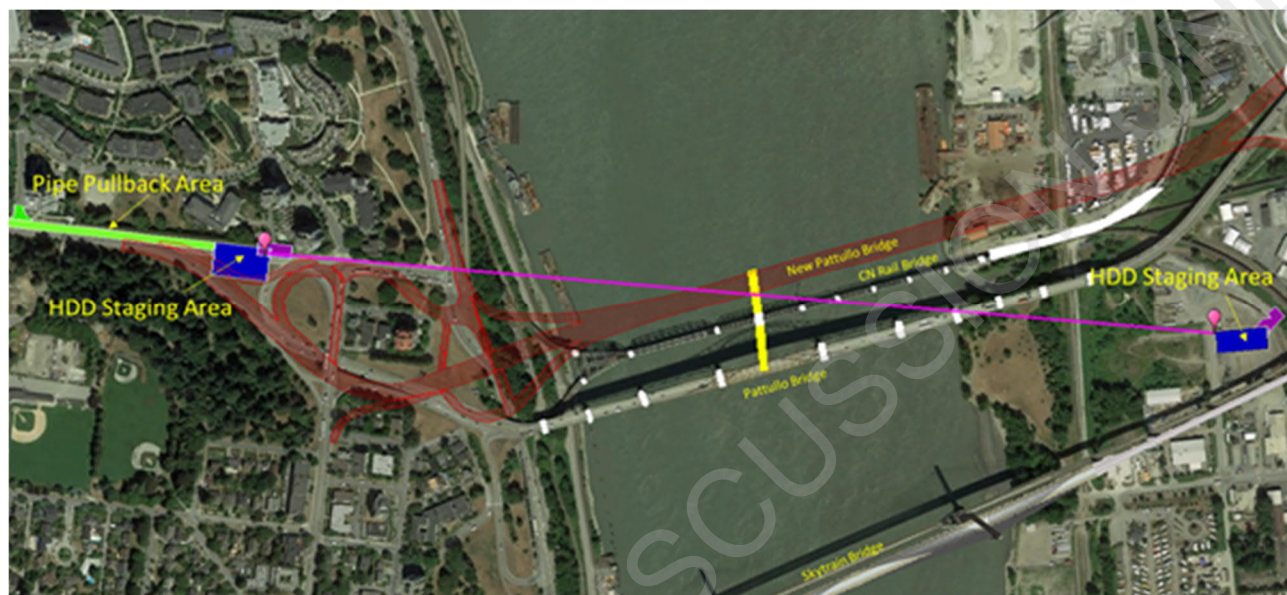


Figure 4-1: Route B

Route B, as shown in the Pre-FEED study, consists of a 1,292 m long installation beneath the Fraser River with a minimum depth of cover of approximately 34.7 m beneath the mudline. The minimum depth of cover beneath the river occurs within the middle of the river. The minimum depth of cover on the north side of the crossing in the vicinity of the shoreline is approximately 36 m. The Pre-FEED study proposed casing on both sides of the installation and a drill and intersect strategy to complete the installation. The horizontal tangent in the middle of the HDD installation is approximately 522 m. The proposed HDD installation crosses beneath several railroad tracks, the Fraser River, Front Road, Central Valley Greenway, a Sky Train tunnel, and piers associated with the Pattullo and CN Bridges. A copy of the Pre-FEED study plan and profile of Route B is provided in Figure 4-2. Route B crosses beneath several CN rail bridge and Pattullo Bridge piers as shown in Figure 4-1.

Unlike Route A1, the Route B setback distance from the northern shoreline of the Fraser River is much greater (on the order of 350 m). This setback distance allows for modification of the HDD entry angle and entry tangent to achieve a greater depth of cover beneath the Fraser River and avoid the issues associated with hydraulic fracture previously discussed for the Route A1 alignment. Note that, while not anticipated, depending on the ultimate alignment, it may still be necessary to review options for launching the HDD from a pit/excavation. This would need to be further reviewed if the design advances.



Refer to section 3.1.1 for a detailed description of the anticipated geotechnical conditions.

The following challenges are identified:

- 514100039-MMD-00-P0-MO-PP-0001, Rev. B

- The HDD entry angle on the north side of 25 degrees is greater than HDD typical bore angles. This angle would result in the need to modify the drill rig for safety purposes. Consideration should be given to lowering this angle.
- There is a lack of geotechnical information through the north side embank down to the bottom of the proposed HDD. Future geotechnical investigations will need to characterize the full soil column on the north side of the crossing.
- It is likely that the HDD alignment will need to be located with the bedrock materials beneath the river to mitigate hydraulic fracture risks. This will likely result in modifications to the bore geometry and casing installation lengths to adequately mitigate potential risks.

5 Summary

The Route A1 (TP/IP DN 323.9) alignment crosses beneath piers of the existing Pattullo Bridge which results in increased risk due to potential settlement of the bridge and is not industry standard practice. Pipe staging area requirements on the south side of Route A1 presents challenges. If the pipe staging area cannot be modified, then the alignment should not be considered further. A feasible pipe staging area to avoid overstressing the pipe will cross the elevated railway, Skytrain bridge, and the Simon Fraser Perimeter Road (SFPR) which will be logistically challenging. This alignment also has a high risk of a hydraulic fracture event and mud loss into the Fraser River. This risk could be mitigated with a deep excavation, but HDD operations from such a deep pit will be challenging, have additional costs and schedule implications, and may prove not to be acceptable by a contractor. A deep pit would also necessitate a deep elbow for the pipeline that may not be desirable from an operations standpoint.

The Route A2 (TP/IP DN 323.9) alignment has an insufficient horizontal tangent to be completed by the drill and intersect method and inadequate pipe string staging area orientation. If the pipe staging area and orientation cannot be modified, this alignment should not be considered further. Other trenchless methods may be possible to complete the installation from the exit point of Route A1 to the tie in location.

The Route B (DP DN 508) alignment will require installing the product pipe beneath CN rail bridge piers and one pier of the Pattullo Bridge. It is understood from FortisBC that CN is opposed to having the pipeline cross their bridge alignment, regardless of the depth of the installation. In addition, installing a gas pipeline beneath a bridge pier is not considered industry standard practice as installation can impact the bridge and its operation due to ground loss and settlement.

Mott MacDonald recommends evaluating other alignment options to determine if alternative alignments avoid the risks and challenges associated with the Pre-FEED alignments.

Pattullo Bridge Replacement Project



transportation
investment
corporation

Via Email: Melanie.Kilpatrick@fortisbc.com

September 14, 2020

Melanie J. Kilpatrick
Project Director
Fortis BC
16705 Fraser Highway
Surrey, BC V4N 0E8

Dear Ms. Kilpatrick,

Re: Pattullo Bridge Replacement Project – Pipeline Removal & FortisBC Reviews

I write further to discussions held between FortisBC, Ministry of Transportation and Infrastructure and Transportation Investment Corporation (TI Corp) representatives on March 4, 2020.

FortisBC has requested the Province to remove the FortisBC natural gas pipeline from the existing Pattullo Bridge as part of the Pattullo Bridge Replacement (PBR) Project (the Project), which includes the demolition of the existing Pattullo bridge on behalf of TransLink.

In consideration of the agreements on the part of FortisBC herein and subject to compliance by FortisBC with the terms herein, the Province agrees to include within the scope of the Project, at the Province's expense, the removal of the decommissioned FortisBC pipeline, that is presently in contact with the bridge structure from a point one metre below the ground at Pier 0 to a point one metre below the ground at Pier 9 (see Attachment 1).

FortisBC agrees as follows:

1. to decommission the FortisBC natural gas pipeline situated on the existing Pattullo Bridge so that it is safe and ready for removal by or on behalf of the Province, on or before March 31, 2023;
2. to inform the Province, in writing, that the FortisBC natural gas pipeline is safe and ready for removal by or on behalf of the Province, on or before March 31, 2023;
3. to cooperate and support key aspects of work on the Project as may be reasonably requested by the Province from time to time, including expeditious review of designs for any Province-initiated relocation of FortisBC facilities; specifically, that relocation designs supplied by or on

behalf of the Province, be reviewed and approved or returned with written comments by FortisBC within 20 business days of receipt;

4. to confirm on or before October 31, 2020 in writing to BC Hydro and Power Authority, with a copy to TI Corp, that FortisBC consents to the dedication of those portions of Parcel Q (PID: 009-057-765) that are adjacent to Bridge Road in Surrey, as shown on the attached sketch plans (Attachment 2), as Arterial Highway and/or Road to facilitate improvements to be completed by or on behalf of the Province along Bridge Road forming part of the Project; and
5. to execute on or before October 31, 2020 the attached Application to Deposit Plan for dedication of Provincial Lands noted as Lots 26, 27 and 28 in New Westminster as Arterial Highway (Attachment 3).

FortisBC acknowledges and agrees that the Province will rely upon the commitments of FortisBC contained herein for the purposes of planning and proceeding with the Project and that time is of the essence of this agreement. The new bridge is scheduled to open in 2023, after which existing bridge demolition will commence.

Please confirm your agreement to the terms as set out in this letter by signing a copy of the enclosed letter and returning it to me at your earliest convenience.

I _____ (name), _____ (title) confirm that I have read and understood the terms here and that I am duly authorized to sign this agreement on behalf of FortisBC.

Authorized Signatory of FortisBC

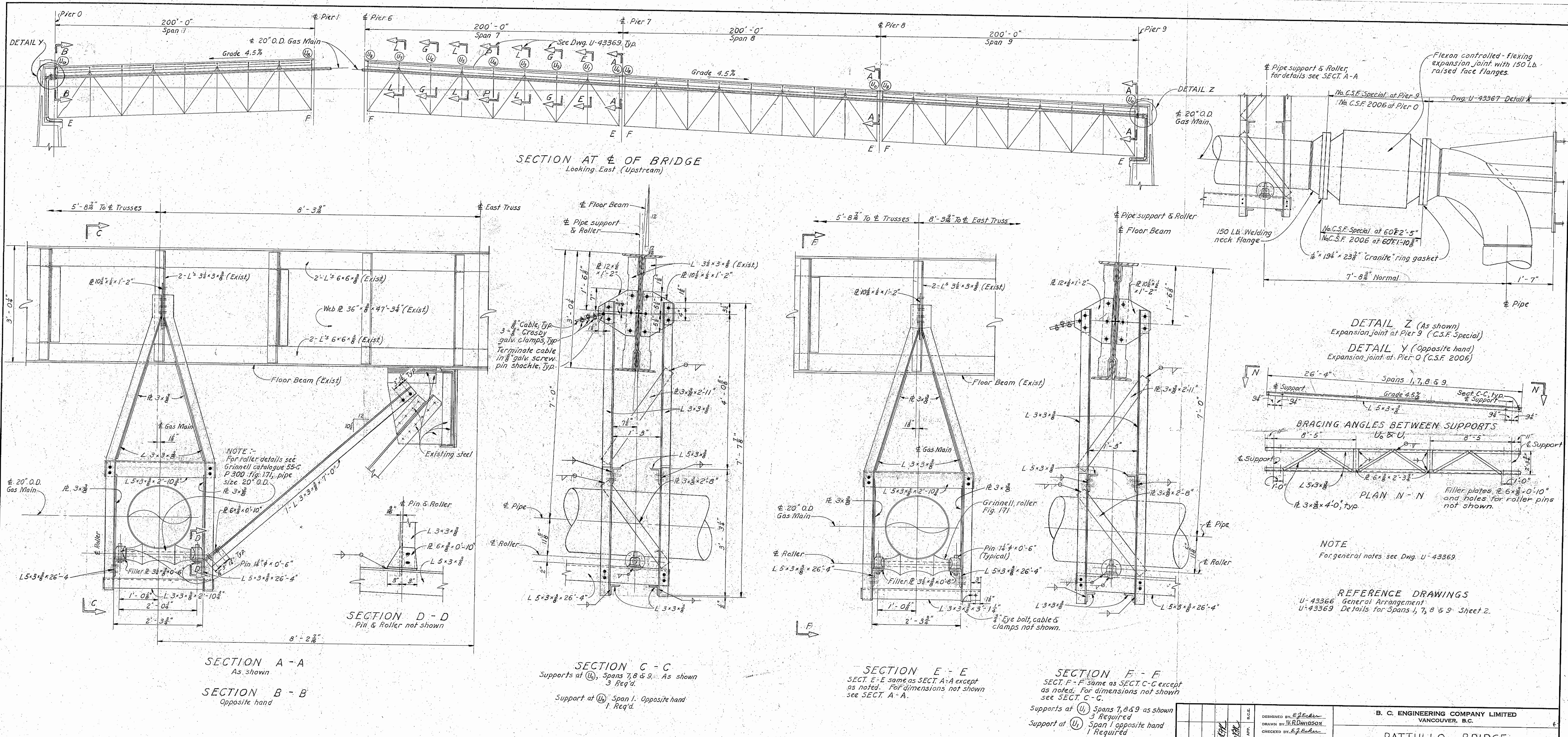
Date

The PBR Project team looks forward to continuing to cooperate and coordinate with FortisBC to facilitate the Project and the relocation of FortisBC utilities.

Sincerely,

Wendy Itagawa
Executive Project Director
Pattullo Bridge Replacement Project

Cc: Amanda Farrell (Amanda.Farrell@ticorp.ca)
Kevin Volk, Assistant Deputy Minister, MOTI
Amanda Farrell, Chief Executive Officer, TICorp
Mike Leclair, Vice President, FortisBC
Ian Pilkington, Chief Engineer, Highway Operations
Sany Zein, Vice President, Translink
Les MacLaren, Assistant Deputy Minister, EMP



DESIGNED BY: E. E. Ecken		B. C. ENGINEERING COMPANY LIMITED VANCOUVER, B.C.	
DRAWN BY: W. R. DAVIDSON		PATTULLO BRIDGE 20" H.P. GAS MAIN	
CHECKED BY: E. J. Ecken		DETAILS FOR SPANS 1, 7, 8 & 9 SHEET 1	
INSPECTED: A. H. Hall		DATE: May 11, 1956	
RECOMMENDED: H. J. Ecken		SCALE: 1" = 30' & 4" = 120'	
APPROVED: H. J. Ecken		2023 U-43368R2	
APPROVED: H. J. Ecken		B. C. ELECTRIC CO. LTD. & ASSOCIATED COMPANIES	



Attachment 2 – Parcel Q Sketch Plans



Attachment 3



September 14, 2020

FortisBC Energy Inc.
16705 Fraser Highway
Surrey, BC
V4N 0E8

To whom it may concern:

**Re: Pattullo Bridge Replacement Project
Application to Deposit Plan – Charge Holder
Plans: EPP99561**

The Ministry of Transportation and Infrastructure (MOTI) as part of the Pattullo Bridge Replacement Project is registering road dedication plans over numerous lots owned in fee-simple by Her Majesty the Queen. As Fortis BC is a registered charge holder, MOTI requires signatures on the Application to Deposit Plans (ADP).

Please find enclosed:

Application to Deposit Plan: EPP99561 **Title:** Lot 26, PID 012-482-561
Lot 27, PID 012-482-579
Lot 28, PID 012-482-587

Please have the enclosed ADP's signed by an authorized signatory for Fortis BC and witnessed as noted below:

EPP99561 see page 3

Please ensure that the witness prints their full name, address (including postal code) and occupation on the left-hand side of the Application. Once the Applications to Deposit Plans have been duly executed please return to Lauren Matthias at Lauren.Matthias@ticorp.ca.

If you have any questions, please contact Lauren Matthias at Lauren.Matthias@ticorp.ca.

Yours truly,

Lauren Matthias
Associate Project Director
Pattullo Bridge Replacement Project
Lauren.Matthias@ticorp.ca

**APPLICATION TO DEPOSIT PLAN
AT LAND TITLE OFFICE
PROVINCE OF BRITISH COLUMBIA**

PAGE 1 OF 6 PAGES

Your electronic signature is a representation that

(a) you are a subscriber under section 168.6 of the *Land Title Act*, RSBC 1996 c.250, and that you are authorized to electronically sign this application by an e-filing direction made under section 168.22(2) of the act, and
(b) if this application requires an execution copy, that you are a designate authorized to certify this application under section 168.4 of the *Land Title Act*, RSBC 1996, c.250, that you certify this application under section 168.42(4) of the act, and that an execution copy, or a true copy of that execution copy, is in your possession.

1. APPLICATION: (Name, address, phone number of applicant, applicant's solicitor or agent)

Andrea Brace, Solicitor for Min. of Transportation and Infrastructure

Ministry of Attorney General, Legal Services

PO Box 9289 Stn Prov Govt

Victoria

BC V8W 9T5

email: andrea.brace@gov.bc.ca

phone: 250-356-8743

Deduct LTSA Fees? Yes ☒

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

SEE SCHEDULE

3. APPLICATION FOR DEPOSIT OF:

PLAN TYPE

PLAN NUMBER

CONTROL NUMBER

NUMBER OF NEW
LOTS CREATED

Reference or Explanatory (Section 107)

EPP99561

158-283-9734

4. OWNER(S): (updated owner(s) name(s), occupation(s), postal address and postal code)

BC TRANSPORTATION FINANCING AUTHORITY

PO BOX 9850 STN PROV GOVT

VICTORIA

V8W 9T5

BRITISH COLUMBIA

CANADA

5. ADDITIONAL INFORMATION:

ADDITIONAL PARCEL INFORMATION

PAGE 2 OF 6 PAGES

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**012-482-561 LOT 26 EXCEPT: PART ON PLAN 23299; BLOCK M PLEASURE GROUNDS
GROUP 1 NWD PLAN 2620**

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**012-482-579 LOT 27 EXCEPT: PART ON PLAN 23299; BLOCK M PLEASURE GROUNDS
GROUP 1 NWD PLAN 2620**

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:
[PID] [LEGAL DESCRIPTION]

**012-482-587 LOT 28 EXCEPT: PART ON PLAN 23299; BLOCK M PLEASURE GROUNDS
GROUP 1 NWD PLAN 2620**

SCHEDULE OF OWNERS AND WITNESSES

PAGE 3 OF 6 PAGES

PLAN NUMBER: EPP99561

CONTROL NUMBER: 158-283-9734

Witness to All Signatures

[signature]

[fill in witness name]

[fill in occupation]

[fill in address line 1]

[fill in address line 2]

Owner

HER MAJESTY THE QUEEN IN RIGHT OF BRITISH
COLUMBIA as represented by the Minister responsible for
the Transportation Act

[signature] Authorized signatory

[fill in the name of signatory]

[signature] Authorized signatory

[fill in the name of signatory]

Witness to All Signatures

[signature]

[fill in witness name]

[fill in occupation]

[fill in address line 1]

[fill in address line 2]

Owner/Charge Owner [as appropriate]

FORTISBC ENERGY INC.
Inc. #BC0778288
(successor to B.C. Gas Inc.)
by its authorized signatories:

[signature] Authorized signatory

[fill in the name of signatory]

[signature] Authorized signatory

[fill in the name of signatory]

SCHEDULE OF OWNERS AND WITNESSES

PAGE 4 OF 6 PAGES

PLAN NUMBER: EPP99561

CONTROL NUMBER: 158-283-9734

Witness to All Signatures

[signature]

[fill in witness name]

[fill in occupation]

[fill in address line 1]

[fill in address line 2]

Charge Owner

CANADIAN NATIONAL RAILWAY COMPANY
by its authorized signatories:

[signature] Authorized signatory

[fill in the name of signatory]

[signature] Authorized signatory

[fill in the name of signatory]

Witness to All Signatures

[signature]

[fill in witness name]

[fill in occupation]

[fill in address line 1]

[fill in address line 2]

Charge Owner

Approved as to Highway Dedication
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY
as owner of charge number G10131 by its
authorized signatory(ies):

[signature] Authorized signatory

[fill in the name of signatory]

[signature] Authorized signatory

[fill in the name of signatory]

SCHEDULE OF OWNERS AND WITNESSES

PAGE 5 OF 6 PAGES

PLAN NUMBER: EPP99561

CONTROL NUMBER: 158-283-9734

Witness to All Signatures

[signature]

[fill in witness name]

[fill in occupation]

[fill in address line 1]

[fill in address line 2]

Charge Owner
ROGERS COMMUNICATIONS INC.
Incorporation No. BC0921753
(successor to Rogers Cable T.V. Limited)
by its authorized signatories:

[signature] Authorized signatory

[fill in the name of signatory]

[signature] Authorized signatory

[fill in the name of signatory]

Witness to All Signatures

[signature]

[fill in witness name]

[fill in occupation]

[fill in address line 1]

[fill in address line 2]

Charge Owner
SHAW CABLESYSTEMS LIMITED
Incorporation No. A0111495
(successor to Shaw Cablesystems Company)
by its authorized signatories:

[signature] Authorized signatory

[fill in the name of signatory]

[signature] Authorized signatory

[fill in the name of signatory]

SCHEDULE OF SURVEYOR GENERAL APPROVALS

PAGE 6 OF 6 PAGES

PLAN NUMBER: EPP99561

CONTROL NUMBER: 158-283-9734

Modified Posting

The monumentation on survey Plan EPP99561 is approved by the Surveyor General.

February 29, 2020

[Date]

[Signature]

Chris Sakundiak

for Surveyor General
File: 0889363

**SURVEY PLAN CERTIFICATION
PROVINCE OF BRITISH COLUMBIA**

PAGE 1 OF 2 PAGES

Your electronic signature is a representation that you are a British Columbia land surveyor and a subscriber under section 168.6 of the *Land Title Act*, RSBC 1996 c.250. By electronically signing this document, you are also electronically signing the attached plan under section 168.3 of the act.

Michael Rinsma
BWRUC2

Digitally signed by Michael Rinsma
 BWRUC2
 DN: c=CA, cn=Michael Rinsma
 BWRUC2, o=BC Land Surveyor,
 ou=Verify ID at www.juricert.com/
 LKUP.cfm?id=BWRUC2
 Date: 2020.02.27 13:42:14 -08'00'

1. BC LAND SURVEYOR: (Name, address, phone number)

MICHAEL RINSMA

#101 - 1061 Ridgeway Avenue

 mike@targetlandsurveying.ca
 604 936 6151
COQUITLAM**BC V3J 1S6**
☐ Surveyor General Certification [For Surveyor General Use Only]

2. PLAN IDENTIFICATION:

Control Number: **158-283-9734**Plan Number: **EPP99561**This original plan number assignment was done under Commission #: **975**

3. CERTIFICATION:

☒ Form 9☐ Explanatory Plan☐ Form 9A

I am a British Columbia land surveyor and certify that I was present at and personally superintended this survey and that the survey and plan are correct.

The field survey was completed on:	2019	November	26	(YYYY/Month/DD)	The checklist was filed under ECR#:
The plan was completed and checked on:	2019	November	29	(YYYY/Month/DD)	233228

☒ None ☐ Strata Form S

☒ None ☐ Strata Form U1 ☐ Strata Form U1/U2

Arterial Highway ☒ I am a British Columbia land surveyor and certify that I am authorized by the Minister of Transportation and Infrastructure under section 44.1 of the Transportation Act to show certain lands identified on this plan dedicated as Arterial Highway.

 Remainder Parcel (Airspace) ☐
4. ALTERATION: ☐

REFERENCE PLAN OVER
ALL OF BLOCK M EXCEPT PART ON PLAN 23299
GROUP 1 NEW WESTMINSTER DISTRICT

PREPARED TO SECTION 102, Land Title Act

SCALE 1 : 750

1" = 750'
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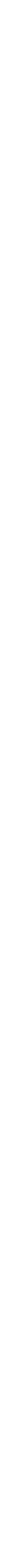
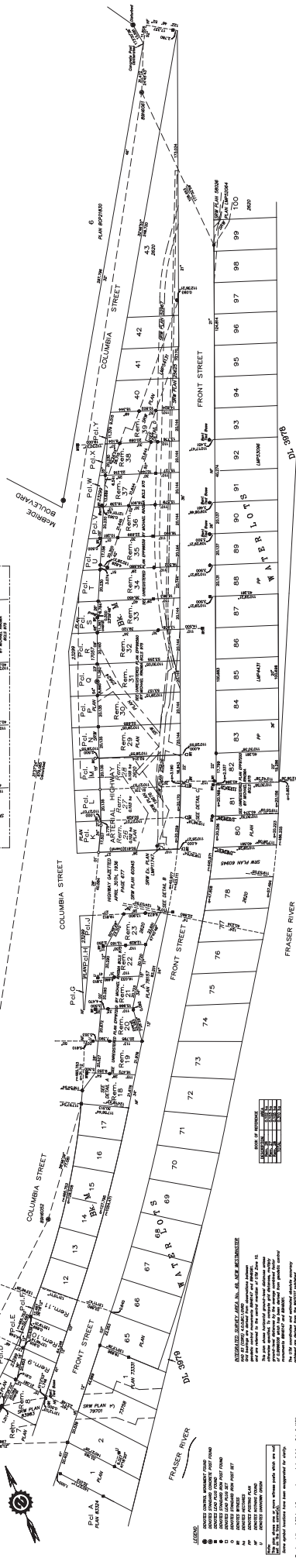
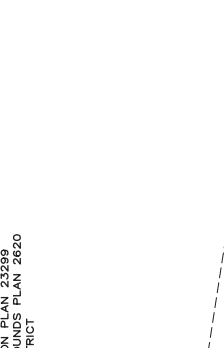
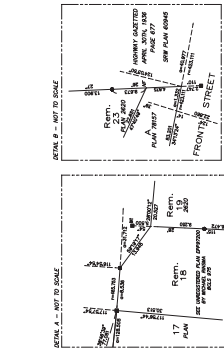
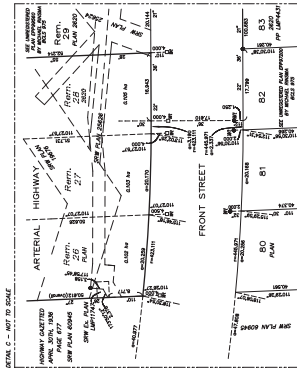
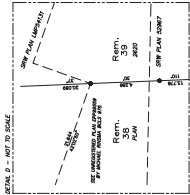
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FortisBC Energy Inc.
16705 Fraser Highway
Surrey, B.C. V4N 0E8
Tel: 778 571 3267

Via email:

October 30, 2020

Transportation Investment Corporation (TI Corp)

Attention: Wendy Itagawa
Executive Project Director
Pattullo Bridge Replacement Project

Dear Ms. Itagawa

Re: Pattullo Bridge Replacement Project – Existing Gas Line on Bridge

I am replying to your letter of September 14, 2020.

Further to my recent telephone calls with Ken Nash, Director Strategic Engagement and Interface with TI Corp regarding the matters raised in the letter, FortisBC is not in a position to sign the letter as currently written. However, we wish to continue to co-operatively work within the best interests of both our respective projects to reach a mutually beneficial agreement on all the matters.

Please advise what FortisBC can do in the interim to ensure the Pattullo Bridge Replacement Project critical milestones are progressing forward as planned. As I have indicated to Ken Nash, we would appreciate the opportunity to discuss these matters further with you. We remain committed to the success of both the FortisBC Pattullo Gas Line Replacement Project and the Pattullo Bridge Replacement Project.

Sincerely,

FORTISBC ENERGY INC.

A handwritten signature in blue ink that reads "Melanie Kilpatrick".

Melanie Kilpatrick
Project Director

- cc. Mike Leclair, Vice President, Major Projects, FortisBC
Amanda Farrell, Chief Executive Officer, TI Corp
Ken Nash, Director Strategic Engagement and Interface, TI Corp
Kevin Volk, Assistant Deputy Minister, MoTI
Ian Pilkington, Chief Engineer, Highway Operations
Sany Zein, Vice President, Translink
Les MacLaren, Assistant Deputy Minister, EMP

Attachment 4.1

(Accessible by opening the Attachments Tab in Adobe)

Attachment 12.8

<div><div></div><div>FORTIS BC</div><div>Energy at work</div></div>		Pattullo Gasline Replacement (PGR)																																
Integrated Master Schedule																																		
Broadway / Gaglardi																																		
Activity ID	Activity Name		Remaining Duration	Start Date	Finish Date	Activity Status																												
Total																																		
Pattullo Gas Replacement (PGR) - M-0010' Broadway and Gaglardi							1753d																											
CPCN - Development M-0010'.1							1753d																											
Capital Cost - Execution M-0010'.3							938d																											
Project Services M-000X.3.A																																		
Procurement M-000X.3.B																																		
Plan AM-000X.3.B.1																																		
External Proc-Consultant M-000X.3.B.1.2																																		
Contracting																																		
PA1630	Prepare Contract Conversion Package - Mainline Construction		30d	14-Jun-21	26-Jul-21	Not Started																												
PA2550	Convert Contract - Mainline Construction		25d	27-Jul-21	31-Aug-21	Not Started																												
PA1640	Issue PO - Mainline Construction		5d	01-Sep-21	08-Sep-21	Not Started																												
PA1660	Issue PO - Pressure Reduction Station		5d	30-Sep-21	06-Oct-21	Not Started																												
PA1670	Issue PO - Other Construction/Services		5d	07-Oct-21	14-Oct-21	Not Started																												
Pipeline																																		
Line Pipe																																		
PA2130	Prepare Purchase Request & obtain Approval - Line Pipe		17d	02-Mar-21	24-Mar-21	Not Started																												
PA1530	Issue PO - Line Pipe		5d	25-Mar-21	31-Mar-21	Not Started																												
Casing Pipe																																		
PA2630	Prepare RFQ - Casing Pipe		15d	11-Jan-21	29-Jan-21	Not Started																												
PA2640	Issue RFQ & Receive Bids - Casing Pipe		17d	01-Feb-21	24-Feb-21	Not Started																												
PA2650	Evaluate Bids - Casing Pipe		10d	25-Feb-21	10-Mar-21	Not Started																												
PA2660	Prepare Purchase Request & obtain Approval - Casing Pipe		10d	11-Mar-21	24-Mar-21	Not Started																												
PA2670	Issue PO - Casing Pipe		5d	25-Mar-21	31-Mar-21	Not Started																												
Induction Bends																																		
PA2090	Prepare RFQ - Induction Bends		15d	16-Sep-21	06-Oct-21	Not Started																												
PA2100	Issue RFQ & Receive Bids - Induction Bends		20d	07-Oct-21	04-Nov-21	Not Started																												
PA2110	Evaluate Bids - Induction Bends		10d	05-Nov-21	18-Nov-21	Not Started																												
PA2120	Prepare Purchase Request & obtain Approval - Induction Bends		10d	19-Nov-21	02-Dec-21	Not Started																												
PA1510	Issue PO - Induction Bends		5d	03-Dec-21	09-Dec-21	Not Started																												
Actuated Valves																																		
PA2140	Prepare RFQ - Actuated Valves		15d	11-Jan-21	29-Jan-21	Not Started																												
PA2150	Issue RFQ & Receive Bids - Actuated Valves		17d	01-Feb-21	24-Feb-21	Not Started																												
PA2160	Evaluate Bids - Actuated Valves		10d	25-Feb-21	10-Mar-21	Not Started																												
PA2170	Prepare Purchase Request & obtain Approval - Actuated Valves		10d	11-Mar-21	24-Mar-21	Not Started																												
PA1590	Issue PO - Actuated Valves		5d	25-Mar-21	31-Mar-21	Not Started																												
Other Valves																																		
PA2180	Prepare RFQ - Other Valves		15d	31-May-21	18-Jun-21	Not Started																												
PA2190	Issue RFQ & Receive Bids - Other Valves		20d	21-Jun-21	19-Jul-21	Not Started																												
PA2200	Evaluate Bids - Other Valves		10d	20-Jul-21	03-Aug-21	Not Started																												
PA2210	Prepare Purchase Request & obtain Approval - Other Valves		10d	04-Aug-21	17-Aug-21	Not Started																												
PA1810	Issue PO - Other Valves		5d	18-Aug-21	24-Aug-21	Not Started																												
Fittings																																		
PA2220	Prepare RFQ - Fittings		10d	11-Aug-21	24-Aug-21	Not Started																												
PA2230	Issue RFQ & Receive Bids - Fittings		15d	25-Aug-21	15-Sep-21	Not Started																												
PA2240	Evaluate Bids - Fittings		10d	16-Sep-21	29-Sep-21	Not Started																												
PA2250	Prepare Purchase Request & obtain Approval - Fittings		5d	30-Sep-21	06-Oct-21	Not Started																												
PA1820	Issue PO - Fittings		5d	07-Oct-21	14-Oct-21	Not Started																												
Misc. Items																																		
PA2260	Prepare Purchase Request & obtain Approval - Misc. Material		10d	19-Nov-21	02-Dec-21	Not Started																												
PA1610	Issue PO - Misc. Material		5d	03-Dec-21	09-Dec-21	Not Started																												

Remaining Level of Effort

Actual Level of Effort

Actual Work

Remaining Work

Critical Primary

Milestone

Summary

Critical Secondary

Critical Tertiary

Data Date: 25-Sep-20

Print Date: 09-Nov-20

Page: 1 of 5

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Date	Revision	Checked	Approved
25-Sep-20	R.00	Lewi Sadik	Deepak Uberoi

<div><div></div><div>FORTIS BC</div><div>Energy at work</div></div>		<div>Pattullo Gasline Replacement (PGR)</div> <div>Integrated Master Schedule</div> <div>Broadway / Gaglardi</div>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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